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## 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.

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## Uniformity of Shop Records

The executive committee of the American Railway Mechanical and Electrical Association, at its recent meeting in Cleveland, laid plans to have the subject of shop records well discussed at the next convention. As one of the members of the committee put it, "most of our members are keeping some kind of records as to the mileage of various parts, costs of repair materials and cost of shop labor for different repairs, but no two of us are keeping our records in the same way, so that it is seldom that they are worth anything for comparison. What we need is to get some uniform system of keeping these records, so that we can compare figures with each other to advantage." At first thought, this is a subject which should come under the jurisdiction of the accountants rather than of the master mechanics. Further consideration will show, however, that the subject is one which could very properly and profitably be taken up in detail by the Mechanics' Association. Not only in actual practice are these records kept for his direct information, but usually all the work is done in the shop, under the personal direction of the master mechanic. Further than this it was suggested that the accountants, in their systems, have interested themselves only in the costs of various items, while the master mechanic requires a large amount of additional information in order prop-

erly to secure the best economical results. He must be acquainted, for example, with the mileage he is obtaining from wheels and other wearing parts as well as the cost per wheel, and he must know the amount of labor put into rewinding an armature, as well as the total finished cost, in order to see where reductions can be made. It is, therefore, entirely in order that the master mechanics take up this subject, although it is not unlikely that a little later the mechanical and accountants' associations can work together in this matter to their mutual advantage.

Very closely allied with this subject is that of piece-work in repair shops which are of such size as to permit men to work continuously for some time on one operation. A change to piece-work after the shop has been run on a time basis usually gives some very startling results, both in the reduction of the cost of performing certain operations and in the amount of work each man turns out. It is very seldom that such a change does not result after a few months in some astoundingly high wages to rapid workmen performing very simple operations. In an informal discussion of the matter at the recent committee meeting, it seemed to be the consensus of opinion of the master mechanics who had enjoyed the most experience with piece-work, that the most desirable plan is a premium system, where employees are paid by the hour, as is usual, but given a premium above their regular wages for work in excess of a certain amount. This should produce a large increase in output per man, while at the same time not resulting in such absurdly high wages as sometimes follow the introduction of the piece-work system. Excessive wages are likely to be a source of dissatisfaction among other employees who cannot be put on piece-work and whose rate per hour is fixed.

## Track Work and the Master Mechanics

In commenting, as we have above, on one of the directions in which the efforts of the American Railway Mechanical and Electrical Association will be directed, it seems suitable to refer to another subject which has been more or less discussed in connection with the proposed work of the association, and that is the subject of track.

There has been, undoubtedly, considerable disappointment among some managers and other railway men because of the positive stand taken by the master mechanics against the admission to their organization of engineers and others engaged in building and maintaining track and roadbed, and their equally determined opposition to the consideration of papers dealing exclusively with this feature of railway work. The subject has come up several times at committee meetings, and it was also discussed at the Saratoga Convention, but on all occasions every suggestion of this kind has been voted down. In justification of their action the master mechanics point to their convention last September, at which they held so many busy sessions without completely exhausting the subjects brought up for discussion. They have more than enough to do, they say, in giving proper study and scrutiny to the subjects which rightly

come before them under their present organization, and they protest that it would be bad policy to take on additional departments when such action would, of necessity, require them to neglect or discard some of the work now in hand.

It is greatly to be regretted that those engaged in track construction do not represent sufficient strength numerically to support an organization of their own, at which subjects pertaining to this important department could be discussed by experts for the improvement of others. No doubt there would be no desire on their part, under such conditions, to seek admission to the mechanical association, and yet it is questionable whether it would not be advantageous for all concerned if these departments were brought closer together. The work of each is important to the other, and has a direct bearing upon the results secured. This is the view of the subject that was taken by a prominent street railway man the other day, who suggested that, if necessary, an additional day could be had for the consideration of track problems, or that one day might be taken out of those now allotted other subjects and devoted to track work. Any plan that will bring the representatives of different departments together in earnest discussion of subjects in which both are interested, and which may vitally affect the general operating results, is commendable. We have frequently urged upon the companies and the associations the necessity for devoting more attention to track work, and to the serious problems which yet remain to be solved in this department. We regard it as one of the most important branches of electric railway work, and we take this occasion to renew with emphasis our warning against the apparent indifference which marks the attitude of many companies toward this subject.

### The Right of Way in Chicago

The blocking of street car traffic unnecessarily by teamsters is an unmitigated public nuisance in many cities, although, in a few, public sentiment, supporting the efforts of the street railway company, has done much to stamp out this evil. Mr. Ely and Mr. Beggs described, at the Saratoga convention, the excellent results secured in Buffalo and Milwaukee by a systematic campaign among the principal owners of the trucks and drays which use the streets, and the efforts of the New York officials toward a solution of the problem seem now to be bearing fruit. The new "rules of the road" in New York, which now bear the authority of an ordinance and which are intended to reduce the unnecessary delays to street traffic from the interference with each other of the vehicles on the street, were published in our last issue, and will, it is thought, effect some reform in this direction.

From our own observation, as well as the testimony of others, there seems to be no city in which there is more delay of this kind than in Chicago. The Arnold report on the street railway situation in Chicago showed what enormous improvements could easily be made by vigorous action on the part of the police. This report in itself should have been sufficient to rouse the Mayor to action, but nothing has come of these excellent recommendations, and, judging from present appearances and experience, nothing is liable to be done under the present administration.

City officials were given another opportunity to really accomplish something at once for the benefit of transportation conditions, independently of any questions of franchise extension or increase of number of cars in service, when a committee of six aldermen from the West Side, last week, met General

Manager Roach and the receivers of the Chicago Union Traction Company and asked for better service. The schedules for train service on the West Side lines were immediately produced, and the Aldermen admitted that they would be satisfactory if they could be adhered to. Mr. Roach is reported to have said: "It is not the fault of the gripmen or motormen that delays occur. Where our schedules are disturbed the cause may be traced in nearly every instance to teamsters who block the right of way. It is useless to appeal to the police; the lax enforcement of the law by policemen can be seen at every corner." The Aldermen, realizing that this was the case, immediately promised to allow the company to swear in a number of special policemen, with power to arrest obstructing teamsters. Like all other moves for the improvement of transportation facilities in Chicago, however, this was blocked in the city's legal department, and so the matter has come to naught. How long this blocking of the wheels of progress in Chicago will continue remains to be seen. There is some indication that the public is waking up to a realization of the true condition of affairs and the causes leading to the present inconveniences imposed upon the patrons of these lines, but although the daily press has advocated vigorous measures for relief, it is too much to expect that the Harrison administration will make such a radical departure as to favor any proposition which will aid the transportation companies in giving the people the service the city deserves and desires.

### Open Cars or Semi-Convertible?

At least one of the large car builders, and probably many others, who have heretofore furnished a large number of open cars at this season for electric railways, have noticed the marked disinclination on the part of operating companies at the present time to place orders for this class of equipment. This condition is explained in most cases by the placing of orders for semi-convertible cars, which seem to be growing in popularity. This is particularly true, it is said, of the companies which are operating suburban extensions of city lines and interurban roads. Formerly the open car was considered a great inducement to the traveling public, especially on scenic routes and through the rural districts, but it is claimed by many managers that the semi-convertible car offers all of the advantage which an open car possesses and does not have some of the disadvantages, especially where high-speeds are maintained. It is generally admitted that the open car will always be popular on the surface lines for city traffic, and as far as the public is concerned it is probable that it will be equally popular on suburban extensions where only a moderate rate of speed is allowable, but for interurban work the semi-convertible is undoubtedly preferable for many reasons.

Some managers of small companies explain their preference for the semi-convertible car on the ground that it will halve their investment, as it will not be necessary to have a duplicate set of cars, but we do not think that there is much in this argument. On every properly conducted road the equipment is thoroughly overhauled at least once a year, and where a double equipment is used, the open cars can be thoroughly repaired and painted or varnished in winter, and the closed car equipment can be put in shape during the summer months. A complete equipment of semi-convertible cars would undoubtedly reduce the necessary number of bodies somewhat, as a full six months is not required to carry out all of the necessary repair work. But a 50 per cent reduction is entirely too large as an estimate.

Against this reduction in equipment must be weighed the lower cost, greater seating capacity and greater popularity of the open car for slow speed service. We by no means agree with those who consider the open car will go out of use. The semi-convertible car undoubtedly has a very large field, and we regard its introduction as probably the greatest single improvement in the street railway industry which has occurred during the last five years. But it should not be regarded as a perfect substitute for the open car, especially where the pleasure traffic is a considerable feature of the business done.

### Lessons From Steam Railroad Practice

The interesting paper by Mr. Armstrong, which we published last week, put in convenient form for reference the serious conditions involved in a schedule with frequent stops. It is a paper which will bear re-reading by every progressive electric railway man. But the very fact that such a paper needed to be written emphasizes the necessity for a thorough study of steam railroad practice by anyone who wishes to have a firm grasp of the principles of modern transportation. Steam railroad practice in either construction or operation cannot be adopted bodily, but most of the mistakes made in the past and now being made on electric railways, come from lack of recognition of certain fundamentals in steam railroad work. When railroading was begun nearly seventy years ago there were no precedents to follow; everything had to be learned by experience, and it was a hard and costly teacher. Gradually the lessons were hammered home, and they have not been forgotten. But, as we have many times pointed out, electric railroading is an evolution from the tramway, an evolution vastly rapid, but still moving by gradual steps so smoothly that its full significance has not yet been completely grasped. The single matter of the effect of stops upon schedule time has needed much elucidation in order to appear in its true importance, and yet the general results of investigations, like Mr. Armstrong's and those which have gone before, have been long well understood by those engaged in general railway work. Steam suburban service has over and over again disclosed the limitation imposed by frequent stations, and the difficulty has been met by the institution of express service, precisely as it had been before on long lines, and just as it is being met now by electric roads. There is a difference of degree in the conditions, since electric motors, particularly with multiple-unit control, can force a greater acceleration than is possible with ordinary steam locomotives, but the general situation is not different.

Indeed, the constants of the case are less changed by the substitution of a new motive power than might at first thought be supposed. For although by multiple motors the possible acceleration can be pushed up to 3 m. p. h. to 4 m. p. h. per second, so that a relatively fast schedule can be maintained in spite of frequent stops, yet such acceleration is neither safe nor desirable, and the practical values come down to half these figures, or less, as indicated in Mr. Armstrong's tables. Similarly the effect of the nature of the roadbed, including grades and curves, upon feasible schedule speeds, have been well understood in general railroading, and enormous sums of money have been spent in straightening, levelling and ballasting the tracks, with most beneficial results, both physical and economical. To be sure, the electric road, so long as it conducts only a passenger traffic, feels the effect of grades relatively less than an ordinary railroad, which, again, is a dif-

ference of degree rather than kind. It is equally true, that owing to the ability to secure rapid acceleration, short short-radius curves with long tangents cause less delay on an electric road than the longer long-radius curves usual in steam railroad location. The effect, however, of quickened schedule on the size of locomotive required, the coal to be burned, and the maintenance cost of the roadbed has been well understood on steam roads, and in changing motive power to electricity, as Mr. Armstrong suggests, these roads have very material advantages. In fact, the ordinary steam suburban system has in these particulars what even the best and most modern electric lines seldom approximate and still more rarely reach. Similarly in long runs few interurban lines even remotely approach in the character, location, and independence of the roadway the conditions common on steam railways. And no better guide can be followed in the evolution of fast electric lines than the ordinary well-operated railroad. This fact is now beginning to be realized, but it has taken an indefinite amount of bitter and costly experience to enforce it. The larger interurban lines, as we have often remarked, are in effect ordinary railways, save in the matter of motive power, and must be operated in a similar manner.

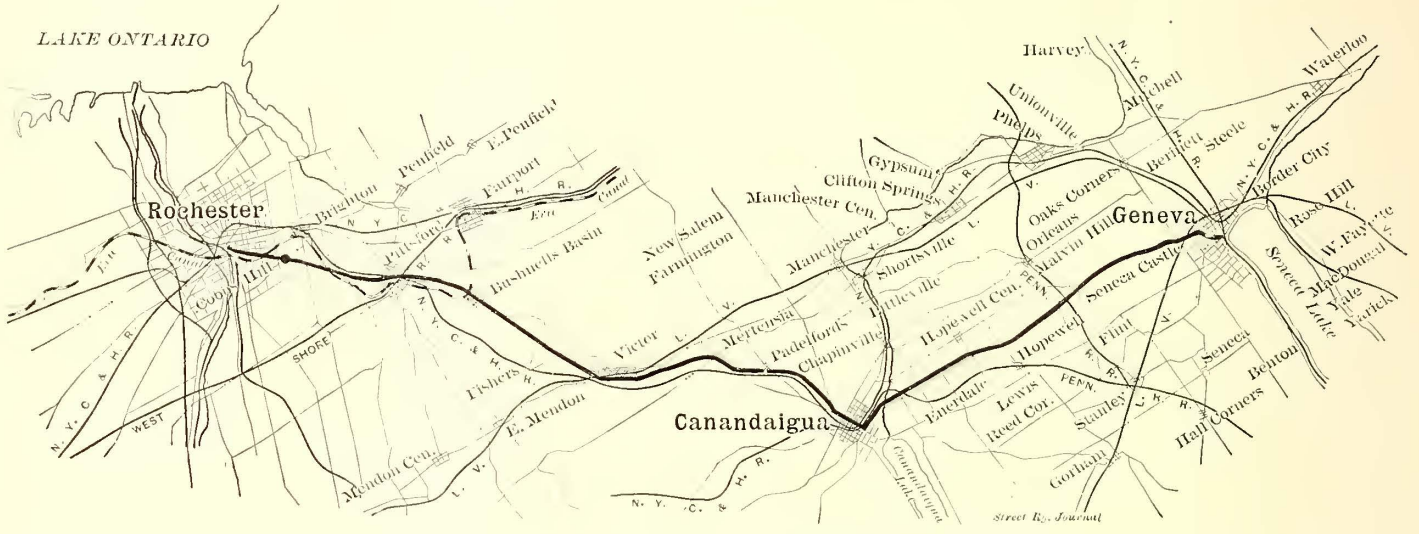
It would not be difficult to multiply instances indefinitely of the idea which we are trying to express: Thus, steam railroads years ago learned that it is unwise to run trains on a single-track road without a complete and effective system of train despatching and signals. On interurban lines scores of accidents have resulted from failing to take to heart this lesson which was ready at hand. Steam roads learned a quarter century ago the value of air brakes on fast-running trains, but it has been a long struggle, happily now successful, to get them into fairly general use on fast electric cars, which need them all the more on account of the frequent service attempted.

We call attention to these things, not in any fault-finding spirit, but to point the moral that rapid transit is rapid transit irrespective of the motive power, and that the wise electric railway man should take the utmost advantage of the experience for which his rivals have paid dearly in years gone by. It is always a pleasant thing to let the other fellow foot the bills, and in this case the advantages are obvious. Almost every time an electric railway man tries some specious simplification of railroad practice it turns out to be a thing which had been tried and failed years ago. Undoubtedly, railroading admits of improvements, but past experience cannot safely be disregarded. Roads which are distinctively of the nature of tramways stand on a different basis, and to a considerable extent have to pay the cost of their own evolution. They have ample troubles of their own, but not the same troubles as the high-speed interurban roads. Lines clearly belonging to either class have the way marked out for them very clearly, but there are roads in transitional stages upon which serious mistakes are peculiarly liable to be made. These constitute the real problem of electric railroading as such, and to them particular attention ought to be directed. They are neither tramways nor railroads at the present time, and while they may eventually gravitate toward one class or the other, they are and may long remain in a condition to which neither railroad precedents nor tramway precedents fully apply. To such roads our present remarks do not apply, but to the rest we would urgently commend the study of what has gone before,

### ELECTRIC INTERURBAN IN WESTERN NEW YORK

The opening of the western division of the Rochester & Eastern Rapid Railway, between Rochester and Canandaigua, recently, was a notable event in electric railroading in Western New York, as it added another to the growing list of competitors of the established steam roads of that section. Early in the spring construction will be resumed east of Canandaigua, and the line completed to Geneva as soon as possible. Work was in progress on this section when the weather made it necessary to discontinue operations for the winter, but considerable headway had been made, and it is now expected that

travel, and which enables passengers to reach the more important business houses or to connect with local lines for any part of the city. The country traversed is very thickly populated, there are many fair-sized villages along the line besides Canandaigua and Geneva, and all of this section has long been tributary to Rochester. The population of the district served, exclusive of Rochester, exceeds 50,000, and those familiar with local conditions assume that the road will receive considerable patronage from that terminal; in fact, judging from present indications, the contributing population of the Flower City will form an important factor in the earning capacity of the property. By taking into consideration the dis-



ROUTE FOLLOWED BY ROCHESTER & EASTERN RAPID RAILWAY

the entire road will be completed and in operation within six months.

The route followed is shown on the accompanying map. It is more direct than the New York Central, and it takes in all the important points touched by the steam line. The distance from Rochester to Canandaigua, by the electric line, is 26.85 miles, to Geneva 43.30 miles, and by the New York Central 29

tricts indirectly served, including those beyond Geneva, and also the city of Rochester, the total population from which the company can reasonably expect to draw patronage is about 300,000. The amount of public travel through the region traversed is indicated by the fact that the New York Central runs twenty-two passenger trains a day through the village of Canandaigua, six of them starting from Canandaigua. At



tion. There are 450 summer cottages on its shores, and the population of the principal points, about 10,000, is, in a fair sense, almost directly tributary to the Rochester & Eastern Railway, as the travel landing at the foot of the lake would have the city of Rochester as its natural objective point. Seneca Lake is 46 miles long, with a line of fine steamers running from Watkin's Glen at its head to Geneva at its foot, and with an electric line running from Watkin's to the city of Elmira. The population indirectly tributary by way of the Geneva, Waterloo, Seneca Falls & Cayuga Lake Electric Railway, which runs from Geneva through the places named to Cayuga Lake, 50 miles long, lying parallel with Seneca Lake, and having the city of Ithaca and Cornell University at its head, aggregates not less than 100,000. It is simply referred to here, but is not included in the estimate of the contributing population mentioned elsewhere. The road itself passes

according to the present plans. A map of the route is herewith presented.

A short distance west of Pittsford the line passes over the Erie Canal on a through, pin-connected, steel-truss bridge, 123 ft. long, on concrete abutments. Near this point it passes under the tracks of the New York Central Railroad by concrete undercrossing, with complete natural drainage. It also passes under the steel bridge of the West Shore Railway, over Main



TRACK AND OVERHEAD WORK NEAR VICTOR

through a very attractive country, as will be appreciated by an inspection of the accompanying views, and for this reason it will command patronage from those riding for pleasure alone.

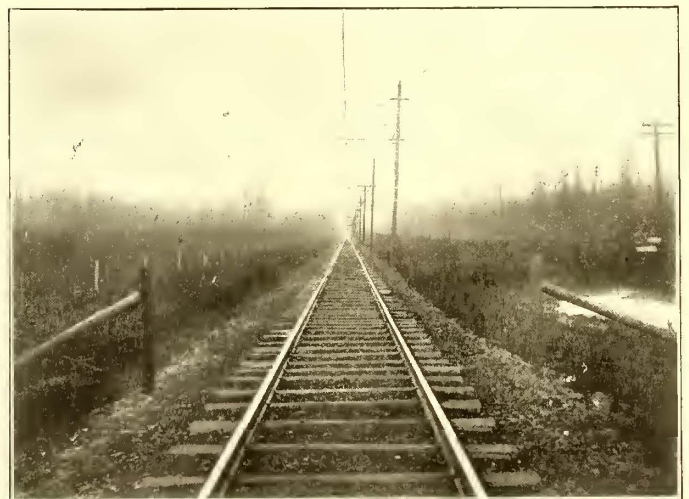
THE ROUTE

Starting at the "Four Corners" in the center of the city of Rochester, the line runs easterly over the tracks of the Rochester Railway Company to the present easterly city limits on Monroe Avenue, where its own right of way and tracks begin. From the city limits to the hamlet known as the "Twelve Corners," the line is located upon the northerly side of Monroe Avenue, which is an improved, macadamized roadway. A short distance east of the "Twelve Corners" the private right of way begins. It is from 66 ft. to 100 ft. wide, providing throughout for double tracks, and this private right of way continues without interruption, except for a short distance near and in the village of Pittsford, the hamlet of Bushnell's Basin, the village of Canandaigua and the city of Geneva, until it reaches Seneca Lake, the eastern terminus of the road



LINE CONSTRUCTION NEAR WOODS

Street in Pittsford, and through the center of the village of Pittsford, and from this point a branch or spur line will be built to the prosperous village of Fairport, about 4 miles to the northeast. From Pittsford the main line passes easterly through the famous Shetland Pony Farm, and then through the village of Victor and East Victor, on private right of way to Canandaigua, the county seat of Ontario County, where it traverses Main Street, through its entire length, to the foot of Canandaigua Lake, where the power house, shops and car house are located. In the village of Canandaigua the line operates over the tracks of the Ontario Light & Traction Com-



ELECTRIC LINE PARALLELING AUBURN BRANCH OF NEW YORK CENTRAL

pany, which have been entirely rebuilt and relaid with new 73-lb., first quality girder rail. The line has also been provided with new overhead equipment for this purpose. The local company is owned and controlled by the owners of the Rochester & Eastern, but the latter has also its own franchises through the village.

From Canandaigua the line will pass, when completed, due east, entirely on private right of way, through Dunkel's Corners, Seneca Castle and the towns of Hopewell and Seneca,

to the city of Geneva, which it enters on Castle Street and penetrates to the foot of Seneca Lake.

The total mileage of the system, including the branch to Fairport, but not the distance of  $2\frac{1}{4}$  miles within the city of Rochester, is 49.3 miles.

#### ROADBED CONSTRUCTION

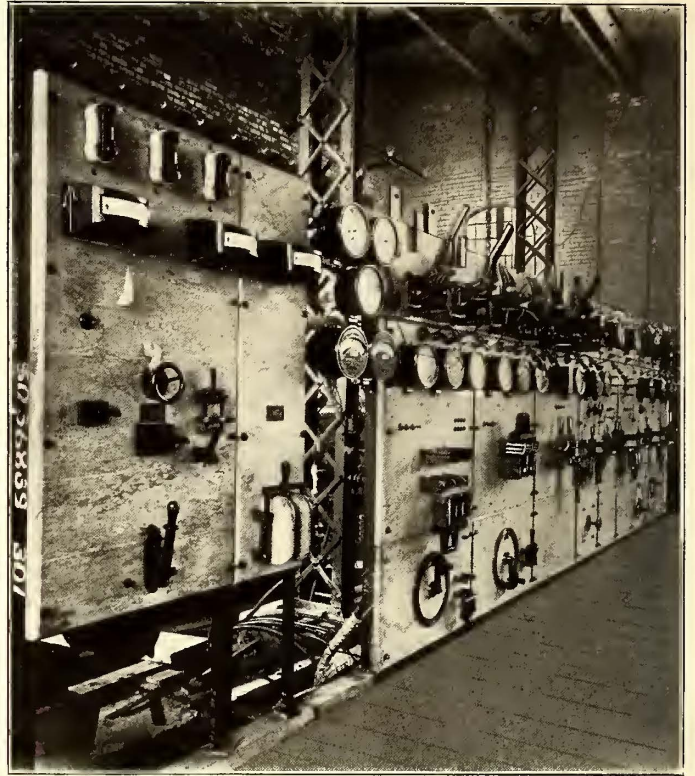
The road is built for the most part on a private right of way, averaging 66 ft. wide, which was bought outright at a cost approximating \$100,000. The exceptions are as follows:

From Rochester city limits the road runs along the north side of Monroe Avenue for about  $2\frac{1}{2}$  miles, and in the village of Pittsford it traverses Main Street for 600 ft.; at Bushnell's Basin about a mile of the public highway is used, but through the village of Victor the road is exclusively on private right of way. In Canandaigua 2 miles of Main Street is traversed, and in Geneva about 2 miles in Castle Street to the lake front. All the rest of the line is on private right of way.

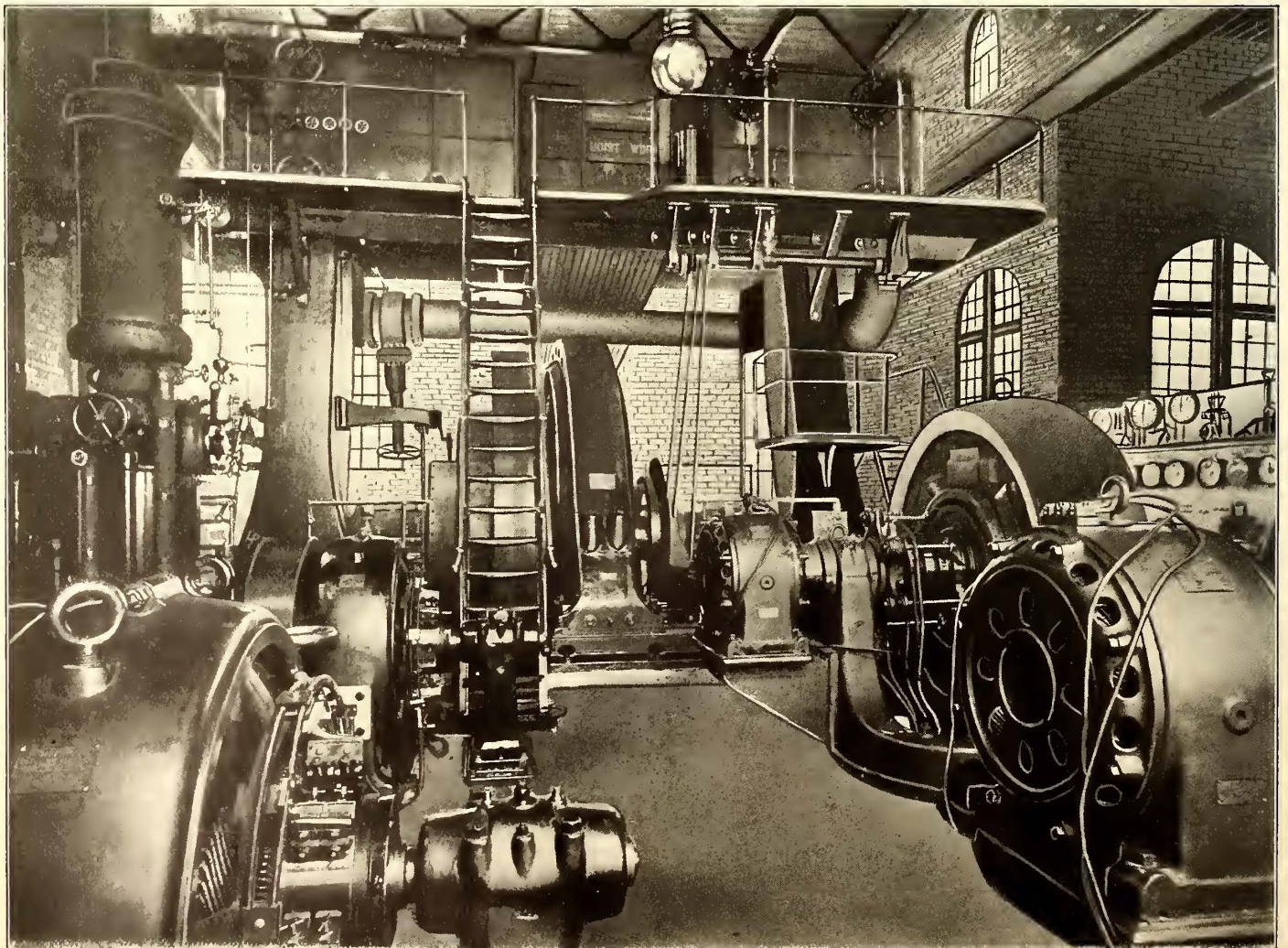
The track is of 70-lb., first quality steel T-rail, with six-bolt splice bars, all of A. S. C. E. standard. It is laid on ties 8 ft. long, of cedar on tangents, yellow pine and white oak on curves, yellow pine on bridges and white oak at switches. They are spaced 26.40 per mile, and 14-in. center on bridges. Steel guard rails have been laid on all bridges, curves and outside of switches. "Protected" rail-bonds of 000 capacity, with 8-in.  $\frac{3}{4}$  terminals, expanded in hand-drilled holes with a hydraulic expander, are used.

The road is ballasted throughout with first quality gravel, a minimum of 6 ins. beneath ties being maintained. This material is secured from pits owned by the company, which aggregate 13 acres, and are located at several accessible points along the road. It is estimated that they contain sufficient gravel to supply the road with ballast for many years.

Bridges were built of steel on concrete abutments, there being sixteen between Rochester and Geneva, excluding those for steam railroad crossings. Two of the bridges are 123 ft. long, pin-connected and with steel trusses. There are five rail-



SWITCHBOARD IN MAIN POWER HOUSE



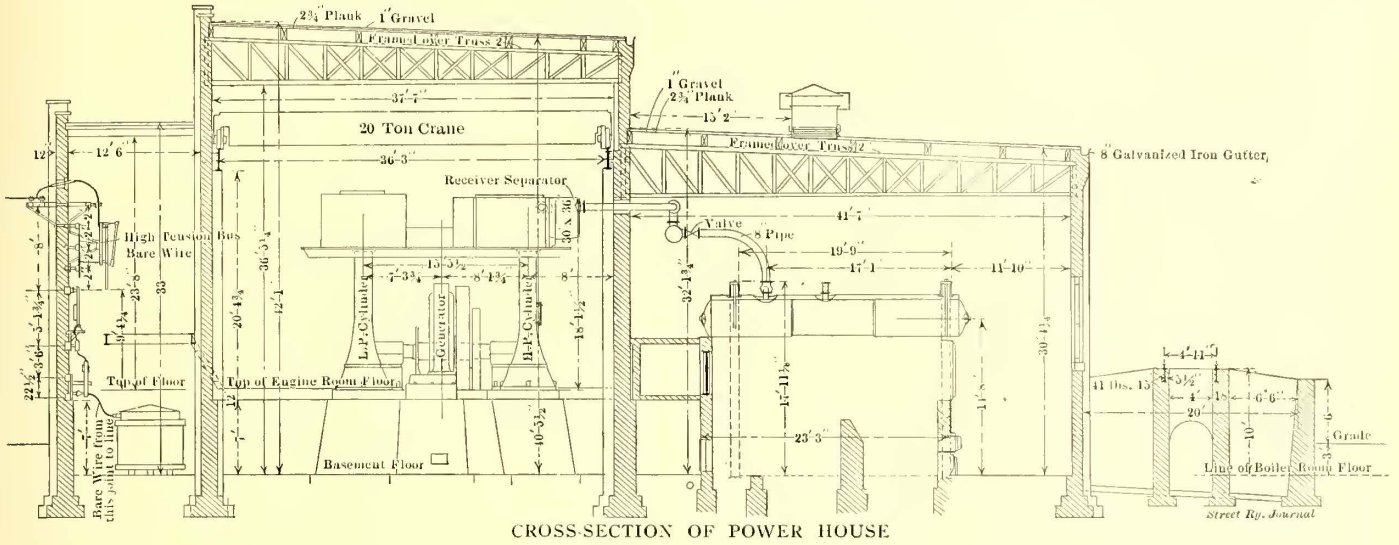
ENGINE ROOM IN MAIN POWER HOUSE, SHOWING DIRECT-CONNECTED GENERATOR, EXCITERS AND ROTARIES

road crossings with a separation of grades, and with steel bridges on concrete abutments. All bridges are designed for a rolling load, consisting of a train with 20,000 lbs. per axle, on a 6-ft., 3-in. wheel base, 26 ft. center to center of trucks, and a dead load of 800 lbs. per lineal foot, with an impact of 80 per cent.

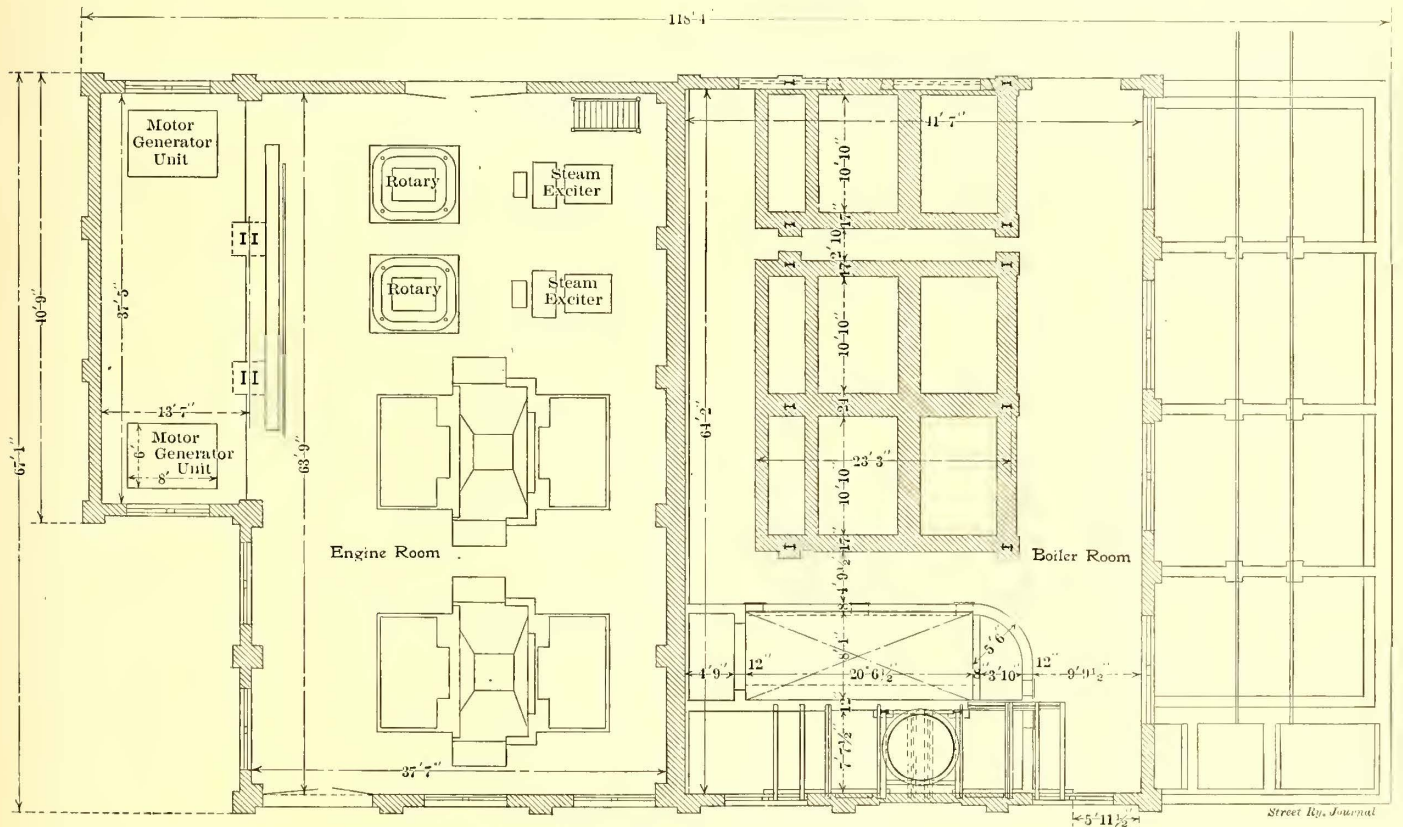
All culverts of over 4-ft. openings in the clear are of concrete arch type, and those of less than 4 ft. are of extra heavy

Trolley wire, of 0000 General Electric grooved copper type, carried on extra heavy 8-ft. 6-in. over-support, flexible brackets, with Ohio Brass hangers and clamps, were installed. The trolley is tapped to the feeder line every half mile. The distributing system is designed for 450-amp. transmission each way from each sub-station.

A telephone line of No. 12 copper circuit is carried on brackets with porcelain insulators. Span-wire construction



CROSS SECTION OF POWER HOUSE



PLAN OF ENGINE AND BOILER ROOM

cast-iron culvert pipe. Drains are of extra heavy vitrified fire-clay sewer pipe.

OVERHEAD EQUIPMENT

The pole line comprises cedar poles of 7-in. top, 30 ft. to 50 ft. high. Extra heavy yellow pine cross-arms and galvanized iron braces are used.

The transmission line is of stranded aluminum conductors, carried on Locke 40,000-volt glass insulators, with extra long paraffined oak pins and special galvanized ridge iron, while the feeder line is also of stranded aluminum, equivalent to 500,000 circ. mil and 400,000 circ. mil copper.

was adopted in villages where necessary, and in these instances 5-16-in. galvanized stranded span-wire was used. The several types of construction are illustrated in the accompanying line views.

POWER HOUSE

The main power house is at the foot of Main Street in the village of Canandaigua. It is 117 ft. 8 ins. x 65 ft. 9 ins. x 44 ft. extreme height, and is divided into two parts by an 18-in. party wall, the north section consisting of an engine room, 38 ft. 7 ins. x 65 ft. 9 ins., with a wing 15 ft. 6 ins. x 39 ft. 5 in., used for a transformer tower and an entrance for



BOILER ROOM

the electric wires into the building, while the south part comprises a boiler room, 42 ft. 7 ins. x 65 ft. 9 in., with a concrete coal-bin extension 21 ft. 6 ins. x 65 ft. 9 ins.

The foundations of the building are all of concrete, made of crushed stone, sand and Lehigh Portland cement, while the

walls are of pressed brick laid in Lehigh Portland cement mortar and average 18 ins. thick. The floors are of steel and concrete throughout, and the roof is of four-ply felt with tar and gravel filling, and is supported on steel roof trusses.

In the engine room are two Williams' vertical cross-compound engines, 22-in. and 43-in. x 32-in. stroke cylinders. One of these is shown in the accompanying cut. The nominal rating, at 150 r. p. m., with 150 lbs. initial pressure and exhausting into a pressure of 2½ lbs. (abs.), is 1050 ihp. These engines were built by the Quincy Engine Works, of Quincy, Ill. They are direct-connected with two 650-kw alternators of the revolving field type, operating at 150 r. p. m. These generators, together with the other electrical apparatus for the power house, were furnished by the Westinghouse Electric & Manufacturing Company. There are two rotary converters, from alternating current to direct current, of 300-kw capacity, at 500 r. p. m., and four 500-kw transformers have been placed in the basement of the transformer tower to reduce the voltage of the alternating current for these rotaries.

For exciting the main generators there are two Westinghouse compound, automatic engines, the cylinders of which are 9-in. and 15-in. x 9-in. stroke. They are directly connected with two 37½-kw, 125-volt direct-current generators.

One 9-in. panel switchboard in the main power house is illustrated herewith. It is composed of two generator panels with rheostats, one transformer panel, two rotary converter panels for alternating current, with fuse panel underneath, two rotary converter panels for direct current, one direct-current two-circuit feeder panel, and one double-



MAIN POWER PLANT, CAR HOUSE AND REPAIR SHOPS



exciter panel. To aid in the installation of heavy machinery, and in the handling of all heavy parts during inspection and repairs, a 20-ton, hand-power, riveted plate girder, traveling crane, with trolley attachment, has been provided. This crane has a 36-ft. 3-in. span and 22-ft. lift, and travels on runways in the walls lengthwise of the building.

The equipment of the boiler room comprises 1124 hp, of Cahall horizontal, sectional, water-tube boilers, with 11,240 sq. ft. of heating surface and 227.43 sq. ft. of grate surface, arranged to be set as three boilers in 1½ batteries. The headers throughout are of flanged steel. The boilers will carry, if desired, 225 lbs. steam pressure.

A feed-water heater of the horizontal water-tube type, 36 ins. x 14 ft. 6 ins., has been provided, as has also a green fuel economizer, containing thirty-two sections of ten tubes, each tube 9 ft. long by 49-16 ins. diameter, giving a total heating surface of 3840 sq. ft. Two fans, 85 ins. in diameter, full-house, using 40,000 cu. ft. of air per minute, at 250 r. p. m., are employed as blowers. They are driven by two simple, vertical engines of 16 hp each, with cylinders 8 ins. in diameter by 8-in. stroke. The condensing apparatus consists of one 24-in. elevated cone condenser of the jet type, having sufficient capacity to condense 60,000 lbs. of exhaust steam per hour, one rotative dry vacuum pump, and one horizontal duplex direct-acting circulating pump. Two 8-in. horizontal receiver separators and two 4-in. vertical receiver separators are employed. There are two boiler feed pumps of the outside-packed double plunger type, one duplex fire pump, of the plunger and ring pattern, having a capacity of 600 gals. per minute at piston speed of 100 ft., or steam pressure of 125 lbs., and one duplex, high-pressure, automatic pump and receiver.

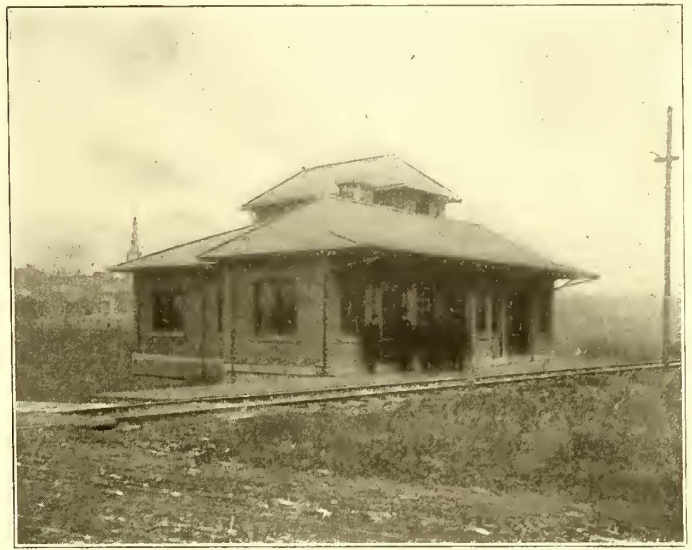
The stack is of ¾-in. iron, 5 ft. 9 ins. diameter and 24 ft. long.

SUB-STATIONS

There are three sub-stations on the line of the road, one at Pittsford, another at Victor, and the third at Seneca Castle.

gether with a plan and cross-section, illustrating the principal features, will be found among the illustrations.

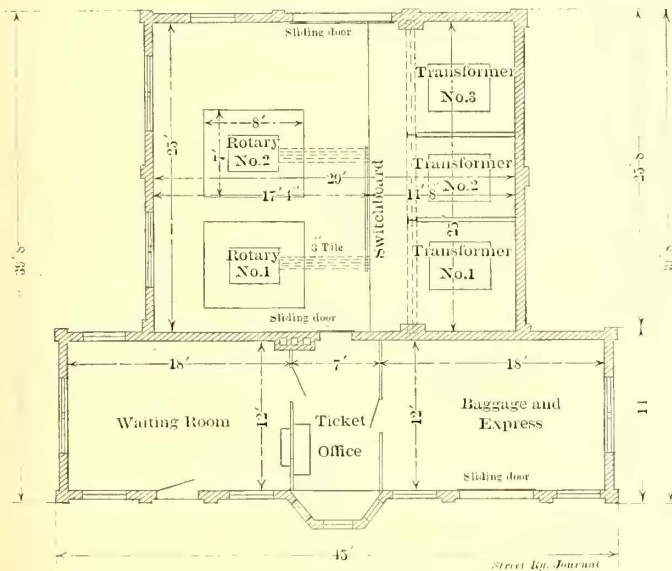
The Pittsford and Seneca Castle stations contain two 300-kw rotary converters, three 200-kw static transformers, three fuse switches and circuit breakers for 20,000 volts, three lightning arresters with choke coils, and one switchboard, consisting of



VICTOR SUB-STATION, EXPRESS AND PASSENGER DEPOT

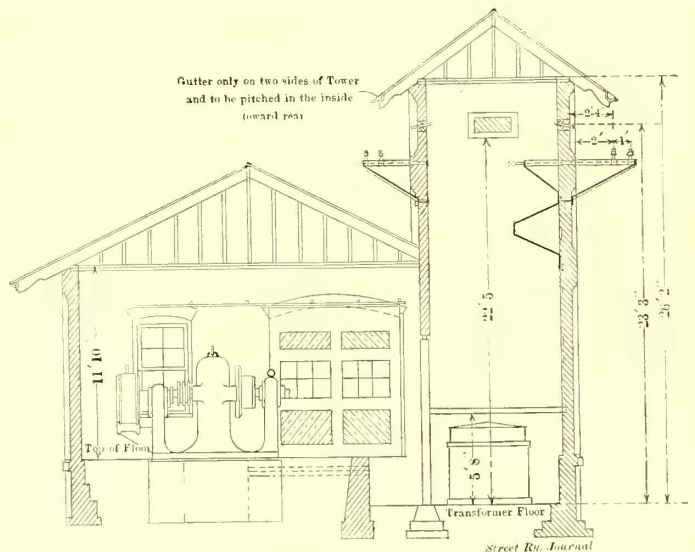
two alternating-current rotary converter panels, one direct-current rotary converter panel, and one double feeder panel.

The Victor station has been laid out for the same machinery, but until contemplated extensions are made there will be installed one 300-kw rotary converter, three 200-kw transformers, three choke coils, six fuse switches, and three lightning arresters. The switchboard comprises one alternating-



PLAN OF VICTOR SUB-STATION

Owing to their location in villages they have been designed to answer for passenger and freight stations as well as electrical distribution stations. These stations are all built with concrete foundations for both buildings and machinery, and the walls are of brick with natural cement mortar. The roofs are of slate. Each station is 39 ft. 8 ins. wide by 45 ft. long over all. The height of the station part proper is 15 ft. 8 ins., and of the transformer tower 29 ft. Each contains a waiting room, 18 ft. x 12 ft.; a baggage room, 18 ft. x 12 ft.; a ticket office, 14 ft. 6 ins. x 7 ft.; a rotary converter room, 20 ft. 6 ins. x 25 ft., and a transformer tower for the entrance of the electrical wires, 8 ft. x 25 ft. Views of the several stations, to-



CROSS-SECTION THROUGH TOWER AND ROTARY ROOM OF SENECA CASTLE SUB-STATION

current rotary converter panel, one direct-current rotary converter panel, and one direct-current feeder panel.

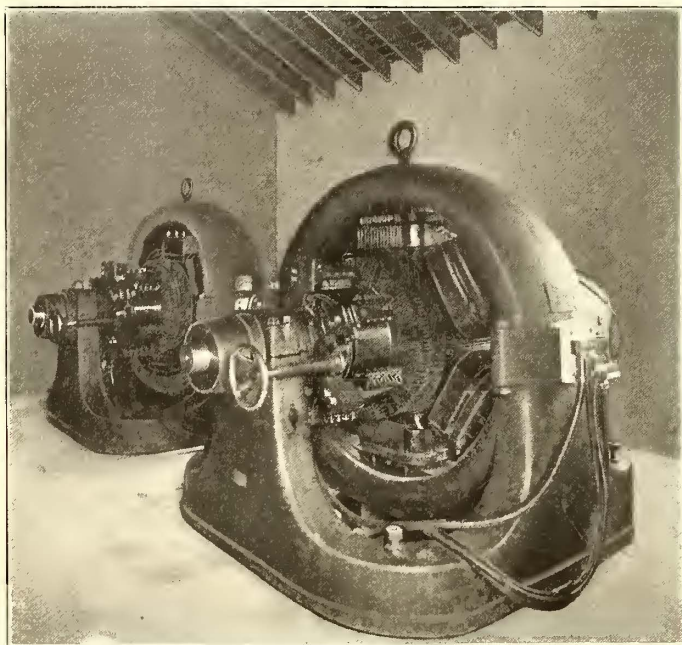
PASSENGER STATIONS

Ample accommodations have been provided for passenger traffic along the line, and as the patronage increases additional stations will be provided. Those already erected are of neat design, and are constructed of brick or wood. They are located at all points where needed. By reference to the plan of the Victor sub-station, which may be accepted as typical of the others, there are passenger waiting rooms and express and freight offices connected with each sub-station, the latter being made of brick with slate roofs.

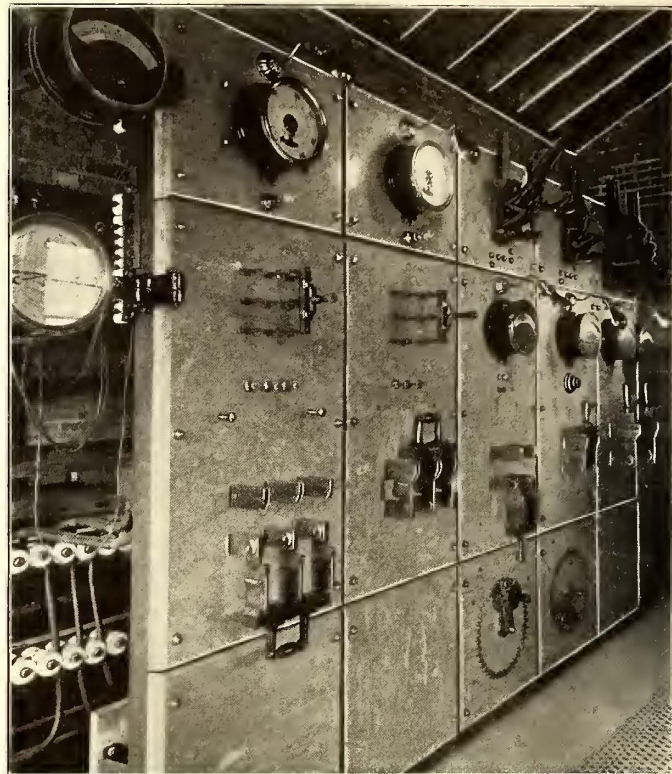
## ROLLING STOCK

The car equipment at present comprises six 52-ft. passenger coaches, furnished by the John Stephenson Company, of Elizabeth, N. J. They are of the most modern type, being double vestibuled and finished in mahogany, with smoking compartment and toilet rooms, water coolers and electric heaters. Each coach is equipped with a telephone set, and the cars are

racks. The cars have Stanwood steel steps and vestibule trap doors of the Zimmerman type. When the vestibule is closed in



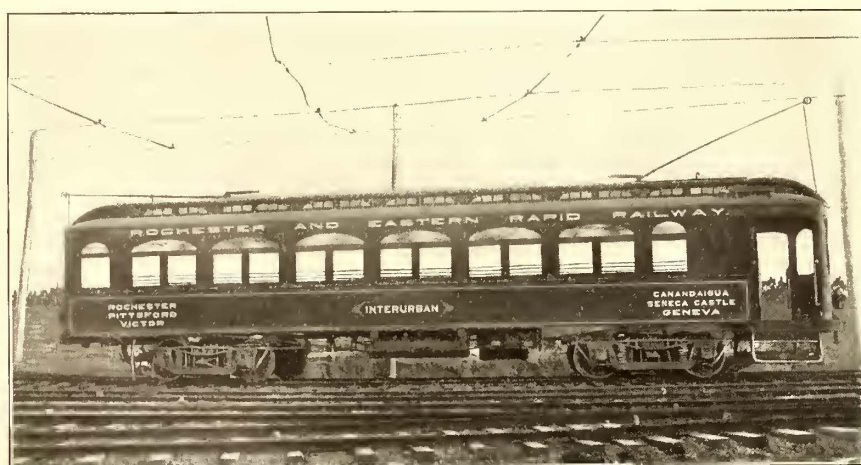
ROTARIES IN PITTSFORD SUB-STATION



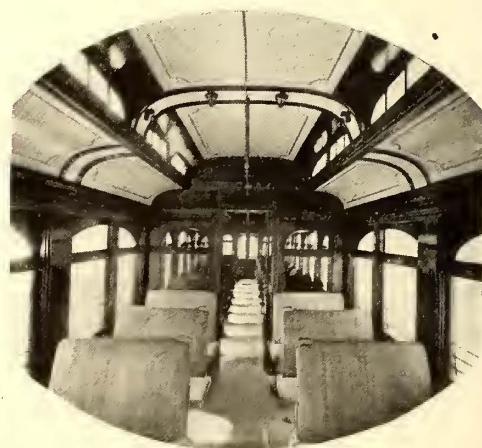
SWITCHBOARD IN PITTSFORD SUB-STATION

all furnished with electric lights and headlights. The accompanying illustrations give a fair idea of their exterior and interior appearance. They are of standard steam railroad construction throughout, being heavily built after designs especially adopted for high-speed interurban service. The length of the car body over corner posts is 40 ft., while the extreme length over the buffers is 52 ft. The length of the vestibule is 4 ft. 6 ins., and the length of the rear platform is

and this trap door is in position, it rests upon two angle-irons fastened securely on each side of the door step, about  $1\frac{1}{2}$  ins. below the floor level, so that the door will be on a level with the vestibule floor, and in reality form a part of it, as it will extend out over the step to the vestibule door, thus making a continuous flooring for the entire enclosure. It is not hinged at the back, but when it is desired to remove it so that the steps may be used for admitting passengers, it is raised and swung



STANDARD PASSENGER COACH



LOOKING THROUGH SMOKING COMPARTMENT

5 ft. The extreme width of the car is 8 ft. 6 ins., and the height from the under side of the sills to the top of the roof is 9 ft. The interior finish and furnishings are attractive and comfortable throughout, the appointments of the regular passenger and smoking compartments, of course, differing somewhat. In the former the seats are of the Hale & Kilburn walk-over type, upholstered in crimson plush, with high backs and head rolls, the cushions being 34 ins. long and 17 ins. wide. In the smoker the same type of seat is used, but the finish is in white woven rattan. Extending the entire length of the car are parcel

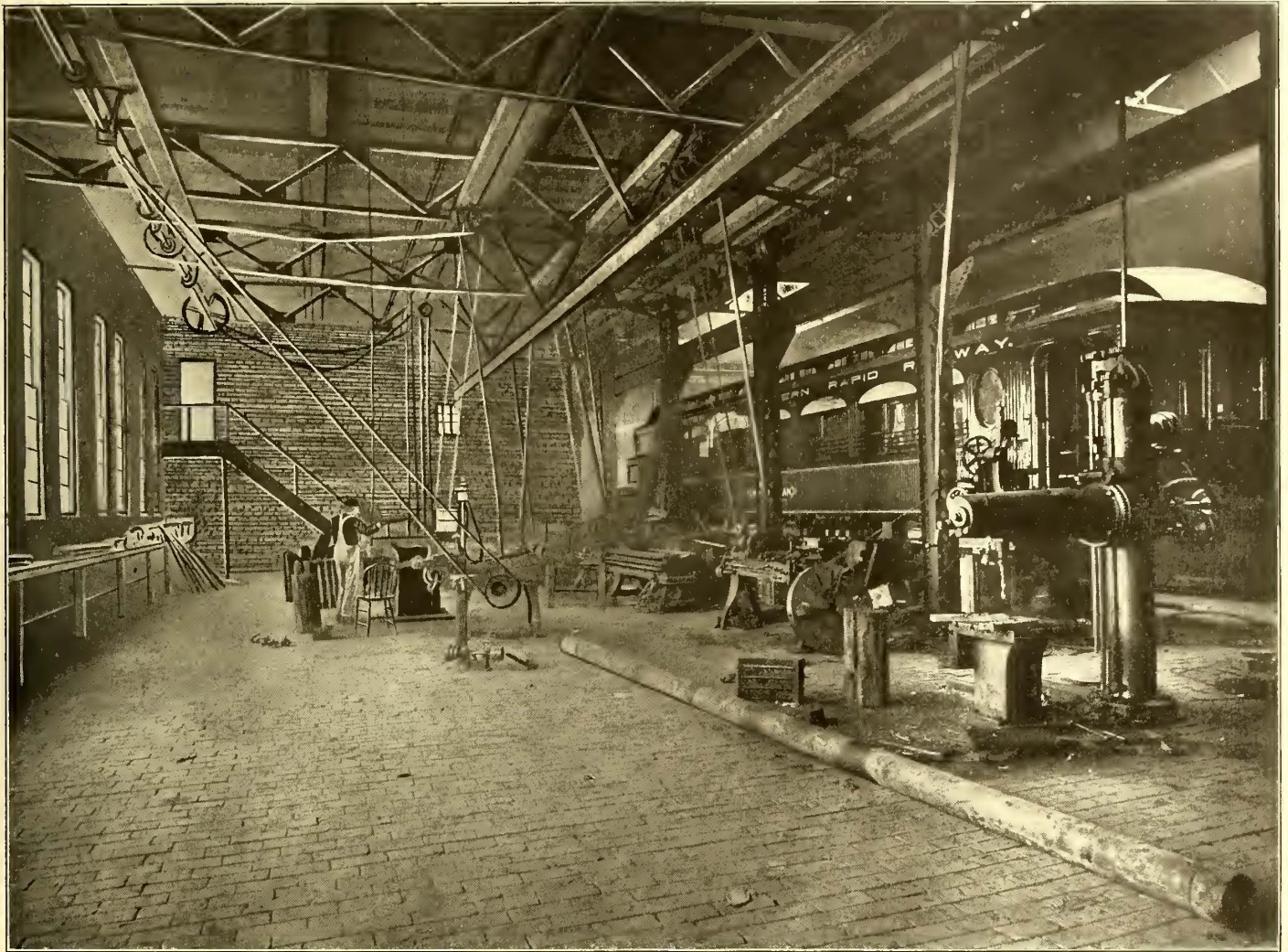
back as if hung on hinges from the vestibule flooring, and allowed to drop into a longitudinal pocket provided at the back of the step. It can be replaced by pulling it up and out of the pocket and letting it down upon the angle-iron rests. A pin at the rear of the step holds it securely in position and prevents the motion of the car from jarring it out of place.

The M. C. B. trucks for passenger cars are extra heavy even for high-speed, and have  $5\frac{1}{2}$ -in. axles and steel-tired wheels. Westinghouse straight-air brakes are provided with a motor-driven air pump on each equipment. The electrical features

are simple, comprising four-motor equipments, General Electric No. 73, with L-4 control and General Electric No. 74, with type-N train control, and solid gears on axles being adopted.

Eight additional passenger coaches, six of them 45 ft. long,

located near the main power house. The foundations are of concrete throughout like the power house, and the walls, averaging 12 ins. in thickness, are laid up in pressed brick. Steel beams, channels and columns are used throughout for



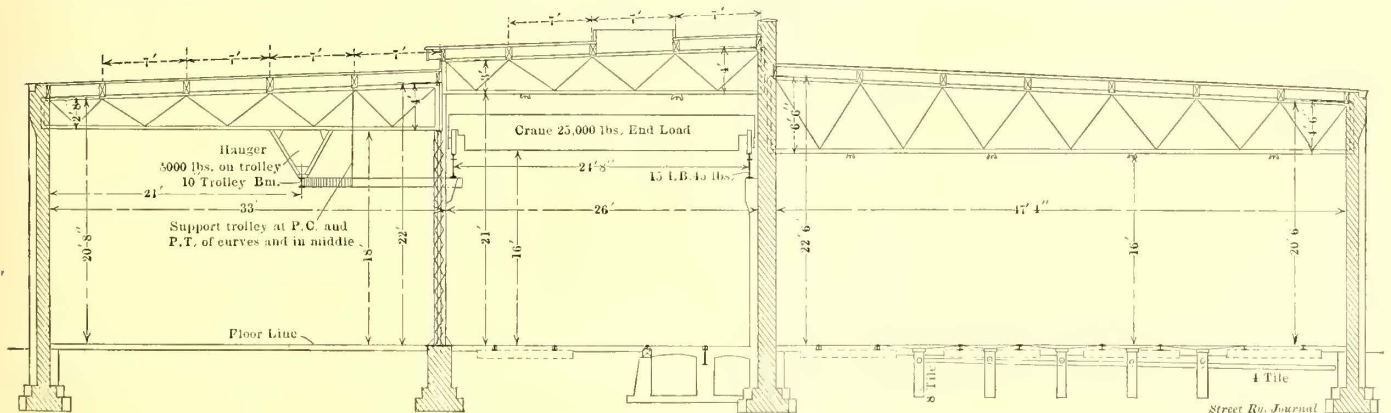
REPAIR SHOP

for summer traffic, are under order, and all are of similar type and finish to those now in use. They will have four General Electric No. 74 motors and type-M control.

There are also two 50-ft. express cars and one 36-ft. construc-

tion. The roof is of four-ply wool felt with tar and gravel filling, and is supported on steel roof trusses.

This structure is divided by a party wall into the car storage side, 48 ft. 4 ins. x 169 ft. 6 ins., and the shop side 60 ft. x 169



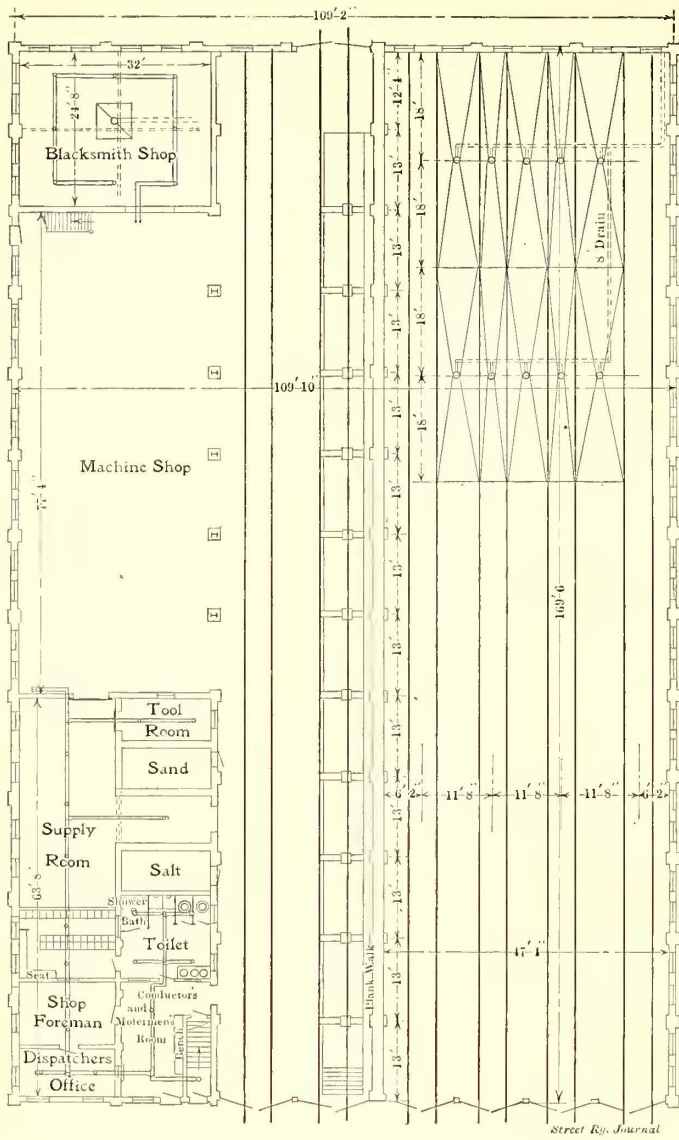
CROSS-SECTION OF REPAIR SHOP AND CAR HOUSE

tion and repair car. A Ruggles double-action, high-speed snow-plow, built by the Peckham Manufacturing Company, completes the equipment.

CAR HOUSE AND SHOPS

The building occupied as a car house and shops is 169 ft. 6 ins. x 109 ft. 10 ins. x 27 ft. 4 ins. extreme height, and is

ft. 6 ins. The former contains four tracks, and has a capacity for storing twelve large cars 50 ft. to 55 ft. long. The latter is devoted to repair shops and general supply and office rooms. There are two tracks running through this part of the building. One of these leads direct to the shop proper, where the repair work will be done, and the other runs over an inspection pit



car bodies from the trucks, and for other heavy work in connection with car and motor repairs.

In the northeast corner of the shop side is a space 24 ft. 8 ins. x 32 ft., enclosed by a brick party wall. The ground floor room of this space is used for a blacksmith shop, and is equipped with a forge and complete assortment of tools for this work. The second story, directly above the space occupied as a blacksmith shop, is used as an armature winding room. The armatures are hoisted from the shop floor and carried into the armature room on traveling hoists.

In the northwest corner of the shop side is a space 63 ft. 8 ins. x 32 ft., likewise separated from the rest of the shop by a party wall. The ground floor of this space is devoted to supply and store rooms, employees' waiting room and wash room, shop foreman's office and train dispatcher's room, while the second story is occupied by the general offices of the company. There are five commodious office rooms, a general auditing room, two wash rooms and a cloak room, all opening from a main ante-room. These offices are finished in yellow pine, natural wood, throughout. A fire-proof vault and a large voucher room are connected to the general auditing room.

The equipment of the shop is operated by a 15-hp compound-wound, direct-current motor. The tools used in the shop were furnished by the Niles-Bement-Pond Company, and include one each of the following machines: Twelve-inch x 6 ft. Niles engine lathe, compound rest, 22-in. x 14-ft. Niles engine lathe compound rest, 16-in. shaper, 14-in. Washburn drill, 36-in. x 4-in. grindstone, 20-in. Whitney water-tool grinder. No. 1 Niles 100-ton hydrostatic wheel press, 16-in. x 8-ft. pattern-maker's lathe, No. 4 power-hack saw. There is also the usual equipment of drills, chucks, vises, anvils and miscellaneous tools, together with shafting and belting to complete the installation.

OPERATION

Although the road has been in operation only a comparatively short time its patronage is much greater than was anticipated by the projectors. This is due in part, no doubt, to the cheap fare as compared with the steam road, the frequency of the service and the convenience of being able to board or alight from a car at the point nearest the passenger's destination; but a large measure of the immediate success of the enterprise must be attributed to the business-like methods employed, which inspired confidence in the management. From the beginning everything has worked smoothly, and it has been evident that the operation of the road was in the hands of

156 ft. 6 ins. x 8 ft. 10 ins. x 4 ft. 3 1/2 ins. deep, constructed of concrete.

On runways above the inspection pit there are two hand-power traveling cranes of 10-ton capacity each, with a span of 24 ft. 8 ins. and a lift of 16 ft. These are used for raising the

**ROCHESTER & EASTERN RAPID RAILWAY COMPANY.**

TIME TABLE NO. 4.

IN EFFECT 12.01 A. M. DECEMBER 2, 1903.

WESTBOUND. DAILY.													EASTBOUND. DAILY.																																																																																																																			
READ UP.			FIRST-CLASS.				WESTBOUND. DAILY.						EASTBOUND. DAILY.						FIRST-CLASS.			READ DOWN.																																																																																																										
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

This Time Table is for the information of employees only, and the Company reserves the right to vary therefrom as circumstances may require.  
Trains in either direction have no superior right over trains in opposite direction, but will meet trains as per Time Table, unless otherwise ordered by the Dispatcher.  
Heavy figures denote regular meeting points. Small figures appearing above show number of opposing train. Work trains must clear all regular trains by 5 minutes.  
Train 29 stops only at Canandaigua, Hathaways, Victor, Fishers, Bushnell's Basin, Palmyra Road, Pittsford, and all regular stops west of Pittsford.

J. H. PARDEE,  
GENERAL MANAGER.

W. R. W. GRIFFIN,  
OPERATING SUPERINTENDENT.

W. G. PARK,  
CHIEF TRAIN DISPATCHER.

SCHEDULE BETWEEN ROCHESTER AND CANANDAIGUA

experienced railroad men. The cars are run at regular intervals, and a schedule for all important points has been arranged, so that those at intermediate stopping places can estimate closely the time a car will pass in either direction. The latest time-table is reproduced on page 98.

Cash fare and ticket-rate sheets are also given, showing mileage and fare between Rochester and any point on the line now in operation. The basis of cash-fare rates is 2 cents per mile, and of ticket rates 1½ cents per mile. No tickets of any kind are sold by conductors except 100-mile books, for the accommodation of patrons to points at which there are no ticket offices. Mileage books are issued on the following terms: One thousand-mile book, at 1.2 cents, \$12.00; 500-mile book, at

offered by the new company. In addition to frequent service in comfortable cars and other conveniences, such as stopping on signal, a considerable difference in fare is offered. For instance, a single fare between Rochester and Canandaigua, the present terminal points, is 58 cents on the steam road, and 45 cents on the electric, while round-trip tickets are sold for 75 cents on the electric and \$1.10 on the New York Central. Corresponding reductions are made for other points by the electric company, and, consequently, the new road is attracting a considerable portion of the patronage formerly enjoyed by the steam road; moreover, it is encouraging people to travel, building up a new clientele of its own, and developing a large business between neighboring stations.

FREIGHT AND EXPRESS

In addition to the passenger business the company expects eventually to engage in the handling of freight and express, but this service has not yet been put on. It is expected that the express service will be started early in the year, and when the line is opened to Geneva considerable business of this kind is looked for.

ORGANIZATION AND MANAGEMENT

The Rochester & Eastern, from Canandaigua to Rochester, has been taken over by the railroad company from the contractors, the Comstock-Haigh-Walker Company, and has been in operation between those points since Oct. 15, 1903. The line from Canandaigua to Geneva is in the final stage of construction, and it is anticipated that it will be in operation, even with most unfavorable weather conditions, by April 1. The traffic from Rochester to Canandaigua has been more than satisfactory to the builders and owners.

The officers of the Rochester & Eastern Rapid Railway Company are: President, W. B. Comstock, Alpena, Mich.; vice-president, A. L. Parker, Detroit; secretary, W. A. Comstock, Canandaigua; treasurer, Henry A. Haigh, Detroit; engineer, F. W. Walker, Canandaigua; general manager, J. H. Pardee, Canandaigua; superintendent, W. R. W. Griffin, Canandaigua; chief despatcher, W. G. Park, Canandaigua; auditor, E. E. Lentz, Canandaigua.

CASH FARES

Table with columns for Mileage (1-31) and Fare (0.05 to 1.10). Includes sub-headers for 'MILEAGE' and 'FARE' and various fare types like 'Cash Fare', '100-Mile Book', etc.

Street Ry. Journal

MILEAGE AND CASH FARES OVER PRESENT LINE

1.3 cents, \$6.50; 100-mile book, at 1½ cents, \$1.50. Monthly commutation tickets, entitling the holder to fifty-four rides, are sold for points between Victor and Canandaigua, and similar tickets for those attending school are issued at special rate.

Accompanying the rate sheets here mentioned, which is shown on this page, the company has issued the following instructions to conductors: "Punch date in cover of each mileage book sold. Detach agent's stub when book is sold and auditor's check when first coupons are detached, and send stubs to auditor with trip report. Mileage books are not limited, and

THE NEAR CORNER ORDINANCE IN NEW YORK

The ordinance recently passed in New York City requiring all surface cars to stop on the near side of the street does not go into effect in Manhattan and The Bronx until Jan. 17. In Brooklyn, however, the cars commenced to stop on the near corner on Jan. 1, and during the last two weeks there have been a great many complaints in the public press from those who do not like the new plan.

Unfortunately for the success of the innovation the city

### IMPROVEMENTS TO THE BELFAST CORPORATION TRAMWAYS

The tramways in the city of Belfast date from 1872, when a system of horse roads was built by a London company. This system has been constantly extended, until at the present time it consists of some 45 track miles owned by the company, and 7 miles operated by the company, and leased from the city. In the days when most of the tramways were worked by horse traction, Belfast was in many ways considered the pioneer system, being as up-to-date as any other in the Kingdom. Up to quite

tensions which are indicated by broken lines on the map accompanying this article. None of the extensions, and only a small portion of the present system go beyond the city limits.

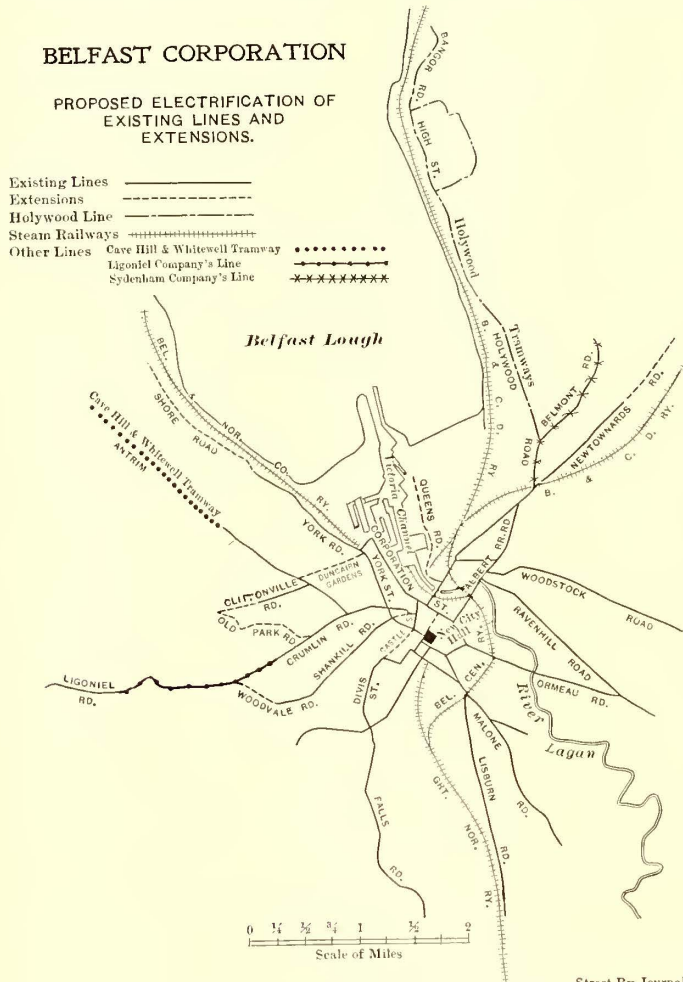
The extension scheme, which has been designed by the firm of Charles H. Merz, which is acting as consulting engineers to the corporation in connection with all of the work, involves some £200,000, and includes, not only the doubling of many existing lines, but a number of new lines as well. Certain of these are in the center of the city and are proposed with the object of reducing the congestion which would otherwise result from the concentration of all the cars at one point. Others are in the nature of loop lines, or are extensions on the ends of the present spurs, reaching, in most of cases, to the city boundary.

The entire system, when completed, will comprise some 76 track miles in a city with a population of 370,000, as against Dublin's 92 miles with a population of 350,000. While the city is fortunate in having recently extended its boundaries so that it has a considerable area for its scene of operations, it is nevertheless somewhat restricted as regards reaching country districts. There are numerous directions in which it would be desirable to make extensions, and a line is being promoted this session between Belfast and Holywood, a seaside resort some 3 miles away.

The policy of the city has been that, while it would oppose any company seeking compulsory running powers over its system, it is willing to favor the promotion of any lines on the outskirts of the city, realizing that they will be useful feeders to its own system, as well as giving greatly improved facilities to the citizens for holiday traffic. Such a course is undoubtedly the only reasonable one for local authorities to take, inasmuch as these country lines supply a need which they cannot themselves supply, and the only result of opposing them hitherto has been that the company has succeeded in getting compulsory running powers in spite of the corporation.

The Holywood line, which is also shown on the map, will be seen to be parallel with the line of the County Down Railway Company, which, on pressure, is likely to oppose it. It is, however, being strongly supported by all the local authorities, and in view of the complete failure of the railway companies during the past few sessions to get Parliament to pay any attention to the plea of competition, there can be little doubt that it will be successful.

The electrical energy for operating the line will probably be obtained from the existing lighting station.



MAP OF BELFAST LINES AND EXTENSIONS

recently the service compared favorably with that of the horse systems in London, but during the past few years the approaching termination of the company's concession has naturally had its effect upon the management.

To explain why such a large system still remains unelectrified involves more space than can here be given. It is sufficient to say that negotiations have been in hand between the city corporation and the company for many years, but hitherto without result. Under the terms of the original act the former could buy the company out in 1893, but this right was not exercised, and the franchise was extended for a period of fourteen years. This period terminates in 1907, but the city has suffered so much from the want of electric traction that it is applying to Parliament for a bill to exercise the powers of purchase without further delay.

In addition to operating its own system, the company, as stated above, operates certain lines built by and belonging to the city under Parliamentary powers granted in 1898, and has also purchased two small lines to Legoniel and Strantown respectively.

In addition to the powers for purchasing and electrifying the above lines, the bill includes the right to build a number of ex-

### RECORD CARDS USED IN ROCHESTER REPAIR SHOPS

The Rochester Railway Company has adopted a form of card record for the mechanical departments which has many points

No. \_\_\_\_\_ IN DATE \_\_\_\_\_

THIS CARD MUST BE SENT TO MASTER MECHANIC WHEN CAR IS IN GOOD ORDER.

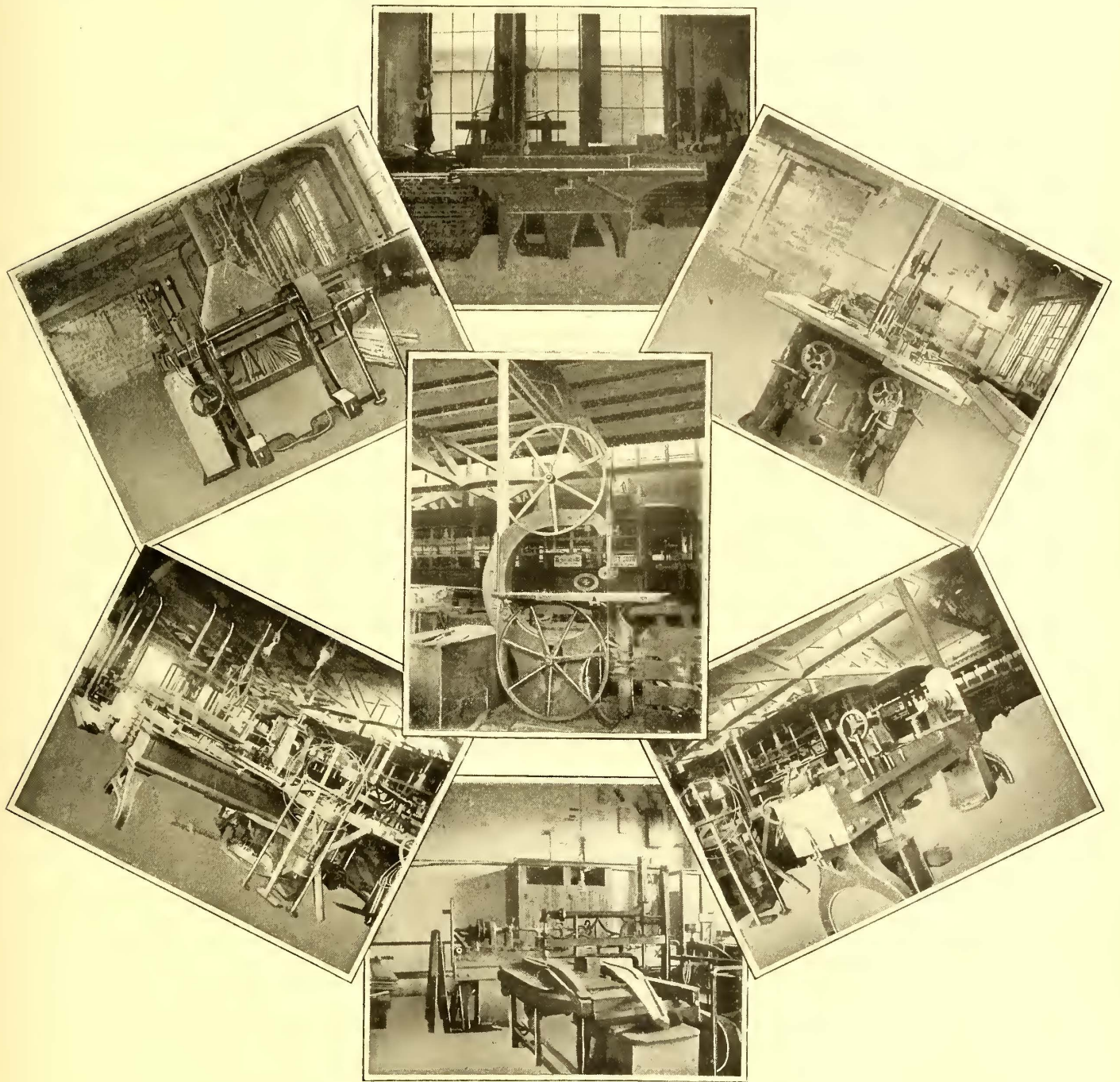
	OUT OF ORDER	WORK DONE	REP. BY
BRAKES			
MOTORS			
CONTROL'RS			
WIRES			
BODY			
HEATERS			
TRUCKS			
This Car Put in Order	M.		190
Station			Foreman.

CARD RECORD FOR REPAIR SHOPS

of merit. The card itself is 6 ins. wide and 4 ins. high, and may be printed on white or colored paper, so as to make a distinction between different classes of cars or branches. In

Rochester three colors are used, one for cars employed in city service and the other two for suburbans and interurbans controlled by the city company. By examining the cut presented herewith it will be noticed that there is a blank space left for the car number, the color of the ticket indicating the service in which it is engaged. These tickets must be filled out and signed by the foreman of the shop in which the repairs are

question of responsibility may be determined. One of the chief advantages of the system, therefore, is that it serves as a reminder and record at the same time, whereas, if shop reports were merely entered in a book they could not be consulted as frequently and conveniently by the master mechanic, as the book would be in the hands of a clerk most of the time with the other records. Now the significant facts are brought to the



VIEWS OF WOOD-WORKING DEPARTMENT IN ROCHESTER CAR SHOPS

made, and sent to the master mechanic every night at the close of working hours. The ticket itself needs no explanation, as it presents at a glance the information required about the car.

These cards are all filed in a box, which may be made any convenient length, depending entirely on the number of cars employed in the system and the amount of repair work done in the shops. In filing, each card is placed in its regular order, both in color and numerically, and in case there have been several cards turned in for one car within a short time, the master mechanic's attention will be attracted to the fact, and an investigation instituted at once, if necessary, to learn why that particular car has been in the shop so often, or, if it appears that the same trouble has happened more than once, the

attention of the master mechanic every night when the foremen file their cards.

NEW SHOP EQUIPMENT

The necessity for a system of this kind has been felt by the company for a long time, as the amount of work done in the shops is constantly increasing. This is partly due to the fact that the company has taken over additional properties and that the city equipment is growing all the time. In addition to the repair work now on hand the company is at present putting six new cars of its standard type through the shops. These will be ready for service very shortly.

Several views of the shop and the mechanical equipment are presented herewith. The company has added to its original

equipment, which has been thoroughly described, together with the shops in these columns. Conspicuous among the machines shown in the cut are the following: A 20-in. jointer and a 24-in. planer, a two-spindle shaper and a 34-in. band-saw of the Clements pattern. A 7-in. tenoner is also shown. Among the most interesting machines, however, is the 20-in. swing turning lathe, on which is a band-saw brazer with a Bunsen burner. A router, made in the shops from a Sanderson sand-papering machine, is also illustrated, and, as will be seen, it is used for working out car posts.

In addition to the machines shown is a large cut-off saw, of the Woods pattern, used for cutting heavy timber, the diameter of the saw being 36 ins., and a double saw-table, the size of the saw used being 14 ins. A mortising machine is also in use, but as it is an upright No. 2½ it is rather light for the work now done. The company also uses a 7-in. four-sided sticker.

Other departments of the shop are equally well equipped, and, altogether, it will be seen that for its size the Rochester Railway Company is prepared to do considerable work in the way of building new equipment as well as making repairs. Alfred Green, the master mechanic and chief electrician of the company, is in charge of this department.

**SOME POSSIBILITIES OF THE ALTERNATING-CURRENT SINGLE-PHASE RAILWAY MOTOR\***

BY. A. H. ARMSTRONG

The electric railway motor has replaced the horse and cable on our city streets, the steam locomotive on overhead and underground rapid transit lines, and has conclusively proved its exclusive right to operate suburban cars over distances reaching more than 50 miles from the outskirts of larger cities. All this has been accomplished with the direct-current series motor operating at a potential approximating 600 volts and with alternating-current distribution to suitably located rotary converter sub-stations. There are isolated cases where the electric motor has replaced the steam locomotive on steam lines, and where this has been done the increase in the dividend earning power of the road has been sufficiently great to warrant the extension of the electric service and the changing over of more steam-operated lines. With the commercial development of the alternating-current railway motor, new possibilities are introduced in electric railroading, owing to the much higher voltages for which the motor itself can be wound, and due also to the fact that alternating current is used directly as motive power without the expensive transforming apparatus required for the direct-current series motor.

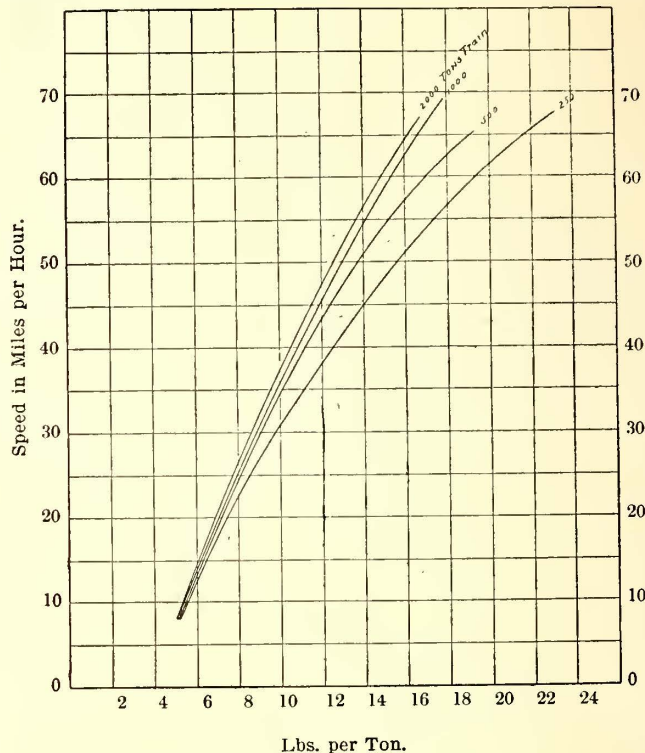
The alternating three-phase induction motor has been applied to traction work with doubtful success, owing to its practically synchronous characteristic, its limited output making it sensitive to the heavy voltage drops liable to occur in railway work, and due, furthermore, to the complication of double overhead trolley required for this type of motor.

During the past few years there have been developed several types of single-phase alternating-current motors having speed-torque characteristics even better adapted for railway work than that of the direct-current series motor, and, furthermore, providing ample starting torque with any voltage variation liable to occur in practical electric railway operation. As these motors can be operated with a single trolley and ground return, and can, furthermore, be operated satisfactorily on either direct or alternating current, it makes their field of usefulness much greater than their direct-current series competitor.

Having such a motor with practically no restriction as to voltage, it is possible to break away from the exclusive field of

electric traction with frequent service and small units and consider the operation of freight and passenger trains over our regular steam lines. In order to arrive at some general conclusions not limited by the local considerations of a specific case, this paper is devoted to a somewhat brief and general discussion of the operation of our steam lines by the alternating-current railway motor.

To make the conclusions general, trains of different weight have been taken, operating at different speeds and varying



CURVE SHEET NO. 1, TRAIN FRICTION CURVES

headway over a level track. As being typical, train weights of 2000, 1000, 500 and 250 tons of 2000 lbs. have been selected. As the investigation of the operation of these trains will be carried to maximum speeds of 60 m. p. h. to 70 m. p. h., the total friction of the train expressed in pounds per ton is given in curve sheet 1. This friction is not that of the trailing load, but includes the running and wind friction of the locomotive itself.

From a number of tests a steam consumption of approximately 30 lbs. per indicated horse-power-hour is taken as the basis of all locomotive work. It is assumed that locomotives are compound, as this steam consumption could hardly be expected with simple engines under average conditions. To make all results comparable further assumptions are made of an evaporation of 7 lbs. of water per pound of coal, an engine efficiency of 85 per cent, and cost of coal at \$2 per ton of 2240 lbs. The price of fuel will vary, and this is considered later. As we are figuring upon actual performance of the locomotive, that is, work done in overcoming train friction, it will be necessary to introduce a factor allowing for coal wasted in making up and damping fires, and general waste incident to locomotive practice when standing idle for a large part of the 24 hours. Furthermore, a steam locomotive is called upon to operate throughout the year at varying temperatures of the surrounding air, and coal consumption during the winter months is in excess of that during the summer. This excess may reach 20 per cent as an average during the cold weather, and hence 10 per cent additional fuel is charged to the locomotive for the work assumed, to take care of the different conditions of operation which the electric locomotive does not have to contend with.

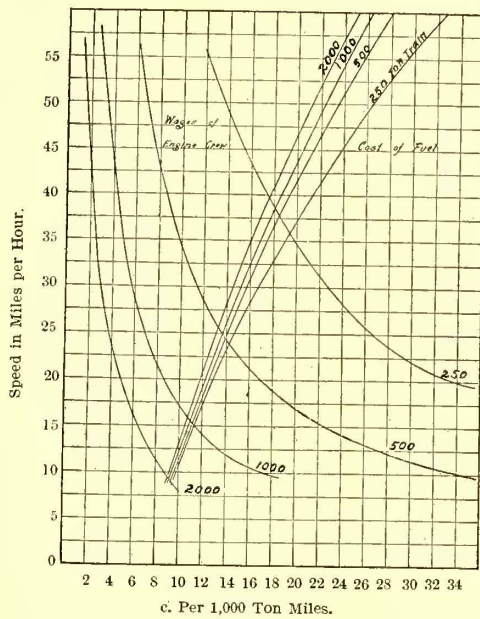
\*Paper read before the Electrical Section of the Canadian Society of Civil Engineers, Nov. 19, 1903.



On the basis of the above assumptions, all of which are the result of practical tests, curve sheet 2 is obtained.

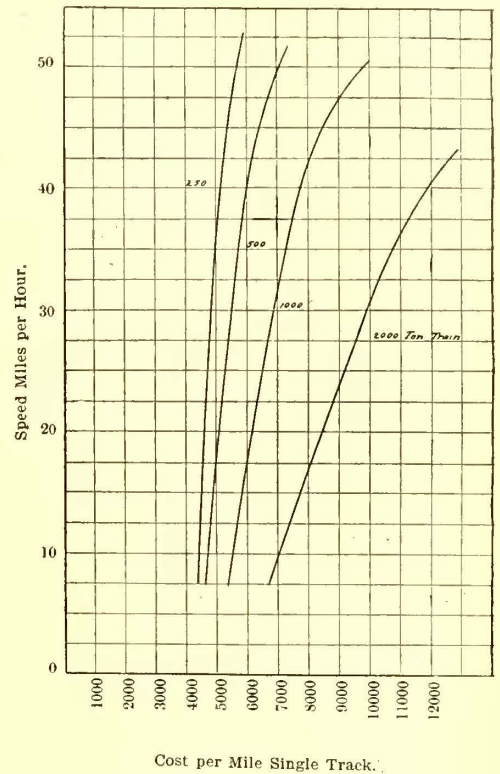
These figures check up reasonably close with the locomotive performance sheets for steam roads after superfluous mileage has been deducted from the total mileage given. As an example, the shifting locomotives and pushers are charged with so many miles per hour, and often do not make one-third the mileage charged to them, so that locomotive performance sheets, as published, sometimes indicate too low a coal consumption per 1000-ton mile of actual work done.

The next item of considerable expense in steam operation is the labor account. As it is immaterial to the train crew whether steam or electric locomotives are supplied, this item will not be entered into. The engineer and fireman, however, are greatly influenced by the character of the motive power. In steam operation a crew working 10 hours a day average for the railroad company will not be in actual service on the road more than 40 per cent or 50 per cent of the time, the remainder of the time being taken up in caring for the locomotive. In electrical operation the full time of the crew can be utilized for active duty, and hence a considerable saving effected in this item. In steam operation a crew costing \$8.50 for 10 hours labor has been assumed to be in

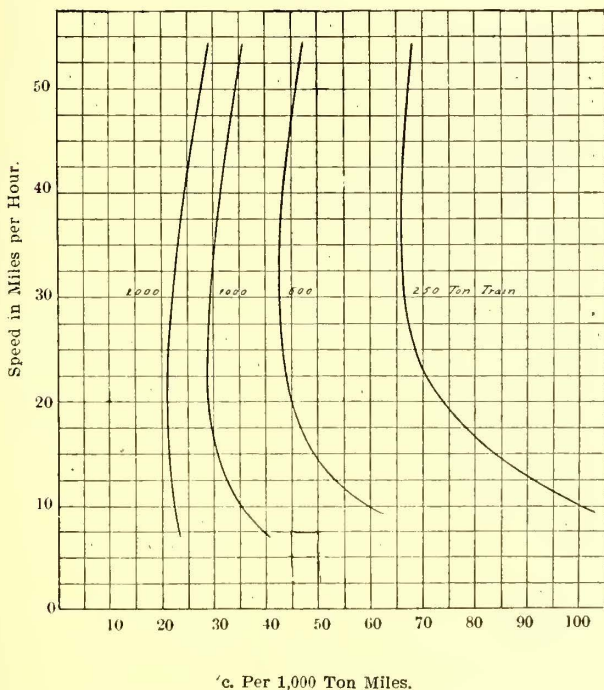


CURVE SHEET NO. 2, COST OF STEAM OPERATION—COAL \$2.00 PER 2240 LBS

In order to approximate the repairs on steam locomotives of different capacities, it is assumed that the locomotive will have



CURVE SHEET NO. 4, COST OF ELECTRICAL INSTALLATION, TEN TRAINS EACH WAY PER DAY



CURVE SHEET NO. 3, COST OF STEAM OPERATION—COAL \$2.00 PER 2240 LBS

active commission for 5 hours per day, while in electric service the crew is assumed to be in commission 8.3 hours per day out of the ten. For shorter hours of labor the same proportion would hold true, and the crew for the electric locomotive will cost but 60 per cent of that for the steam locomotive. The cost of wages per 1000-ton mile is given in curve sheet 2.

its weight proportioned to the trains which it is to handle, and as a basis of the repair item the following values are assumed, agreeing closely with the results of compound locomotives in actual service:

STEAM OPERATION—REPAIRS, CENTS PER 1000-TON MILE

	Cents
250 tons.....	25.
500 tons.....	13.5
1,000 tons.....	7.7
2,000 tons.....	3.3

The items of oil, waste and water are not determined here at length, but are introduced in the final values obtained for operating expense. Combining the figures obtained above for steam operation, including fuel at \$2 per 2,240 lbs., engine crew at \$8.50 per 10 hours (five of which are in actual service), repairs, oil, waste, water, etc., the results in curve sheet 3 are obtained.

It is evident from the curves that each weight train can be run at a certain speed with a minimum expense for operation, this speed varying with the weight of the train. This economical speed will, of course, vary with any variation of the constants assumed above, such as the price of coal, labor, etc., but the values obtained are instructive and are given below:

SPEEDS OF ECONOMICAL OPERATION

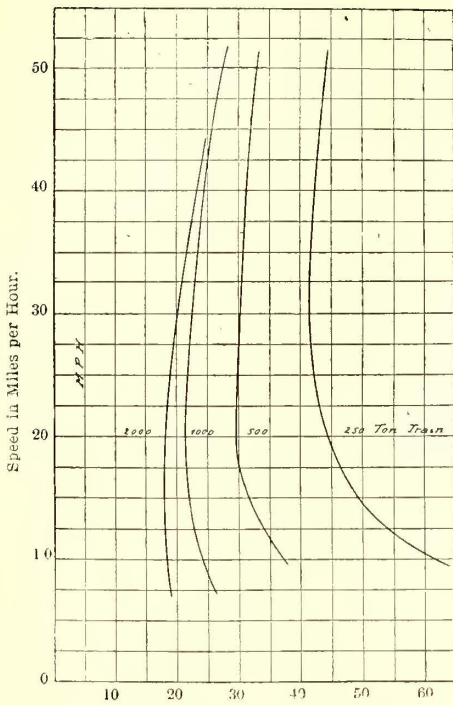
	M. P. H.
250 tons.....	38
500 tons.....	28
1,000 tons.....	23
2,000 tons.....	19

Considerable latitude is given above and below these speeds without greatly increasing expense per 1000-ton mile for operation.

Coming now to the determination of the cost of operating an electrically-propelled train under the same conditions, we arrive at some very interesting results due to the low first cost of electrically equipping the proposed steam line afforded by the alternating-current single-phase motor.

The same friction values are used as given in curve sheet 1

for steam operation. From these values the kilowatt capacity of each train is determined for the different speeds and varying weights of trains. From these values the cost of trolley copper, step-down line transformers and generating station are determined. The electrical system consists, in brief, of a generating station controlling



CURVE SHEET NO. 5, COST OF ELECTRICAL OPERATION—COAL \$2.00 PER 2240 LBS

100 miles of track, that is, feeding 50 miles in either direction. At intervals of approximately 12 miles are installed step-down transformers reducing the transmission potential to 3000 volts or more for the trolley potential. This trolley potential is assumed at 3000 volts for a good majority of the results, but for heavy work, that is, 1000-ton and 2000-ton miles, the voltage is somewhat increased, but nowhere exceeds a safe operating value. The transmission potentials also are kept entirely within practical limits. The generating station does not get excessively large, and the electrical system throughout presents no features of unusual interest, but rather duplicates work that is being done throughout the country. By keeping all values within conservative limits, the results obtained become of practical application and not of theoretical interest.

The cost of installing the electric system complete, including generating station, transformer sub-stations, transmission line, pole, bonding of track, etc., is given in the following table:

COST OF ELECTRICAL INSTALLATION—COST PER MILE SINGLE TRACK

M. P. H.	2,000-ton Train		
	Five trains each way	Ten trains each way	Twenty trains each way
10	5,600	7,020	9,860
20	6,520	8,490	12,430
30	8,510	9,840	14,580
40	11,690	11,910	16,770
1,000-ton Train			
10	4,800	5,500	6,920
20	5,200	6,200	8,100
30	6,250	6,900	9,400
40	7,600	7,700	10,600
50	9,820	9,820	12,700
500-ton Train			
10	4,400	4,700	5,400
20	4,500	5,100	6,000
30	5,100	5,500	6,800
40	5,900	6,000	7,500
50	7,100	7,100	8,600
250-ton Train			
10	4,200	4,400	4,800
20	4,300	4,600	5,000
30	4,600	4,800	5,400
40	5,100	5,200	6,000
50	5,700	5,700	6,600

The above tables are given at length, as they form very interesting reading, showing how the cost increases with the size

of the unit rather than by the frequency of the trains. Also it is very necessary to arrive at an initial cost of electrical installation somewhat accurately, as this constitutes a funded debt upon which the saving, if any, between electrical and steam operation must pay dividends.

In determining the cost of electrical operation it has been necessary to consider the cost of producing power, and a sliding scale has been taken for the different kilowatt outputs, ranging from 4 mills per kilowatt-hour to nine or more, with coal at \$2 per ton, depending upon the kilowatt capacity of the generating station. It is assumed that steam turbines and modern methods of generating station construction are used, looking to the greatest economy of operation. Wages of engine crew, as stated, are taken at 60 per cent of those for steam operation. Repairs for electrical locomotives are given in the following table:

ELECTRICAL LOCOMOTIVE REPAIRS

250 tons.....	8.	cents per 1,000-ton mile
500 tons.....	4.8	" " "
1,000 tons.....	2.3	" " "
2,000 tons.....	1.	" " "

These repairs, in common with that given for steam operation, include all running repairs, overhauling and renewals. The cost of electrical operation is given complete in curve sheet 5, which is directly comparable to the cost of operation for steam previously given. It is obvious that as there is a fixed charge of 5 per cent depreciation and repair account on the entire electrical installation, it is necessary to consider the frequency of travel over our proposed route. In order to make it as general as possible, it has been assumed that there will be five, ten and twenty trains per day each way. The cost of operation, expressed in cents per 1000-ton mile, does not vary greatly with the different frequency of trains, but the dividend account must be based upon a selected train frequency. For convenience, a train frequency of ten per day each way is taken, and the cost of electrical operation given. For other frequency of trains, the cost of operation per 1000-ton mile will not vary more than 1 cent or 2 cents either way from the results given in the curves, and they are, therefore, of fairly general application.

By comparing this curve with that given for steam operation, a considerable saving is shown, giving varying dividends depending upon the frequency of travel, weight of train, maximum speed, etc. In fact, frequency of travel and weight of train are the determining features in considering the adoption of electric transportation. In order to show the dividend-earning power, that is, the saving in electric operation over steam as the percentage of the cost for electrical installation, the three following tables have been prepared for a frequency of train service of five, ten and twenty trains each way per day:

INTEREST ON ELECTRICAL INVESTMENT

Five Trains Per Day Each Way				
M. P. H.	2000 Tons	1000 Tons	500 Tons	250 Tons
10	5.75%	8.17%	9.25%	9.22%
20	3.88	4.92	5.73	6.02
30	1.81	3.82	4.1	4.85
40	....	3.47	3.68	4.07
50	....	....	3.36	3.74
Ten Trains Per Day Each Way				
M. P. H.	2000 Tons	1000 Tons	500 Tons	250 Tons
10	8.48%	14.8 %	17.5 %	18.3 %
20	4.68	8.87	11.05	11.9
30	1.31	7.2	8.1	9.65
40	....	6.8	7.62	8.14
50	....	....	6.72	7.48
Twenty Trains Per Day Each Way				
M. P. H.	2000 Tons	1000 Tons	500 Tons	250 Tons
10	8.92%	23.1 %	31.4 %	34.5 %
20	2.6	12.9	19.1	22.1
30	....	9.8	13.65	17.8
40	....	9.73	12.8	15.~
50	....	....	11.25	13.7

As shown by the above tables, electric locomotives cannot compete with steam for trains of 2000 tons at higher speeds, owing to the enormous cost of equipping the road electrically with the constants chosen. Should such heavy railroading be contemplated electrically, it would be necessary to adopt longer transmissions than the 50 miles either way from the power house assumed, and which is very conservative, also the use of higher voltages on the trolley than the 5000 volts or 6000 volts maximum assumed in arriving at the tables. The scope of the paper has been limited, however, to the use of standard apparatus and the voltages met with in every-day practice. The results given thus represent the practice of to-day and not what electrical engineers may be able to do sometime in the future. The consideration of the operation of 2000-ton trains at speeds of 50 m. p. h. or 60 m. p. h. is hypothetical, as no steam locomotive could be constructed that would furnish sufficient power to haul a train of this weight at the speeds considered. The problem is feasible from an electrical standpoint, as the weight of the locomotive could be distributed among a number of units distributed throughout the train to lessen the draw-bar pull without exceeding a permissible weight per axle.

The discussion of the paper has been limited thus far to the use of coal costing \$2 per ton for both steam and electric locomotive work. It is a well-known fact that generating stations can use cheaper coal than it is economical to use on steam locomotives, and hence it is interesting to follow through the results with varying prices of coal. In figuring the cost of coal, it is assumed that coal will be charged to operation at the price for which it could be sold in the wholesale market at the locality used. Coal at \$2 per ton is somewhat cheap, especially for some of the Western roads, and the same method of figuring has been used in determining the earning capacity of the electrical installation for \$3 and \$4 coal as well. As the saving in electrical operation and its percentage of the cost of installing the electrical system are of fundamental importance, the tables for interest-earning capacity, expressed as percentage of the electrical installation, is given in the following tables, both for \$3 and \$4 coal:

COAL AT \$3.00 PER 2240 LBS.—INTEREST ON ELECTRICAL INVESTMENT

Five Trains Per Day Each Way				
M. P. H.	2000 Tons	1000 Tons	500 Tons	250 Tons
10	8.35%	10.6 %	10.8 %	9.6 %
20	6.77	6.8	6.9	6.4
30	4.35	5.8	4.85	5.02
40	8.12	5.5	4.94	5.0
50	....	....	4.7	4.67

Ten Trains Per Day Each Way				
M. P. H.	2000 Tons	1000 Tons	500 Tons	250 Tons
10	12.8 %	17.7 %	19.5 %	19.4 %
20	8.77	12.1	13.2	13.
30	7.3	10.7	10.	11.1
40	6.	10.75	10.47	10.3
50	....	....	9.4	9.34

Twenty Trains Per Day Each Way				
M. P. H.	2000 Tons	1000 Tons	500 Tons	250 Tons
10	14.9 %	27.8 %	38.4 %	36.3 %
20	8.2	17.7	22.6	23.8
30	7.9	15.	17.	20.1
40	6.25	15.2	17.3	18.1
50	....	....	20.4	16.9

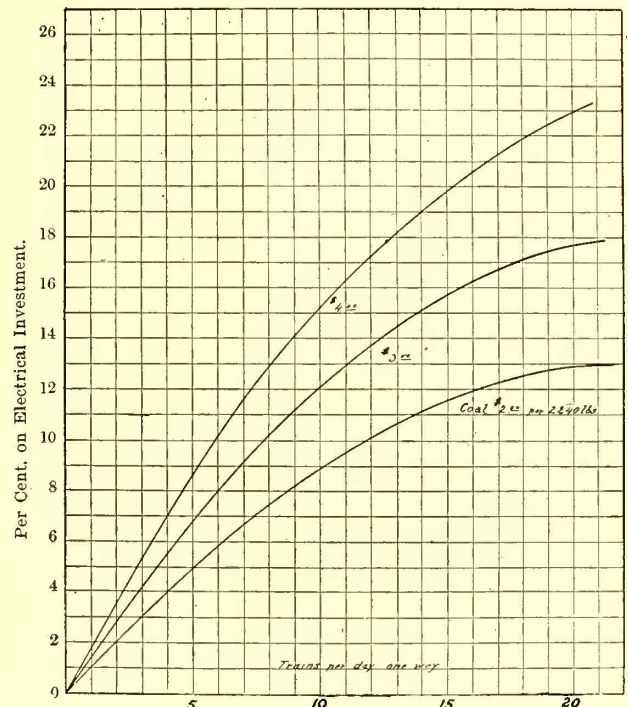
COAL AT \$4.00 PER 2240 LBS.—INTEREST ON ELECTRICAL INVESTMENT

Five Trains Per Day Each Way				
M. P. H.	2000 Tons	1000 Tons	500 Tons	250 Tons
10	11.0 %	11.65%	11.6 %	10.2 %
20	9.65	8.65	8.15	7.19
30	7.04	7.74	6.35	5.72
40	5.64	7.54	6.2	5.75
50	....	....	6.13	5.6

Ten Trains Per Day Each Way				
M. P. H.	2000 Tons	1000 Tons	500 Tons	250 Tons
10	16.8 %	20.8 %	21.4 %	20.4 %
20	13.4	15.2	15.8	14.7
30	12.0	14.3	12.2	12.7
40	10.72	15.	12.8	11.8
50	....	....	12.2	11.2

Twenty Trains Per Day Each Way				
M. P. H.	2000 Tons	1000 Tons	500 Tons	250 Tons
10	21.1 %	33.2 %	38.4 %	38.0 %
20	14.8	22.9	27.4	25.6
30	16.8	20.3	20.3	22.6
40	12.4	20.9	21.1	20.7
50	....	....	20.4	20.1

A study of the above tables brings out the fact that for very infrequent service, that is, five trains per day each way or less, it would hardly pay to equip the road electrically, there being a dividend of from 4 per cent to 7 per cent on the capital invested.



CURVE SHEET NO. 6, NET EARNINGS ELECTRICAL INSTALLATION, 1000-TON TRAIN UNITS

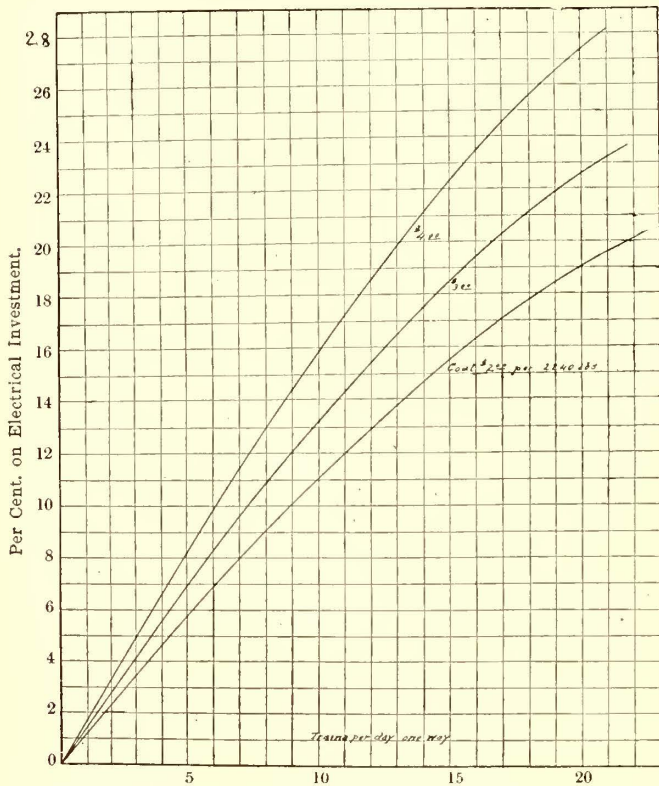
With more frequent service, however, the saving in electrical operation becomes more marked until at from fifteen to twenty trains per day each way, the interest-earning power of the electrical investment is worthy of very careful consideration. It should be borne in mind that all these figures do not contemplate increase in the present traffic of the road, and, therefore, do not take into consideration one of the chief characteristics of electric traction, that is, developing short-haul local traffic, and thus increasing the dividends by increasing the receipts rather than by cutting down operating expenses. The well-known ability of electric roads to greatly increase previous steam traffic has lead them to be installed, in many cases, without too close an investigation into their economical installation. We must also take into account that the electrically-equipped road, while caring for the heavy through freight traffic with an earning capacity of from 4 per cent to 7 per cent on the investment, can also build up a local traffic, both freight and passenger, with practically no additional cost and showing very large returns.

Taking up the possibilities of the alternating motor in general haul work the problem had to be treated in a general way, in order not to lose sight of the scope of the problem in considering local details. The average specific problem has its local conditions, which must be carefully considered in detail, and, in many cases, would show a greater return for the money

invested than indicated in this paper. For instance, all power is supposed to be generated from coal from power house devoted to the interests of railroading alone. Along many of our roads exist water-power facilities which could be advantageously developed and furnish power much cheaper than the figures assumed from coal generation. Furthermore, the cost of power in the smaller generating station capacity has been assumed as high as 1 cent per kilowatt-hour or more, and should a generating station supply other industries, such as mining, lighting, general power distribution, etc., the cost of purchasing power would be considerably decreased with a consequent reduction in cost of operating electrically. The results given in the table, therefore, are of general application only, and may be considerably modified when considering the local aspect of a given proposition. It is believed, however, that the results as obtained are based upon conservative assumptions, in fact, most of these assumptions were obtained from operating conditions, and, with the figures given, outline somewhat briefly

services can be dispensed with entirely if we consider that the electric locomotive cab can be made the caboose for the train, and the train crew serve as a reserve for the engineer in case of trouble. The cost of fuel has been assumed equal in both cases, but there is an added expense in handling the fuel for steam operation as the source of supply of the locomotives is distributed in small pockets over considerable track, each pocket requiring more or less outlay for its establishment and maintenance, all of which can be saved by electric locomotive fed from a central generating station. The increasing tendency toward the adoption of very heavy trains calls for heavier locomotives with consequent increase in weight of rail, cost of bridges, ballasting track, and general maintenance of the right of way. Indeed, the wear upon a light rail with a heavy reciprocating engine must be considerably more than that given to the rail by an electric locomotive of half the weight, and having a perfectly uniform rotary impulse imparted to the drivers. Just how much money may be saved by the lessened maintenance of the track is conjectural, and hence has not been entered into here, but the figure must reach a considerable size for heavy locomotive work. As the maintenance of electric locomotives is considerably less than its steam competitor it will reduce the size of the repair shops required, the difference in the interest on which should appear as a fixed charge against steam operation. Furthermore, a steam locomotive, including a tender, has not more than 50 per cent of its weight upon the drivers, which will constitute from 7 per cent to 10 per cent of the average train weight. As this is a dead weight, producing no revenue, it would be fair to compare the two systems by estimating upon a train for steam operation from 7 per cent to 10 per cent heavier than for electric operation. The comparative figures given in the table, based upon 1000-ton miles, are not, therefore, entirely fair toward electric operation, but should be somewhat increased for haulage involving the use of the steam locomotive.

The earning capacity of the money invested in electric equipment can be looked upon, therefore, as exceeding the values given in the tables, but as stated above, local conditions will largely affect the application of the general figures to any given example. Should all the factors entering into the engineering expense of operating roads by steam and by electric locomotives be carefully considered, the possibilities opened up by the use of the alternating motor are sufficiently great to warrant its replacing the steam locomotive in many of our railway systems, either in part or for the complete system.



CURVE SHEET NO. 7, NET EARNINGS ELECTRICAL INSTALLATION, 500-TON TRAIN UNITS

the possibilities of the alternating-current single-phase motor in the railway field.

The operating expenses considered include fuel, wages, repairs, oil, waste, water and 5 per cent depreciation on the electrical installation. No depreciation is charged off against the locomotives, as although the electric locomotives cost more than the steam, they will permit of a greater mileage, so that the total capital invested in locomotives should be practically the same in either case. There are a number of expenses incidental to steam operation other than those considered, which must be done away with with the adoption of the electric locomotive. While each of these expenses is small they may amount to considerable in the aggregate. For example, the electric locomotive is double ended and requires no turn-table. Two electric locomotives can be coupled together and operated by one engineer in the cab of the leading locomotive, each locomotive doing an equal share in hauling the train. In fact, it is not strictly necessary to consider the use of a fireman in electric propulsion, as his duties will be largely confined to ringing the bell and waiting for the engineer to die of heart disease. His

### POWER REQUIRED FOR OPERATING CARS

During the investigation of transportation problems in New York the State Railroad Commission secured some interesting data regarding the amount of power required for operating cars on surface and elevated lines, and also made inquiries of the several companies with reference to the supply of power. The Brooklyn Heights Company took an average day's record on which 224 elevated electric cars and 1247 surface cars were operated. The average station load while these cars were in service was 51,171 amps., which was divided approximately as follows:

	Amps
224 elevated cars, at 67 amps.....	15,008
1247 surface cars, at 29 amps.....	36,163
Total .....	51,171

As these figures were procured on the evening of June 10, at 5:30 o'clock, no provision was made for heating and lighting, but the records show that taking into account these factors the average amount of power required for the operation of one surface car and one elevated car at station bus-bar is as follows:

SURFACE CAR		Kilowatts
	Amps	Per Car
Operation .....	29 or	15.95
Heating .....	6 "	3.63
Lighting .....	2 "	1.1
ELEVATED CAR		
Operation .....	67 "	36.85
Heating .....	15 "	8.25
Lighting .....	2 "	1.1

In Manhattan, on the elevated system, the current consumed in the operation of an average loaded car is 35 amps. at 600 volts, or 21 kw. For lighting, 1.5 kw is allowed, while 4.8 kw must be provided for heating and 6 kw for operating air pumps. This amounts to 27.9 kw at the car, and, assuming that the car kilowatts represent 78 per cent of the station kilowatts, it will be seen that provision must be made for 35.6-kw output at the station for each car in operation.

The Interurban Street Railway Company's figures for the surface lines in Manhattan show that the "power required for each car is about 16 kw in summer and 25 kw in winter. This includes current for both light and heat." Touching upon the available supply of power the Interurban's report is interesting:

"We have never, since we began the electrification of the street car lines in New York City, been short of power, having at various dates installed three temporary power stations with an aggregate capacity of 7000 kw, to furnish power for our lines in process of conversion, while our large Ninety-Sixth Street power station was building. These temporary power stations were continued in operation until the Ninety-Sixth Street power station was finished and able to furnish all power required. They were then dismantled.

"On Jan. 1, 1902, we had the following power available, but not all required or used:

"Ninety-Sixth Street power station, nine generators, of 3500 kw each; total, 31,500 kw.

"Twenty-Fifth Street power station, four generators, of 900 kw each; total, 3600 kw.

"One Hundred and Forty-Sixth Street power station, three generators, of 900 kw each; total, 2700 kw.

"One Hundred and Forty-Sixth Street power station, two generators, of 500 kw each; total, 1000—3700 kw; grand total, 38,800 kw.

"In addition we had storage batteries for use on the peak of the load aggregating 10,000 kw for 2 hours, or 15,000 kw for 1 hour, or a total power available at time of heaviest load of 53,800 kw.

"On June 8, 1903, we had power available as follows:

"Ninety-Sixth Street power station, eleven generators, of 3500 kw each; total, 38,000 kw May 1.

"Kingsbridge power station, four generators, of 3500 kw each; total, 14,000 kw.

"Storage batteries, 15,000 kw. Grand total, 67,000 kw.

"This power is distributed through the city by means of nine sub-stations with transforming machinery aggregating 42,000 kw at normal load, or 63,000 kw at 50 per cent overload."

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**NEW CAR SHOPS IN THE SOUTH**

The Southern Car Company, of High Point, N. C., successor to the Briggs Car Company, of Amesbury, Mass., has located its new electric car-building plant at High Point, N. C. The place chosen possesses many advantages, as the town is in the heart of a district abounding in timber suitable for car building. The officers of the company have, in combination with others, purchased a tract of 50,000 acres of this timber land, and will cut 100,000 ft. per acre. High Point is also the center of numerous furniture factories, and the company is,

therefore, in position to draw upon a large local body of skilled mechanics and woodworkers. The new works are on the main line of the Southern Railway, and thus enjoy excellent shipping facilities.

The plant is equipped with the most up-to-date apparatus for turning out all styles of electric cars, and this, combined with the natural advantages of the site, will, no doubt, enable the company to turn out an excellent product at low cost.

The machine and erecting building measures 230 ft. x 160 ft., with a setting-up capacity of sixty to eighty cars. This building is constructed of brick, with trussed monitor roof, having 100-ft. spans, with large wings, allowing all of the machine, cabinet work and finishing to be completed under one roof.

Two spacious offices open into a large, well-lighted drafting room, located at the entrance to this building. Between the drafting room and stock room there is a long passage to the erecting room. The time registers and paymaster's desk are located in this hall, and all workmen going to and from work register as they pass through.

A part of the large stock room is utilized as a sewing room for making covers, curtains and seat linings. From this stock room doors lead to the erecting and machine rooms. The machine room, 160 ft. x 40 ft., has a well-equipped woodworking department. All the machinery, including iron-working machinery, is motor driven. The power house, dry kiln and blacksmith shop are about 50 ft. from the main building, to which they are connected by tracks.

The company has a novel arrangement for transferring its kiln-dried lumber from kiln to machine room by means of three tracks and roller-bearing trucks, which permits drying and transferring three carloads of lumber with but one handling. The blacksmith shop is well equipped with blast forges, trip hammers, lathes, punches and shears for the handling of that part of the company's work.

A fine lavatory for the workmen has been set apart between the machine and cabinet room. The cabinet room is well lighted and conveniently arranged with benches and gluing facilities. From this room two large doors open into the erecting room, and from the cabinet room all work goes into a large painting room, which has tracks and other facilities for painting and finishing a number of cars at once. This paint room opens into the erecting room by folding doors. The erecting room has a clear space without posts of 100 ft. x 200 ft., with twelve tracks for transferring, has a fine cemented floor level with the rails and a large car pit. At the rear of this room are two large balconies for the finishing and handling of sash, doors and headlinings. The first balcony is suspended at the same height as the staging of roofing, allowing workmen to go and come from this balcony carrying their roofing stock along the staging.

The front of this erecting room has twelve double doors, and running the whole front of this building is a 40-ft. transfer table. The grade of the land here is such that the flat cars on their side tracks for shipping are flush with this transfer table, thus permitting cars to be run out of the finishing room onto flat cars for shipment without raising or lowering, and making a great saving in time and handling. In addition to large lights in monitor roof the partitions which separate the wings from the main erecting room are also well filled with sash for lighting the lower part of this room.

The officials of the Southern Car Company are men who have had much experience in car building. The principal officers are: President, J. Elwood Cox; vice-president, E. A. Snow; secretary and treasurer, E. R. Briggs.

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 The Indianapolis, Franklin & Columbus Railway, in Indiana, has placed along its route thirty-five new and comfortable waiting stations.

THE PRODUCTION OF GAS FOR GAS ENGINES

The constantly increasing use of gas engines for power and lighting work has brought with it a strong demand for apparatus that will produce a working gas of constant calorific value. The dissatisfaction with the earlier types of gas engines was principally due to their poor regulation and to the rapid deterioration caused by high-working temperatures and impure gases. Improved methods of construction have in a large measure reduced their mechanical defects, but even the best gas engines will fail unless supplied with proper fuel.

The Power & Mining Machinery Company (formerly Loomis-Pettibone Gas Machinery Company), of New York, has for many years made a specialty of erecting plants for the production of fuel gas, having long recognized the necessity of providing the means for producing gas for power at the lowest possible cost, utilizing in the highest degree the heat value of

tubular type, and is connected at its base with the generators. A positive exhauster is connected with the top of the boiler beyond the producer-gas valve, C. The four valves, A, B, C and D, are operated by hydraulic pistons.

In starting fires in the generators a layer of coke or coal, about 5 ft. in depth, is put in and ignited at the top, the exhauster creating a downward draft. When this fuel is ignited coal is frequently charged, raising the fuel bed to about 8 ft. above the grates, and there maintained. Bituminous coal is generally used, and is charged at intervals, as needed, through the feed door in the top of the generator.

Air is also admitted through the same doors, and by the exhauster is drawn down through the fresh charge of coal, and then through the hot fuel bed beneath. The resultant producer or generator gas is drawn down through the grates and ash pits of generators 1 and 2, valves A and B, up through the vertical boiler 3, valve C to scrubber and exhauster, valve D being closed, and is delivered into a gas holder. When the exhauster has brought the fuel up to incandescence the charging doors, E and F, are closed, valve B lowered, valve C closed, and valve D, leading to the water-gas holder, is opened. Steam is then turned on into the ash pit of generator 2, and, in passing through the incandescent coal, is decomposed, forming water gas. From generator 2 the gas passes through the connecting pipe, shown near the top of the generators, and down through machine No. 1. The gas passes through valve A into and up through the boiler, 3, and thence, after being washed in a scrubber, is conducted into a holder. Water gas is made for 5 minutes, when the temperature of the fuel beds having been considerably reduced, the steam is shut off, valve D closed, valves C and B opened, and the charging doors, E and F, opened. This process of making water gas and producer gas is alternated at intervals of five minutes or more, according to the quality of gas desired.

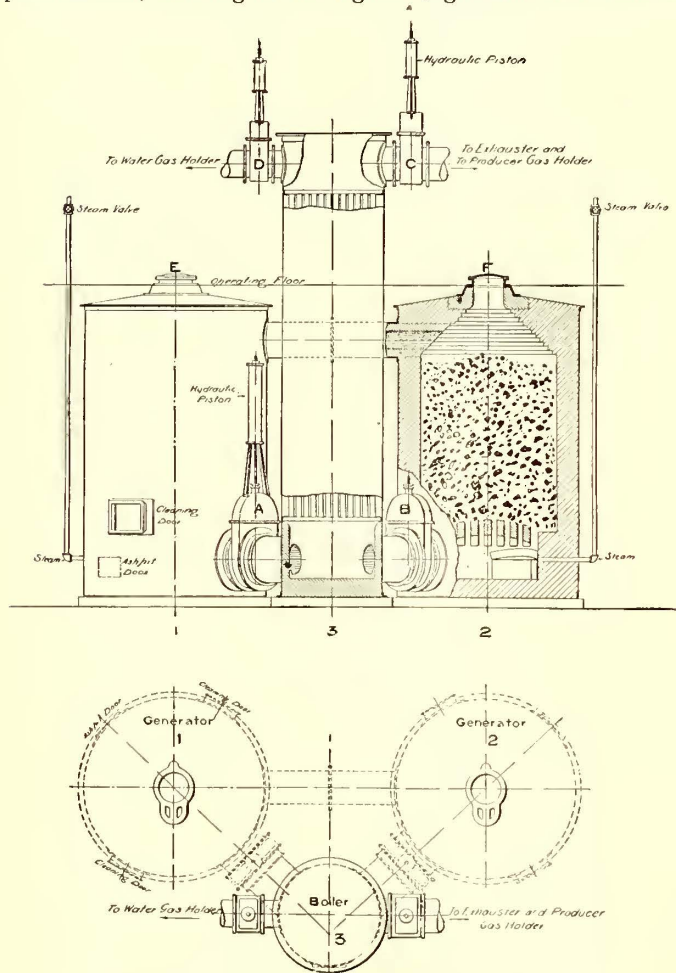
In making the next run of water gas the course of steam is reversed, i. e., valve A is closed and the steam is turned into the ash pit of generator No. 1. Valve B is left open, but the other valves, C and D, and the charging doors, E and F, are operated the same as in the first case.

While the fires are being blasted and during the making of a run of water gas, the hot gases in passing through the boiler give up a large proportion of their sensible heat, which is converted into steam. This, in turn, is directed under the fires in the generators for decomposition. Another advantage of the double generator apparatus is that, as all gas is made to pass through the fire the tarry matter from the coal is converted into fixed gases that can be conducted any distance through ordinary pipes and at any temperature or pressure. Again, as the steam is forced through two fires the percentage of condensable water vapor is exceedingly small.

Instead of making water gas in every alternate stage for the same length of time as producer gas, the generator may be worked on producer gas alone, steam being then admitted at various points while the exhauster is running and the operation of making producer gas is going on.

From the generating plant the producer gas is delivered to one holder and the water gas to another holder. From these holders the two gases pass to an especially designed proportional mixing valve, by which they are uniformly mixed in any proportion desired. From this mixing valve the mixed or power gas passes to the engines wherever located.

The operation of a pair of generators of the type described is exceedingly simple, and it is stated that a man with ordinary intelligence, even if he has had no previous experience in the manufacture of gas, would be competent, with a week's practice, to take charge and run the apparatus. As the valves are provided with hydraulic pistons the labor is reduced to a minimum, and only a few seconds are required to change from making one kind of gas to another.



PLAN AND ELEVATION OF GAS PRODUCER

the fuel gasified and adapting its apparatus to the use of all kinds of fuel. Loomis generators are being used for power purposes on a large scale, and are adapted to use all grades of bituminous and anthracite coal, also wood and coke. The gas yield in heat units varies, of course, with the quality of fuel used, but it is claimed that the average thermal efficiency is about 80 per cent.

The accompanying illustrations show, in plan and elevation, the Loomis gas apparatus for making water and producer gas. The unit consists of two generators, 1 and 2; vertical boiler, 3; water-cooled valves, A and B; producer-gas valve, C; water-gas valve, D. The generator is cylindrical, constructed of iron and steel, from 5 ft. to 11 ft. in diameter, and from 12 ft. to 18 ft. in height. The lining is of fire-brick with fire-brick arched grates, ash pit and flue to boiler in the bottom. It is provided with a door on top for firing and admission of air, two cleansing doors above the grate and one below the grate, opening into the ash pit. The vertical boiler is of the multi-

Among the plants in which the Power & Mining Machinery Company has recently installed its gas producers are the following: Velardeña Mining & Smelting Company, Valardeña, Durango, Mexico, for 2300 hp, consisting of four Crossley double-cylinder gas engines. The engines are to be belted to 25-cycle alternators, the current to be used for lighting and power. Rockland Electric Company, Hillburn, N. Y., for 1000 hp, consisting of three 300-hp Westinghouse gas engines and one 100-hp unit, all connected to Westinghouse 60-cycle alternators. The Velardeña and Rockland plants are nearing completion. Winchester Repeating Arms Company, New Haven, Conn., for seven three-cylinder vertical type Westinghouse gas engines, consisting of one 80-hp, one 90-hp and five 160-hp engines, connected to Westinghouse direct-current generators. Potosiña Electric Company, San Luis Potosi, Mexico, for three Westinghouse double-acting gas engines, total capacity 750-hp, connected to Westinghouse 60-cycle alternators.

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**CONVERTIBLE CARS FOR AUSTIN, TEXAS**

The Austin Electric Company, of Austin, Tex., has received, lately, two convertible cars from the J. G. Brill Company which are especially interesting from the fact that they are provided with portable vestibules, including double folding doors. The substantial character and handsome appearance of these vestibules is plainly to be seen in the accompanying illustration. When the vestibules are removed, folding gates, which close the entrances when desired, are attached to the car bodies. Another unusual feature in these cars is the solid paneling of the entire space between the double corner posts. Usually that part which comes above the belt rail is occupied by a sash, but in this case oak panels were substituted. The cars are for use on the city lines of Austin and also for the lines which run a short distance into the suburbs to the park and fair grounds controlled by the company. Besides being the capital of the State, Austin is one of the largest commercial centers in Texas, and affords an excellent field for electrical operation on a large scale. About a year ago the American Car Company, of St. Louis, built eight cars of this type, which are reported to be giving excellent satisfaction.

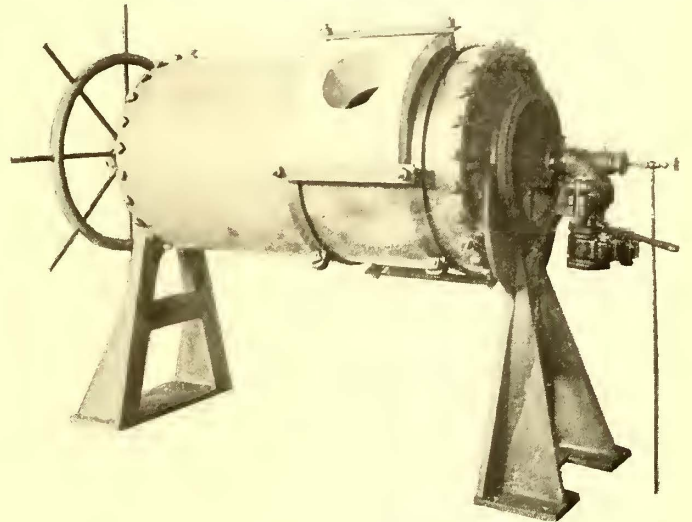


CONVERTIBLE CAR USED IN AUSTIN, TEXAS

The new cars are 20 ft. 7 ins. long over end panels, and 30 ft. 7 ins. over crown pieces; from panels over crown pieces, 5 ft.; width over sills and sill plates, 6 ft. 10¼ ins., and over posts at belt, 7 ft. 9 ins.; sweep of posts, 5 ins.; from center to center of posts, 2 ft. 7 ins. The side sills are 5¼ ins. x 6 ins., plated on the outside with 6-in. x 5/8-in. steel. The end sills are 4¼ ins. x 6 ins.; thickness of corner posts, 3¾ ins. Guard rails are provided on either side, and when not in use are held under the water boards by special gravity catches. The interiors are finished in ash with ceilings of birch. The seats are 33 ins. long, and arc of the reversible-back type. The seating capacity of a car is thirty passengers. The cars are mounted on Brill 21-E trucks, having 7-ft. 6-in. wheel base, 33-in. wheels and 4-in. axles, and are equipped with two 25-hp motors.

**A NEW METAL-MELTING FURNACE**

The accompanying cut illustrates a new metal-melting furnace which has been evolved by the Lunkenheimer Company, of Cincinnati, Ohio, after considerable experimenting with nearly every type of furnace on the market. The company is using ten of these furnaces in its own foundry, and states that it has found this type to afford a very efficient and economical method of melting metals, particularly brasses and bronzes. The furnace consists of a cylindrical sheet-steel drum having cast-iron heads. The interior of this drum is lined with fire-proof tile, with two openings on opposite sides of the drum.



METAL MELTING FURNACE

Only one of these openings is in use at one time, the other being closed by a fire-clay filling. The object of having two openings is to increase the life of the furnace linings. It has been found that the furnace wears out quicker around the filling hole (which also serves as outlet for the flame) than elsewhere. The advantage that this furnace has over others is that when one filling hole is worn out it can be closed by a fire-clay filling and plate, the furnace reversed, and the other opening used.

The oil burner is of a special type, designed to give the greatest amount of heat with a minimum oil consumption. In the Lunkenheimer foundry from six to seven heats per working day of 10 hours have been secured from each furnace. The weight of each heat averages about 550 lbs., and the oil consumption varies from 2 gals. to 2½ gals. of crude oil per 100 lbs. of metal melted. The life of the linings is from 300 to 400 heats, varying with the kind of metal melted. The whole furnace is of heavy and substantial construction. On account of the simple form of the tile it is very easy to reline.

This furnace is made in two sizes, the No. 1 size having a capacity of 550 lbs. of metal per heat, and the No. 2 size having a capacity of 1200 lbs. of metal per heat.

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The Maumee Valley Railway & Light Company, of Toledo, Ohio, has abandoned the practice of handling freight, and will confine itself exclusively to passenger business in the future. It was found that the handling of freight at existing freight rates and in competition with the steam roads was not profitable. Some of the other Toledo roads, however, claim that their freight business is increasing and proving popular, and some of them are increasing their facilities looking to enlarging the scope of this branch of the business.

### EIGHT-CAR EXPRESS TRAIN FOR THE SUBWAY

The accompanying cut illustrates an eight-car train for service in the New York Subway, comprising one of the latest shipments made by the John Stephenson Company on its order of 100 cars for the Interborough Rapid Transit Company, of New York. These cars are each 50 ft. 1 in. long, and the total length of the train of eight cars will, therefore, exceed 400 ft. This is the largest number of cars that will be operated in a single train, and these, of course, will not be run excepting in rush hours. Each express train will be made up of four motor cars, the estimated weight of which will be 86,000 lbs. each, and four "trailers" of 50,000 lbs. each, and will weigh, therefore, with equipment and passengers, according to the engineers' estimates, 272 tons.

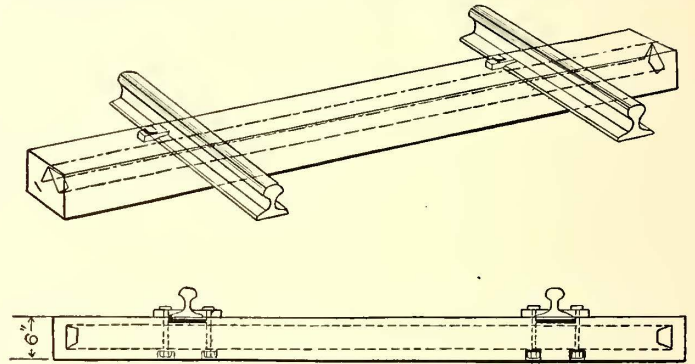
A train of this size will have a seating capacity of 416 passengers, and, judging from the space in the aisles, as many more can be accommodated when necessary without discomfort. These are probably the longest trains in service of this character, and they are equal in carrying capacity to most trains operated on steam lines. The Manhattan Elevated, when operated as a steam railroad, was limited to five-car trains, and since electricity has been introduced six-car trains have been adopted. This is the nearest approach to the subway plans that has been made in this class of service, but the Manhattan cars cannot accommodate as many passengers as the subway coaches, and, consequently, they fall far short of the latter in their capacity per train.

The Interborough Rapid Transit Company will operate two classes of train service in the subway, the same as in the elevated branch, one being for local and the other for express. The first will consist of five-car trains, composed of three motor cars

and two trailers, making an average speed of approximately 16 m. p. h. The second will be the eight-car express trains, one of which is shown in the accompanying cut, made up of four motor cars and four trailers. The requirements of the subway franchise include a provision for the maintenance of an average speed of 30 m. p. h. on the express trains. Each motor car will carry two 200-hp motors, and the necessary controlling and braking apparatus. All of these features, as well as the construction details of the car bodies, have already been described in these columns.

### THE AFFLECK CEMENT RAILWAY TIE

Various forms of steel and cement railway ties have been proposed. One of the simplest is the invention of David S. Affleck, of Chesterton, Ind., who has had some under test on a sand-pit siding of the Lake Shore & Michigan Southern Railroad at that place for about six months. It is stated that an average of twenty locomotives per day with trains of sand cars have passed over this track, and the ties have not shown the



CEMENT RAILWAY TIE

slightest defect, either before or since the winter set in. As can be seen from the accompanying drawing this tie consists of steel angle-bars imbedded in Portland cement. The ends of these angle-bars are slightly bent, to anchor them more securely in place. The rails are held by clips and bolts. The bolts pass clear through the ties, with nuts in recesses in the bottom of the tie. A thin wooden shim is placed between the rail base and tie.

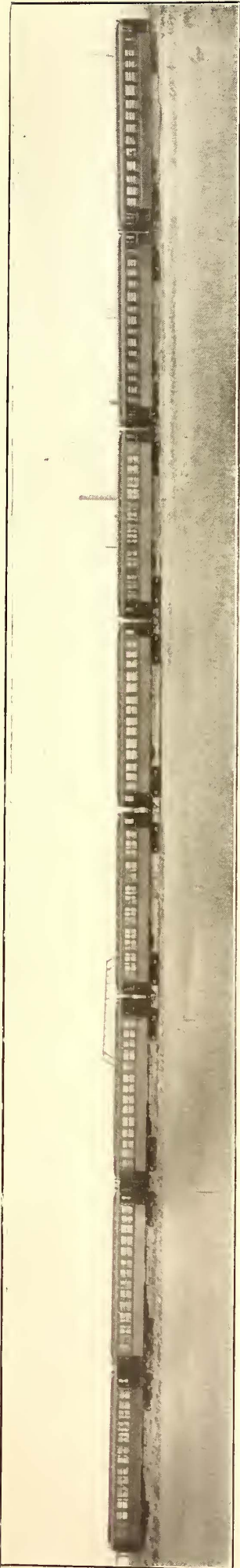
### RECENT IMPROVEMENTS IN BROOKLYN

The traffic of the Brooklyn elevated lines has shown such a continuous increase that up to this week the company has found it impossible to abandon steam power entirely, even during the non-rush hours. The recent arrivals of new rolling stock and other equipment, however, has finally permitted the company to put these lines on an exclusively electrical basis during all except the rush hours.

Among the recent orders placed by the company is one for 100 new elevated cars. This order was divided as follows: Twenty-five to the J. G. Brill Company, forty to the Laconia Car Company, and thirty-five to the Bradley Car Works, of Worcester, Mass. The Brooklyn Heights Railroad Company has also ordered thirty steel ash cars from the South Baltimore Car Works, and during the last few months has placed with the Westinghouse Electric & Manufacturing Company orders for 200 elevated railway motors and 500 surface railway motors.

The Corporation of Liverpool, England, has decided to hand over to the poor of the city the discarded uniforms of tramway employees. Some one has expressed the hope that proper care will be taken to cancel or obliterate the badges of office, in the shape of buttons, etc., in order to forestall cases of bogus conductors collecting fares, and bogus inspectors catching them at it and reporting them at imaginary headquarters.

AN EIGHT-CAR EXPRESS TRAIN FOR THE NEW YORK SUBWAY





## FINANCIAL INTELLIGENCE

WALL STREET, JAN. 13, 1904.

### The Money Market

As had been expected, from the analysis of conditions a week ago, a further lowering of money rates has occurred during the past week. Call money from an average of 4 per cent dropped to an average of 2½. On sixty and ninety-day loans, the rate fell from 5 to 4¼ per cent, while 4½ per cent is now freely quoted for the distant options. All this has been accompanied by a decided change in the relations between lenders and borrowers. Funds are now being pressed by the lending institutions for the first time in a very long while. The same phenomenon is noticeable in the market for commercial paper, where the demand for prime material has suddenly grown much more active. The explanation for this change in the money situation simply lies in the fact that the crop-moving money which went out to the West and South during the autumn, is flowing back to this city in very large volume. Chiefly as a result of this movement, and in smaller part owing to receipts of gold from Europe, excess disbursements by the Treasury and the redeposit of cash drawn out for local circulation during the holiday period, the banks reported on Saturday the unusual increase of \$10,000,000 in their cash holdings. Since that time another \$1,000,000 gold has arrived from London, and the Sub-Treasury has paid out a further large sum on routine government expenditures. Everything suggests, therefore, another good-sized cash increase at the end of the present week, and indeed a continued balance in favor of the banks for another month at least.

Surplus reserve, raised \$5,145,000 by last week's operations, stands now at \$14,687,000, which is almost exactly the same as a year ago, and a trifle ahead of 1902. Only two contingencies can be foreseen to interfere with this satisfactory state of affairs. One is the possibility of a foreign war, in which case the United States would undoubtedly be appealed to to extend its credit freely to the European markets. The other is the danger that the prevailing low rates of interest may lead to heavy borrowing by our own railway and industrial corporations, many of which have long stood in need of money for improvements, and to reimburse them for extraordinary expenditures advanced out of current earnings. With the precedents of 1902 and 1901 in mind—when the same sort of borrowing tied up, to the market's great detriment, a mass of previously active capital—the heavy loan expansion the last three weeks is a decidedly unwelcome symptom. The loan item of the Clearing-House banks stands now close to \$916,000,000, which is the highest reached since last September, and only \$34,000,000 below the record total of February, 1903.

### The Stock Market

A generally strong stock market, with activity entering in specialties and light trading in most of the usually active stocks, comprises the record of the week. Outwardly, the crisis in the Far East has been the principal influence. It has notably depressed the European markets, British consuls touching, last Wednesday, the lowest price in thirty-eight years. Foreign dealings on our own Exchange have accordingly curtailed, and, on the whole, Europe has sold more of our stocks than it has bought. It was hard to say, however, just how far the fear of an outbreak of war is responsible for the restricted business in the local market. In the opinion of many careful observers the numerous causes of uncertainty in the domestic financial situation sufficed to explain why our market should move with extreme caution. There are at least four definite restraints upon any considerable advance in prices at the present time: First, the doubt which the unfavorable Steel report has raised, fresh in everybody's mind, whether the reaction in general trade which began last summer has not further to run; second, the increasing tendency toward expansion, and the already high level of bank loans; third, the approaching presidential election; and fourth, the decision which is expected within the next month or two in the Northern Securities case. Probably the last of these four drawbacks on the market is just now the most cogent. That anything but a flatly hostile opinion will be handed down by the Supreme Court, very few people dare to expect. The question as to what will be done in case the Northern merger is dissolved, and what will happen to the other combinations which, on a similar interpretation of the statute, must be considered illegal, is something that can only be vaguely discussed. What the market fears

chiefly is the first violent sentimental shock that would almost inevitably follow. Accordingly, cautious persons are now found taking the ground that with this dreaded blow overhanging, much of an advance from the present level of prices is not to be expected. It looks as if we shall have a rather narrow traders' market for the time being, with more or less rapid fluctuations in either direction.

The local traction stocks have rather taken a back seat in the week's speculation. Interest has shifted into other quarters, where the rise in prices hitherto has been less pronounced. Most of the gossip in the traction group concerns the speculative position of the stocks, and nothing more is heard of the silly rumors of combinations and alliances, leases and so forth, which were in circulation a fortnight ago. The pool in Brooklyn Rapid Transit still appears to retain its hold, but observers of the trading claim that there is quiet realizing from the inside whenever conditions permit. The earnings of the company having been published, the "good news" is regarded as out. Manhattan and Metropolitan are well bought on the recessions, but there have been no further attempts to advance the prices.

### Philadelphia

Dealings among the Philadelphia street railway specialties have been light, with no important variation on the week. The principal activity has centered in the common shares of the Philadelphia Company, which have sold as high as 40⅞, as low as 39¾, and ended yesterday at 40. Philadelphia Company preferred lost a point, from 46 to 45. Rapid Transit, after dropping to 8 early in the week, rallied later to 8¾, receiving better support than has appeared for some time. Philadelphia Electric has fluctuated between 5⅞ and 6⅞. Philadelphia Traction sold at 97½ and 97⅞, Union Traction from 45⅞ to 46⅞, Railways General at 1¼ and 2, United Traction of Indiana at 35, Consolidated of New Jersey at 65½ and 65⅞, and American Railways at 44. One hundred shares of Fairmount Park Transportation sold at 18½, another hundred at 18¾, and several odd lots at 19.

### Chicago

The season of annual reports and dividend action is at hand in the Chicago market. City Railway shares have advanced from 162 to 165, on the expectation that the year's traffic statement, due middle of next month, will show about the same total gross earnings as a year ago. On the other hand, North Chicago stock broke to a new low record—80—on the reduction of the quarterly dividend from 2 to 1¼ per cent. West Chicago rose 2 points, from 45 to 47, on the report that the dividend on the stock would not be altered. The Union Traction stocks, which are, of course, intimately concerned in these matters, have held rather steady, the common selling between 6½ and 6⅞, and the preferred between 30½ and 31. The annual report of the Northwestern Elevated is expected to reveal about 4 per cent earned on the preferred stock, but there is little idea of the beginning of dividends in the near future. One sale of the preferred shares has been reported this week at 50, and 100 of the common sold at 16¾. Scattering transactions are recorded in South Side at 93, Lake Street receipts at 2⅞, and Metropolitan common at 17½. The last-named has been helped by the knowledge that the voting trust will soon be dissolved, after which the common shareholders will have the same voting privileges as the holders of the preferred.

### Other Traction Securities

On considerably increased trading Massachusetts Electric common rose from 19 to 21½ in the Boston market. The preferred fell as low as 75, but later recovered to 76. West End common advanced from 89½ to 90, and the preferred sold at 108 and 109. Elevated shares were unchanged, fluctuating in small lots between 140 and 140½. On the Baltimore Exchange, weakness reappeared in the United Railways Company. The common stock at 8⅞ and the income bonds at 55¾, represented the lowest prices of the season. Later there was some recovery, the stock returning to 8⅞, and the incomes to 56¾. Meanwhile the general mortgage 4s declined from 91⅞ to 91. Other sales for the week in Baltimore comprise Atlanta Street Railway 5s at 103, City & Suburban (Washington) 5s at 91½ and 93. Charleston Consolidated Electric 5s at 102, City & Suburban (Baltimore) 5s at 112, Anacostia & Potomac 5s at 90, and Baltimore City Passenger 4½s at 101½. On the New York curb, Interborough Rapid

Transit declined another half-point to 92, then rallied to 93 $\frac{7}{8}$ . Brooklyn City Railroad sold at 234 and 233 $\frac{1}{2}$  for 100 shares. Eight hundred Washington Traction preferred changed hands, between 47 and 47 $\frac{1}{2}$ . An odd lot of New Orleans preferred sold at 31. Washington Electric common changed hands between 12 $\frac{7}{8}$  and 13 $\frac{3}{8}$ , and Brooklyn Rapid Transit 4s sold at 77 $\frac{1}{2}$ .

Tractions were stronger at Cincinnati. Cincinnati, Newport & Covington issues were leaders in the activity. The 5 per cent first mortgage bonds were in strong demand, and dozen sales, aggregating \$64,000 worth, were made, the range being from 108 to 109, the former the close. The preferred stock showed a slight decline on sales of about 200 shares. Several sales were made in the common at 29 $\frac{1}{2}$  and 30. Cincinnati Street Railway touched 134, and then dropped back a point on sales of 200 shares. Detroit United sold at 65, and then advanced to 67 for a small lot. Cincinnati, Dayton & Toledo sold at 26 $\frac{1}{2}$ . The 5s of this company sold at 81 $\frac{1}{2}$ . Northern Ohio Traction consolidated 5s are in demand, at around 99. Rather a quiet week at Columbus. Columbus Railway & Light sold at from 33 to 34, the old common at 85 and the preferred at 104.

In Cleveland the Northern Ohio Traction & Light was practically the only active issue. Two hundred shares sold at 14, and a 100-share lot at 14 $\frac{1}{4}$ , the highest mark in several months. Northern Texas Traction sold at 32, the previous mark. A small lot of Cleveland Electric sold at 68 $\frac{1}{2}$ , but holders are asking 75 for more.

**Security Quotations**

The following table shows the present bid quotations for the leading traction stock, and the active bonds, as compared with last week:

	Cosing Bid	
	Jan. 5	Jan. 12
American Railways	43 $\frac{1}{2}$	a44
Aurora, Elgin & Chicago (preferred)	a55	a55
Boston Elevated	140	140
Brooklyn Rapid Transit	49 $\frac{1}{8}$	49 $\frac{1}{8}$
Chicago City	160	160
Chicago Union Traction (common)	6 $\frac{1}{2}$	6
Chicago Union Traction (preferred)	28	30 $\frac{5}{8}$
Cleveland Electric	65	66 $\frac{1}{2}$
Consolidated Traction of New Jersey	—	a65 $\frac{1}{4}$
Consolidated Traction of New Jersey 5s	105 $\frac{1}{2}$	105 $\frac{1}{2}$
Detroit United	66 $\frac{1}{2}$	65 $\frac{1}{2}$
Elgin, Aurora & Southern	a32	—
Lake Shore Electric (preferred)	—	a42
Lake Street Elevated	1 $\frac{3}{4}$	2 $\frac{1}{8}$
Manhattan Railway	142 $\frac{1}{2}$	142
Massachusetts Electric Cos. (common)	19 $\frac{1}{2}$	21 $\frac{1}{4}$
Massachusetts Electric Cos. (preferred)	75 $\frac{1}{4}$	76
Metropolitan Elevated, Chicago (common)	17	17
Metropolitan Elevated, Chicago (preferred)	51	51
Metropolitan Street	122 $\frac{1}{4}$	120 $\frac{1}{2}$
Metropolitan Securities	88	87
New Orleans Railways (common)	10	9 $\frac{5}{8}$
New Orleans Railways (preferred)	30 $\frac{1}{2}$	29
New Orleans Railways 4 $\frac{1}{2}$ s	80	79
North American	83 $\frac{1}{2}$	85
Northern Ohio Traction & Light	13 $\frac{1}{4}$	13 $\frac{1}{4}$
Philadelphia Company (common)	40 $\frac{3}{4}$	40
Philadelphia Rapid Transit	8 $\frac{1}{4}$	8 $\frac{1}{2}$
Philadelphia Traction	97	97 $\frac{1}{2}$
St. Louis Transit (common)	13	a13 $\frac{5}{8}$
South Side Elevated (Chicago)	92 $\frac{1}{4}$	91
Third Avenue	119	122
Twin City, Minneapolis (common)	91	89
Union Traction (Philadelphia)	45	46
United Railways, St. Louis (preferred)	55	55
West End (common)	89 $\frac{1}{2}$	89 $\frac{1}{2}$
West End (preferred)	109 $\frac{1}{2}$	108 $\frac{1}{2}$

a Asked.

**Iron and Steel**

The announcement of an advance in prices on the principal products of the American Steel & Wire Company is the most gratifying news that the steel trade has had in some time. It may not show conclusively that a turn for the better has come, but it does show that some good judges believe that it has. In the greater part of the trade conditions remain substantially what they have been for the last six weeks. Consumers are waiting for lower prices, and meanwhile living from hand to mouth; producers are refusing to make any further commissions. In pig-iron the Northern furnaces have cut quotations, influenced to this action by the lower cost of fuel; they are, accordingly, getting

the business away from the Southern makers. Quotations are as follows: Bessemer iron \$13.75 and \$14, Bessemer steel \$23, steel rails \$28.

**Metals**

Quotations for the leading metals are as follows: Copper 12 $\frac{7}{8}$  and 13 $\frac{1}{8}$  cents, tin 29 $\frac{1}{4}$  cents, lead 4 $\frac{1}{8}$  cents, and spelter 4 $\frac{7}{8}$  cents.

**CHICAGO ELEVATED RAILWAY TRAFFIC IN 1903**

Daily average traffic figures for the Chicago elevated roads for the year 1903 were as follows:

	SOUTH SIDE		
	1903	1902	Inc.
January	86,637	79,154	7,483
February	88,516	79,386	9,130
March	87,989	80,313	7,676
April	87,553	81,000	6,544
May	82,884	76,063	6,821
June	85,262	76,449	8,813
July	76,236	70,067	5,460
August	72,646	68,334	4,312
September	81,887	76,572	5,315
October	85,788	83,112	2,670
November	143,398	83,299	60,099
December	93,937	88,513	5,424
Daily average for year	89,280	78,566	10,714
Gain for year, 13.65 per cent.			

	NORTHWESTERN		
	1903	1902	Inc.
January	68,266	62,010	6,256
February	69,885	64,760	5,125
March	70,070	65,362	4,708
April	71,340	65,430	5,910
May	66,990	63,199	3,791
June	66,571	60,813	5,758
July	59,393	56,110	3,283
August	60,093	57,911	2,182
September	68,107	63,950	4,157
October	71,617	69,362	2,055
November	71,422	67,236	4,186
December	76,259	71,607	4,652
Daily average for year	68,315	63,986	4,329
Gain for year, 6.77 per cent.			

	METROPOLITAN		
	1903	1902	Inc.
January	112,171	98,029	13,712
February	116,690	100,466	15,624
March	116,716	105,512	11,204
April	117,597	109,246	8,351
May	109,330	105,799	3,531
June	111,613	101,743	9,870
July	102,057	97,920	4,128
August	102,971	100,099	2,872
September	112,993	109,751	3,242
October	117,387	115,980	1,407
November	114,148	110,289	3,859
December	120,694	115,682	5,012
Gain for December, 4.33 per cent.			

The gains on the South Side Elevated Railroad were helped by the excessive traffic during the Chicago City Railway strike. The increase on the Metropolitan West Side Elevated Railway is believed to have been caused by the introduction of universal transfers on the Chicago Union Traction lines.

**ANNUAL REPORT OF THE BOSTON ELEVATED RAILWAY COMPANY**

The annual meeting of the stockholders of the Boston Elevated Railway was held Jan. 4, and the old board of directors was re-elected, as follows: Frederick Ayer, William A. Bancroft, John J. Bright, Samuel Carr, T. Jefferson Coolidge, Jr., Francis H. Peabody, James Phillips, Jr., William S. Spaulding, Walter S. Swan and Robert Winsor.

President Bancroft presented the report for the year ending Sept. 30, 1903, which in part was as follows:

The total number of stockholders is 2554, holding 133,000 shares of stock. Of these 2172, holding 106,550 shares, are in Massachusetts.

In the management of the property for the fiscal year ending

Sept. 30, 1903, the directors were obliged to contend with the high price and uncertain supply of coal brought about by the strike in the coal fields. It was necessary to buy coal wherever it could be bought, and at prices which the stringency of the situation had fixed. The increase in the cost of coal over the previous year was \$398,289.46, to which should be added an increase in the cost of labor in handling the same over the previous year of \$10,727.65, making a total of \$409,017.11. Deducting the natural increase, it leaves \$400,248.16 as the extra expense on the coal account over the previous year, or an increase of about 71.08 per cent.

During the year a revision of wages has been made. In order to make it easier for young men who desire to enter the car service of the company to spend the time, which sometimes takes several weeks, to learn enough of the business to perform their appropriate duties, provision was made to pay such learners at the rate of a dollar a day while so learning. That the compensation of new or "extra" men after they were accepted in the surface car service should be certain, a minimum wage of one dollar and one-half a day was established for all those who report for duty at the car-houses and remain there during the prescribed hours, even if not actually employed in the operation of cars. To more suitably recompense those who by the experience of long and faithful service become more efficient, an increased compensation of 5 cents a day was established for every five years of continuous service up to fifteen years of such service. The daily wage for the surface car men, when hired, is \$2.25 per day for the first five years, then \$2.30 for the second five years, and \$2.35 for the third period of five years, and thereafter \$2.40 per day, until such time as incapacity to operate a car shows itself. Then, that men may be still further encouraged to render long and faithful service, such employment as a man is fit to perform is given to him; but in case a man is, in the judgment of the management, unfit to perform any duty in the service of the company, and has been continuously employed by the company for a period of twenty-five years, or has reached the age of sixty years, and has been continuously employed by the company for a period of fifteen years, it was determined to contribute to the support of such employee a sum not exceeding \$25 per month during the rest of his lifetime. These, or corresponding provisions, apply also to elevated car men, and to certain others connected with the operation of cars. Further, as an inducement for meritorious service, it was determined to pay the sum of \$15 at the end of the calendar year to each car service man (and to certain others connected with the operation of cars) who has rendered continuous and satisfactory service throughout the year. This revision of wages is estimated to increase the pay-roll during the first year, beginning Jan. 24, 1903, by about \$200,000. The company has also provided free legal advice for all its employees, and last winter supplied coal at less than cost to all its employees who desired it. About 7250 tons of coal was so supplied at an estimated saving to the employees of \$40,000.

The increase in the total number of revenue passengers for the entire system was 5 per cent as against an increase of 4.1 per cent for the previous year. The increase in the number of persons entering the subway was 9.75 per cent. as against 14.97 per cent increase of the previous year. The number of free transfer passengers still continues to increase. It is estimated that the total for the year was not far from 130,000,000. This is more than 55 per cent of the revenue passengers, which numbered 233,563,578. This is an increase of 13 per cent for free transfer passengers as against 5 per cent for revenue passengers.

The operation of the elevated lines has continued with good success. As against a 5 per cent increase in total revenue passengers, the receipts at main line elevated stations, exclusive of subway, increased 15.9 per cent, and at Atlantic Avenue elevated stations 59.3 per cent. The receipts at subway stations for elevated service alone increased 8.3 per cent. The surface car mileage increased but 0.8 per cent, while the elevated car mileage increased 23.8 per cent.

The extension of the surface tracks amounted to 5.16 miles. The total length of surface tracks controlled by the company, including that leased from the Old Colony Street Railway Company, is now 421.48 miles. The elevated mileage is over 16 miles, making a total mileage of 437,499. Sixty-one surface cars have been ordered. These are somewhat larger and heavier than the standard car, and are to be used on certain lines only, because it is not feasible to use them on most of our lines. They will be equipped with air-brakes, because of their size and weight. Twenty-four elevated cars have also been ordered, and are to be equipped with an improved type of multiple unit control, to be supplied by the General Electric Company. Motors for these cars and motors and controllers for the new surface

cars have also been purchased from the General Electric Company.

A summary of the business for the year is as follows:

Gross earnings from operation .....	\$11,959,514.54
Operating expenses .....	8,259,860.49
Net earnings from operation of owned and leased lines.....	\$3,699,654.05
Subway rental .....	\$217,932.03
Less amount collected from the Boston & Northern Railway Company .....	20,039.79
	\$197,892.24
Interest on funded debt of West End Street Railway Company .....	644,615.76
Dividend on preferred stock of West End Street Railway Company, 8 per cent .....	512,000.00
Dividend on common stock of West End Street Railway Company, 7 per cent .....	651,848.75
Dividend on stock of Somerville Horse Railway Company, 6 per cent .....	9,180.00
Taxes on West End Street Railway Company.....	501,761.96
Total payments under lease of West End Street Railway Company .....	2,517,298.71
	\$1,182,355.34
Miscellaneous interest .....	59,856.72
	\$1,242,212.06
Taxes, Boston Elevated Railway Company .....	\$312,043.05
Compensation tax under Act of 1897.....	103,214.43
	415,257.48
Balance .....	\$826,954.58
Dividend No. 6, paid Feb. 15, 1903, to stockholders, 3 per cent .....	\$399,000.00
Dividend No. 7, paid Aug. 15, 1903, to stockholders, 3 per cent .....	399,000.00
	798,000.00
Surplus for the year .....	\$28,954.58

VOLUME OF BUSINESS FOR THE YEAR

Total revenue passengers carried .....	233,563,578
Increase over business of previous year.....	11,078,767
Or an increase of about .....	5%

SUBWAY TRAFFIC

Total number of subway passengers, Oct. 1, 1902, to Sept. 30, 1903, was 32,018,986; and they were carried from the various subway stations as follows:

Boylston Street .....	1,514,823
Mason Street.....	3,548,277
Park Street .....	11,401,624
Seollay Square .....	9,337,791
Adams Square .....	2,847,064
Haymarket Square .....	3,369,407
Total number carried from these stations in previous year was ....	29,172,150
Gain over previous year .....	2,846,836
Or about .....	9.75%
Average number of subway passengers per day .....	87,723
Average number of subway passengers per day previous year.....	79,923
Gain .....	7,800
Or about .....	9.75%

GENERAL BALANCE SHEET, SEPT. 30, 1903

ASSETS

Construction .....	\$5,133,359.35
Equipment .....	1,614,332.90
Real estate .....	5,104,898.52
Subway construction and equipment .....	160,343.38
Cash on hand and in bank .....	4,019,431.64
Bills and accounts receivable .....	855,963.31
Stocks and bonds .....	208,010.72
Bonds deposited with Commonwealth of Massachusetts.....	500,000.00
Materials and supplies .....	1,045,011.22
Somerville Horse Railroad Company .....	102,851.11
West End Street Railway Company (open account) .....	753,429.72
West End Street Railway Company (property account) .....	860,427.07
Total assets .....	\$20,358,068.94

## LIABILITIES

Capital stock .....	\$13,300,000.00
Audited vouchers and accounts .....	293,784.86
Salaries and wages .....	124,051.35
Dividends not called for .....	7,697.50
Matured interest coupons unpaid .....	31,337.50
Rentals unpaid .....	333,873.75
Outstanding tickets and checks .....	24,407.79
Interest accrued and not yet due .....	113,651.66
Taxes accrued and not yet due .....	904,351.88
Rentals accrued and not yet due .....	131,825.00
West End Street Railway Company (lease account) .....	1,207,201.98
West End Street Railway Company (bond account) .....	171.80
Damage fund .....	598,015.93
Insurance fund .....	360,000.00
Depreciation fund .....	600,000.00
Surplus .....	2,327,687.94
Total liabilities .....	\$20,358,058.94

## INCOME ACCOUNT FOR THE YEAR ENDING SEPT. 30, 1903

## DEBIT

Operating expenses .....	\$8,259,860.49
For general expenses .....	\$730,058.20
" maintenance of roadway and buildings .....	791,189.93
" maintenance of equipment .....	822,190.25
" transportation expenses .....	5,916,422.11
Taxes .....	917,019.44
West End Street Railway Company's tax on capital stock and property .....	501,761.96
Boston Elevated Railway Company's tax on stock and property .....	312,043.05
Boston Elevated Railway Company's compensation tax on income .....	103,214.43
Coupon interest on West End Street Railway Company's bonds .....	644,615.76
Rentals of leased railways .....	1,173,028.75
Rental of subway .....	217,952.03
Less amount collected of Boston & Northern Railway Company .....	20,039.79
Dividends paid on capital stock .....	798,000.00
Balance carried to surplus account .....	28,954.58
Total .....	\$12,019,371.26

## CREDIT

Earnings from operation .....	\$11,959,514.54
From passengers carried .....	\$11,666,906.60
" carriage of mails .....	26,362.83
" tolls for use of tracks by other companies .....	47,765.62
" rentals of real estate .....	100,191.64
" advertising in cars .....	77,029.11
" interests on deposits, etc. ....	34,440.43
" miscellaneous income .....	6,808.31
Interest from special deposits .....	59,856.72
Total .....	\$12,019,371.26

## MILEAGE OF ELECTRIC EQUIPMENT

Miles of elevated track completely equipped with electric third-rail system .....	16.015
Miles of surface track completely equipped with electric overhead system .....	413.461
Miles of surface track partially equipped .....	1.970

## PROGRESS OF CHICAGO PUBLIC HEARINGS

The Chicago City Railway franchise ordinance which is being considered in a series of public hearings in Chicago has been severely attacked by various radical believers in municipal ownership. Municipal ownership advocates having expressed their views, the views of those favoring the ordinance are now being heard. Clarence S. Darrow, the attorney prominent in representing union labor interests, made the most severe attack on the ordinance, and claims that the figures given in the ordinance as to the amounts to be expended on improvements are entirely too high, and that no such expenditures are necessary. Mr. Darrow, however, gave nothing to substantiate the sweeping general statements in which he condemned the ordinance. The hearing will soon be closed and the matter taken up by the Council.

## CHICAGO CITY COMPANY OFFERS COMPENSATION

On Tuesday, Jan. 12, the Chicago City Railway Company made its first definite proposition to the local transportation committee on the question of compensation. The company agrees to pay 5 per cent of the gross receipts for the next twenty years, and 20 per cent of the gross receipts above \$197,000,000. The city estimates that the income for the term of the franchise will be between \$227,000,000 and \$240,000,000. The company figures on gross receipts of \$7,000,000 for the first year of the franchise, and an average annual increase of \$300,000. The compensation offered by the company is in lieu of all other public charges against the corporation, excepting taxes on tangible property. The company, of course, expects to pay taxes upon its real estate and personal property as heretofore, but it asks that the taxes on capital stock be deducted from the compensation paid to the city, and also the car license charges and bridge taxes, which have heretofore been borne by the company.

The question of what compensation should be paid to the city by the Chicago City Railway had been argued for the corporation on Jan. 8, by F. H. Parke, of Haskins & Sells. He told the committee on local transportation of the probable earnings and expenses of the company during the twenty years the franchise under discussion has to run, premising his argument with the statement that the further earnings of the company depend entirely on the growth of the city. What the population of Chicago would be twenty years from now, Mr. Parke said, could not be foretold with certainty. Assuming that the growth of Chicago for the last twenty years will continue for the next twenty, Mr. Parke said that in 1924 the city ought to have a population of 3,400,000.

Taking this and other considerations into account Mr. Parke figured that the increase in the earnings of the railway company would average \$300,000 a year, with expenses also increasing, but not in proportion. The present plant would give a salvage of \$10,000,000, and it would cost \$15,000,000 more to improve it, making a total value of \$25,000,000, of which \$15,000,000 would be bonds. For seven years, estimating operating expenses at 6 per cent of gross receipts, and allowing for interest and sinking fund for the bonds, and 6 per cent on \$18,000,000 of stock, there would be a deficit, but, after that, a continually increasing surplus. At the end there would only be left \$5,863,850 to go to the city. This would equal 2½ per cent of average gross earnings.

so that at best 1904 will be nearly gone before there can be any settlement of franchise matters, as far as the Chicago Union Traction Company is concerned.

An appeal has been introduced in Congress declaring the tunnels under the Chicago River an obstruction to navigation, and ordering them removed. The Chicago Union Traction Company has addressed a letter to Colonel Hepburn, chairman of committee on Interstate and Foreign Commerce, asking that no hasty action be taken on this bill in view of the fact that the Chicago Union Traction Company is now endeavoring to arrive at a settlement of franchises and future routes of the Chicago Union Traction Company in the streets of Chicago. It asks that a thorough investigation be made by the committee before taking action looking to the passing of the bill.

### UNION TRACTION TO ASK FRANCHISES

After strengthening its legal grip upon the bridges leading into the heart of Chicago from the North and West sides by filing two auxiliary bills before Judge Grosscup, the Union Traction Company receivers have decided to make a direct appeal to the Common Council for a renewal of expiring franchises on Washington, Adams and Harrison Streets. These grants, together with others on the West Side, were given the Chicago Passenger Railway, and are not affected by the ninety-nine year act dispute.

The filing of the bills has caused Corporation Counsel Tolman to ask for and obtain a postponement of ten days for the hearing set for Jan. 16. He also protests against having the case heard in Washington, and suggests that Chief Justice Melville W. Fuller be asked to come West and sit with Judge Grosscup, if Justice Day is unable to do so.

An important session of the receivers was held Jan. 9, at which the financing of the proposed improvements was earnestly discussed. Harry B. Hollins, of New York, took the place of Receiver R. R. Govin, who is detained in Cuba by the illness of his mother.

### THE THREE-CENT FARE SITUATION IN CLEVELAND

As outlined in the last issue of STREET RAILWAY JOURNAL, the Johnson contingent in the City Council of Cleveland decided to push through all pending three-cent fare measures before the State Legislature could pass the proposed law placing the granting of all street and electric railway franchises in the hands of a State railway commission. At the Council meeting held Monday evening, Jan. 11, this programme was carried out in a manner which astonished even Mayor Johnson himself. Not only did the Johnson Democrats support the measures, but the nine Republican members of the City Council were solid in favor of the ordinances. It developed at a caucus before the meeting that the three-cent fare measures would pass, and it is thought that rather than to give Johnson the opportunity of making political capital of what was to come to pass, the Republican members decided tentatively to support the measures.

All three ordinances outlined last week are now the law in Cleveland. Under the first grant the Forest City Railway Company has the right to construct and operate a line over the following route: Public Square to Ontario Street, to Broadway, to Woodland Avenue, to Southern Avenue, to South Woodland Avenue, to Corwin Street; also from the corner of Woodland and Wilson and Kinsman Streets, on Kinsman Street to the city limits. These routes are now occupied by the Woodland and Kinsman Street lines of the Cleveland Electric Railway Company, which grants, the ordinance states, expire by limitation on Sept. 20, 1904.

The second ordinance gives the Forest City Company the right to build and operate over the following route: Commencing at the corner of Prospect and Erie Streets, on Erie Street, to Central, to Lincoln Avenue; also commencing at the corner of Quincy Street and Wilson Avenue, on Quincy Street, to Woodland Hills Avenue. These routes are occupied by the Central Avenue, and a portion of the Scoville Avenue lines of the Cleveland Electric Railway, and the ordinance states that the franchises expire by limitation on March 22, 1905.

The ordinances provide, among other things, that the lines shall be completed and in operation the day after the ordinance goes into effect, unless prevented from doing so by legal complications; that the valuation of the property agreed upon by the two parties, plus 20 per cent, shall be paid, in the first case by June 20, 1904, and in the second case by Dec. 22, 1904; that in event of failure to agree upon a valuation for the properties the matter shall be adjudicated by a court of competent jurisdiction, the payment in either case to be made by the guarantee in cash; that all new construction shall be of the latest type; that the rate of fare shall be 3 cents for each passenger, said fare to entitle the passenger to one continu-

ous ride in the same general direction and one transfer on any other line operated by the company if said transfer shall be necessary to enable said passenger to reach his destination, the city reserving the right to regulate the issuance and use of transfers to carry out this provision, and also the right to establish other transfer points, and require the exchange of free transfers with other street railroad companies; that the city shall have the right at any time to purchase the lines at a price to be agreed upon by the two parties interested, or by a committee of arbitration, composed of three persons, one selected by each interested party, and the third to be chosen by these two; and that the city reserves the right to grant any other parties the joint use of not to exceed 10 per cent of the length of any route mentioned.

As already outlined in these columns, the Cleveland Electric Railway Company maintains that the grants here mentioned do not expire for several years later than stated in the ordinances, the claim being made that in every case the time of limitation was extended at the time the old companies received the right to change their power to electricity. This Mayor Johnson denies.

The third ordinance may or may not be of vast importance in the future of all electric railways in Cleveland. The ordinance provides that in all cases in which the city, by virtue of ordinances previously passed, has not divested itself of the power to regulate the rates of fare by a stipulated rate in the ordinance, the same are hereby required to make a rate of 3 cents. This ordinance takes effect within ten days from date of publications, so that unless injunctions are put in force, the citizens of Cleveland within the district bounded by Wade Park Avenue, Harvard Street, Dennison Avenue and Edgewater Park, embracing more than three-fourths of the territory within the limits of Cleveland, will have the advantage of 3-cent fares. As the ordinance says nothing about transfers, this small satisfaction is left to the old company. It is understood that only three grants, the Euclid Avenue, Payne Avenue and Scoville Avenue, stipulate that the rate of fare shall be 5 cents, and in consequence are immune from the sweeping attack. It is unofficially announced that the Cleveland Electric Railroad has decided to accept the reduction, and thus dispose of the matter, and that the effect of this action will be that 85 per cent of the residents of Cleveland will pay 3 cents, and 12 per cent will pay the present rate of 5 cents, while the remaining 3 per cent will have to pay 7 cents, but may transfer for twenty-one miles.

### FOREIGN INVITATIONS TO THE INTERNATIONAL ELECTRICAL CONGRESS OF ST. LOUIS

In response to the request of the Director of Congresses at St. Louis, the president of the American Institute of Electrical Engineers, and the committee of organization of the congresses, the State Department at Washington has issued instructions to the American diplomatic officers abroad that they shall invite the various foreign Governments to appoint official delegates to the International Electrical Congress at St. Louis in September, 1904. The number of delegates requested to be appointed by each country is in conformity with the precedents established at the Chicago Congress of 1903, and at the Paris Congress of 1900.

### IMPORTANT NEW PROJECTS IN MICHIGAN

The Ionia & Owosso Railway Company and Jackson & Lansing Railway Company have been incorporated, the former with a capital stock of \$1,500,000, and the latter with a capital stock of \$1,200,000, for the purpose of building electric railway lines from Ionia to Jackson via Owosso and Lansing. These two lines, together with the recently organized Grand Rapids & Ionia Railway Company, controlled by the same persons, contemplate the construction this year of a line that will run through the principal part of central Michigan, and, in connection with the lines owned by the Hawks-Angus syndicate, form a complete trunk line clear across the State, from Muskegon on the west to Detroit on the east. E. M. Hopkins, of Detroit and New York, president of all the companies, is authority for the statement that the survey is practically completed from Grand Rapids to Ionia, and that the entire line will be completed during 1904. The plan of the projectors is to begin work as soon as the weather conditions will permit. The entire line will be constructed upon private right of way, except through the cities and villages. Franchises have been secured in nearly all of the latter, and the private right of way is rapidly being procured. The officers of the companies are E. M. Hopkins, of Detroit and New York, president; Ex-Governor John T. Rich, of Detroit, vice-president; C. H. Pomerooy, of Saginaw, treasurer; Frank Westcott, of Vernon, secretary; Governor A. T. Bliss, of Saginaw; J. L. Hudson, of Detroit; W. E. Harris, of DeGraff, Ohio; Judge F. S. Porter, of Lansing, and W. W. Steele, of Detroit, directors.

## THE TROLLEY IN DELAWARE

Before many months lower Delaware will probably be connected by trolley with the city of Wilmington, Delaware's metropolis, and unless the plan now under consideration miscarries, there will be an electric railway all the way from Wilmington to Smyrna, a distance of 38 miles. In addition, it is likely that the line will be extended to the extreme end of the State, reaching Lewes and Rehoboth, the terminus of the Delaware line. To substantiate the talk of the trolley, representatives of the Middletown & Odessa Company and Wilmington & New Castle Trolley Company have held several conferences lately about the proposed extension down the State, and all that is lacking is the signing of a written agreement on the part of the companies in question. An official of the Middletown & Odessa line is authority for the statement that an agreement imposing the conditions mentioned has been drawn up and is now being considered by officials of the Wilmington & Delaware City line. It is expected that Harry A. Richardson, of Dover, president of the Wilmington & Delaware City line, will soon append his signature to this agreement. If this is done, construction of the Smyrna extension will begin in a few months.

According to the plan under consideration, the Wilmington & Delaware City Railway is to be extended to Odessa, provided the Middletown & Odessa line is extended to Smyrna, in Kent County. Officials of the Middletown road desire to build down the State, but first wish to be assured that their passengers can be carried into Wilmington without inconvenience. The extension of the Wilmington & Delaware City line to Odessa would solve the problem, and it is understood that officials of that company have assured the Middletown officials that they will build from Delaware City to Odessa provided the extension from Middletown is laid down. If the line is built to Smyrna, as contemplated, the State Capital will undoubtedly be reached, as part of the road has already been graded and leveled by a company incorporated here several years ago.

## WORK OF THE Y. M. C. A. STREET RAILWAY BRANCHES

Y. M. C. A. officials report that during the year just closed the association has made greater strides than ever before in the new department for street railway employees. Well equipped and thoroughly organized branches have been established in Rochester, Brooklyn and Richmond, Va., with experienced railroad secretaries in charge.

The association at Rochester has quarters in the State Street car house, and the board of directors of the company has just made an appropriation of \$3,000 to provide needed improvements and enlargement. In the city of Brooklyn a new building costing over \$30,000 has been turned over to the association by the Brooklyn Rapid Transit Company, yet there are times when the facilities are taxed to the utmost by the men who are anxious to take advantage of the many opportunities for physical and intellectual development. At Richmond, Va., the Passenger and Power Company recently made an appropriation for fitting up rooms in the car houses for the use of employees. Over 300 men have expressed a desire to join the new association. A library valued at \$1,000 will be installed, and a music box and talking machine provided.

In a number of other cities, at the request of street railway officials, investigations have been made by representatives of the association, and reports made in each case outlining the work to be done. While it is true that this work is comparatively new, the interest manifested by the men and the companies seems to warrant the confidence shown by representatives of the association, that during 1904 a number of additional branches will be organized in metropolitan centers for the use of men in the employ of street railway companies.

## THE INTERURBANS OF OHIO IN THE RECENT STORM

The interurban roads of Ohio made a very fine showing during the severe snow storms last week. With the exception of one or two new lines that had not yet secured snow plows, all of the companies were prepared for the storm, and kept their lines open and operated cars almost on schedule time. The Cincinnati Traction Company operated twenty-two sweepers on its city and suburban lines, and kept cars running at regular intervals on every line but one, on which wires were down. Cars on the system of the Interurban Railway & Terminal Company were troubled by sleet, but the lines were kept open. The Cincinnati, Dayton & Toledo cars were delayed, but none of them were thrown out of service. All of the Columbus interurbans were kept open, with the exception of the Urbana, Mechanicsburg & Columbus, which had not yet secured its snow plows. Owing to the unfinished condition of this line, the company has obtained a court order per-

mitting it to suspend operations for sixty days, if desirable. Some of the Cleveland roads operated under reduced headway, but traffic was not suspended by any of them. The Lake Shore Electric Railway made a particularly creditable record, as its entire line from Cleveland to Toledo was kept open, and all cars ran through without an accident. Not one of the cars on the Lake Shore was more than an hour late, whereas all of the trains on the Lake Shore & Michigan Southern (steam), which parallels the electric line, were delayed from one to six hours. President Bicknell, of the Lake Shore, is greatly elated over the showing made by his road, particularly because of the fact that a Lake Shore & Michigan Southern flyer was tied up near Norwalk by deep snow, and the passengers took the electric line into the city. Many of these passengers abandoned the steam line entirely and came through to Cleveland in the electric cars.

## THE STRIKE AT BLOOMINGTON, ILL.

The extreme violence of the striking employees of the Bloomington & Normal Railway, Electric & Heating Company seems to have finally awakened the law-abiding citizens of the city to the appreciation of their duty, and the measures adopted for protection give hope that the lawless element will soon be effectually put down. The Mayor has recently issued a proclamation on the strike announcing that all who interfere with the operation of cars in any way will be prosecuted vigorously, and the Citizens' Alliance of the city, composed of business men and citizens, has tendered the sum of \$10,000 to aid the company in its contest with the strikers. So determined now are the authorities that all lawlessness shall cease that even the Aldermen patrol the streets twirling rosewood police clubs, and wearing huge tin stars pinned to their civilian overcoats.

The State Board of Arbitration convened at Bloomington, but adjourned on Jan. 7, announcing its inability to make any settlement. On that very date regular service was resumed by the company with local non-union men, and on Saturday, Jan. 9, the last of the imported men were deported for Chicago. The strike was declared Jan. 1, the issue being the refusal of the company to grant the men an increase in wages from 17 to 18 cents an hour.

## CHANGE IN CAR HOUSE CONSTRUCTION AT CLEVELAND

In addition to the adoption of the plan of storing many of its cars in the open, as outlined in a recent issue of the STREET RAILWAY JOURNAL, the Cleveland Electric Railway has decided to make a number of changes in the construction of some of its car houses which will be used for storing cars that are out of season. At the Windermere car house, which is one of the largest in the city, it is the intention to erect a solid brick cross-wall, thus dividing the house into four sections, each division being sufficiently large to hold twenty cars. There will be entrances and curves from both ends, and the tracks will be elevated at the center, giving them about a 1½ per cent grade, which it is thought will be sufficient to allow cars to run out when the brakes are released. Similar arrangements will be made at other car houses. At the Lake View house the wooden walls will be replaced with brick. The company is using every precaution to avoid a repetition of the Holmden Avenue car house fire.

## CHANGE IN THE MANAGEMENT AND SALES OFFICES OF THE NATIONAL ELECTRIC COMPANY

At a meeting of the board of directors of the National Electric Company, successor to the Christensen Engineering Company, F. C. Randall was elected vice-president and general manager to succeed R. P. Tell, resigned. R. P. Tell was elected secretary and treasurer of the company, and B. T. Becker was appointed assistant general manager.

The general sales office of the Christensen air brake department of the National Electric Company has been transferred from 135 Broadway, New York, to the Milwaukee works, and will be under the direct charge of F. C. Randall, vice-president and general manager of the company. The company will still retain a sales office at 135 Broadway, New York, which will take care of New York City and all of New England and Canada. This office will be in charge of J. T. Cunningham, who has been the New England representative of the company for the last two years. J. D. Maguire has been appointed special sales representative of the air-brake department of the National Electric Company, and will make his headquarters at the New York office. J. H. Denton, who formerly made his headquarters at the general sales office at New York, has been appointed chief of the inspection department at the Milwaukee works in addition to his position as chief engineer of sales department for Christensen air brakes. Mr. Denton in future will be located in the Milwaukee office.

**COMING BANQUET OF THE NEW ENGLAND STREET RAILWAY CLUB**

The annual banquet of the New England Street Railway Club, which is always held in mid-winter in Boston, is scheduled this year for Thursday evening, Jan. 28. It will be held at the Hotel Brunswick, on Boylston Street, and a large attendance is expected.

As the demand for tickets will undoubtedly be greater than the capacity of the hotel, no tickets unpaid for by Jan. 21 will be reserved. Members will be permitted to purchase tickets for guests, until the committee considers that it is being done to such an extent as to exclude members. The price of tickets is \$2.50 each, and they can be secured at any time now by application to J. H. Neal, secretary-treasurer, 101 Milk Street, Boston. The banquet will begin at 7 p. m., and will be preceded by a reception to commence at 6 p. m.

**NEW BOSTON ENGINEERING FIRM**

George W. Swazey and Herbert W. Smith, both of Boston, have joined their interests, and will give their attention to the building of street railways, the installation of lighting and power plants, and the handling of supplies, representing some of the leading houses in that line. They are now negotiating to act as purchasing agents for several foreign syndicates.

Mr. Swazey is well known to the street railway profession, having completed and placed in operation several lines, the last being the Claremont Railway & Lighting Company, Claremont, N. H., whose power plant is a combination of water and steam.

Mr. Smith has been for several years connected with the supply business, being for the last four years assistant manager of the railway department of the Stuart-Howland Company.

**STREET RAILWAY PATENTS**

[This department is conducted by W. A. Rosenbaum, patent attorney, Room No. 1203-7 Nassau-Beekman Building, New York.]  
UNITED STATES PATENTS ISSUED JAN. 5, 1904

748,591. Third-Rail Cover; Henry F. Duffy, Seattle, Wash. App. filed June 20, 1903. A third-rail protector consisting of a sectional cover whose sections are successively raised and lowered by the car to permit the contact-shoe to make uninterrupted contact with the rail.

748,592. Third-Rail Protector; Henry F. Duffy, Seattle, Wash. App. filed June 20, 1903. A modification of the preceding patent.

748,619. Electric Railway; Charles J. Kintner, New York, N. Y. App. filed Sept. 22, 1899. The sections of the working conductor are held in a strained and bowed condition by springs acting on rock-shafts connected with their terminals. The contact shoe presses the section downward to connect it with the feeder.

748,620. Electric Railway; Charles J. Kintner, New York, N. Y. App. filed March 10, 1902. A feature of this invention is the provision of circuit closers which automatically connect and disconnect turn-out third rails when the track switch is thrown.

748,621. Safety System of Electric Railways; Charles J. Kintner, New York, N. Y. App. filed Nov. 15, 1902. Circuits and circuit connections whereby the current potential is always maintained substantially constant to the motor on the car and each sectional conductor is automatically disconnected from the current feeder only after electrical connection has been severed between it and the current collecting means carried by the car.

748,628. Automatic Guard or Life Saver for Tram Cars or the Like; David Maxwell, Dundee, Scotland. App. filed Aug. 15, 1902. Details.

748,688. Street Railway Switch; Walter J. Bell, Los Angeles, Cal. App. filed May 7, 1903. Details of construction of a switch-throwing apparatus operated by hydraulic cylinders controlled by electric valves.

748,810. Electric Car Plow; William F. Taylor, Jr., Providence, R. I. App. filed March 30, 1903. In connection with the main contact for the propelling current, subsidiary contacts are provided for engagement with extra rails in signaling or switch-throwing circuits.

748,811. Switch; William F. Taylor, Jr., Providence, R. I. App. filed March 30, 1903. Contact plates in the roadbed are engaged by hinged arms on the car to deliver current from the trolley to motors in the roadbed which move the switch.

748,812. Switch-Throwing Mechanism; William F. Taylor, Jr., Providence, R. I. App. filed March 30, 1903. A special arrange-

ment of gearing actuated by an electric motor to throw the switch tongue.

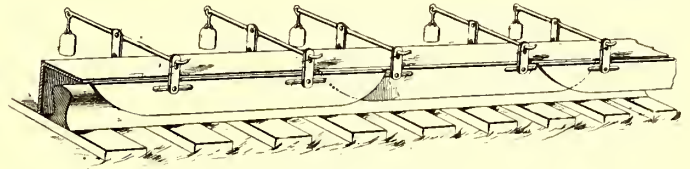
748,813. Contact-Shoe; William F. Taylor, Jr., Providence, R. I. App. filed March 30, 1903. Details of construction of a shoe suspended from overhead supports to be engaged by a trolley.

748,815. Railway Block Signal and Switch; William F. Taylor, Jr., Providence, R. I. App. filed March 30, 1903. A controller on the car platform adapted to operate both signals and rail switch.

748,872. Electric Railway System; William G. Lowrie, New York, N. Y. App. filed June 21, 1901. The invention relates particularly to the construction of a trolley which moves through a closed conduit in contact with conductors therein, the motion being obtained by the attraction of a magnet carried by the car.

748,903. Car Seat; Hubert Witte, St. Louis, Mo. App. filed Sept. 14, 1903. Details of construction of a "walk-over" seat.

748,987. Trolley Harp; Edward D. Rockwell, Bristol, Conn. App. filed Nov. 7, 1903. The trolley wheel is mounted in bearing



PATENT NO. 748,591

blocks adapted to slide into ways in the harp, the wheel being free to rock to follow curvatures in the wire.

749,009. Device for Operating Street Railway Switches; Harry T. Young, Homestead, Pa. App. filed April 18, 1903. A rotary disc with projections thereon connected with the switch tongue by link and lever connections is adapted to be engaged by a spring-pressed rack bar carried by the car, to thereby rotate the disc and actuate the switch.

749,042. Electric Railway System; William M. Eader, Middletown, Md. App. filed July 27, 1903. A third-rail collecting device, consisting of spring-mounted rollers spaced apart and arranged to readily engage a second section of the rail when passing from one section to another.

**PERSONAL MENTION**

MR. EZRA D. WHITAKER has resigned as treasurer of the Hoosac Valley Street Railway Company, of North Adams, Mass., a position he has filled for two years. He resigned because of the pressure of other business.

MR. IRVING H. REYNOLDS, formerly with the Allis-Chalmers Company, and for many years identified with the design and construction of that company's engines, has accepted a position with the William Tod Company, of Youngstown, as consulting engineer.

MR. A. B. SANDERS, who has for a number of years been connected with the engineers' department of the American Telephone & Telegraph Company, of New York City, and later with the Electric Storage Battery Company, of Philadelphia, has taken charge of the electrical department for John B. Watson, Drexel Building, Philadelphia.

MR. SAMUEL C. GRIER, president of the Youngstown, Park & Falls Street Railway Company, of Youngstown, Ohio, died at Pittsburg a few days ago. Mr. Grier was born in Allegheny, Pa., in 1851. He was at the head of several manufacturing establishments in Pittsburg and Allegheny, and was a director of two leading banks at Allegheny.

Mr. T. J. RODERICK, superintendent of the Indianapolis, Shelbyville & Southeastern Traction Company, of Shelbyville, Ind., for the past year, has resigned and will be succeeded by Mr. Arthur A. Anderson, who will also be superintendent of the Indianapolis & Cincinnati line when completed. Mr. Anderson formerly was superintendent of the Indianapolis city lines.

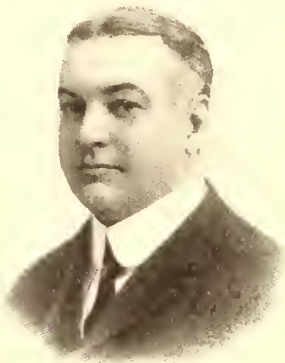
MR. J. B. McCLARY, who, on Jan. 1, retired as general manager of the railway department of the Birmingham Railway & Light Company, of Birmingham, Ala., after having served with the company for more than sixteen years, was presented with a handsome gold watch Dec. 31 by the employees of the company as a token of esteem. Mr. McClary's successor, as previously announced in the STREET RAILWAY JOURNAL, is Mr. George Harris, who has been connected with the company since 1890.

MR. N. S. BRADEN, formerly manager of the Westinghouse Electric & Manufacturing Company's district office at Cleveland, Ohio, has been appointed sales manager of the new Canadian Westinghouse Company, Ltd., and assumed the duties of that office Jan. 1, 1904. Mr. Braden succeeds the late Mr. Thomas C. Freneyar, who died on Dec. 10, 1903. Mr. Freneyar's office was at Toronto, but Mr. Braden will make his headquarters at Hamilton, Ont. Mr. Braden was born at Indianapolis thirty-four years ago. He went to the Jenny Electric Motor Company, in his native city, in 1892, and remained with that company until 1899, when he joined the Cleveland district sales office of the Westinghouse Electric & Manufacturing Company as a salesman, where he later became manager.

MR. GEORGE W. PARSONS, who for a long term of years has ably managed the business of the frog, switch and signal department of the Pennsylvania Steel Company, has resigned from the active management of the department, but will remain connected with it in an advisory capacity. Mr. C. W. Reinoehl, who has also been for a long time with the Pennsylvania Steel Company, succeeds Mr. Parsons as superintendent of the frog, switch and signal department, and Mr. W. C. Cuntz succeeds Mr. Reinoehl as sales agent, in charge of the Steelton (Pa.) sales office. These different appointments became effective Jan. 1, 1904.

MR. F. L. WANKLYN, who recently retired as general manager of the Montreal Street Railway Company, of Montreal, Quebec, was waited on a few days ago by the leading officials of the company and presented with a gold mounted mantel clock. Mr. W. G. Ross, the new managing director, in a few remarks, referred to the progress the company had made under Mr. Wanklyn's management, and the regret felt by all that his other business arrangements had necessitated his withdrawal from the company. The clock, which bears a neat inscription, was handed to Mr. Wanklyn by Mr. P. Dube, the new secretary. Mr. Wanklyn, in expressing his gratitude, hoped the friendships he had formed would endure long after he had severed his connection with the company. Mr. Wanklyn's retirement from the office of general manager and vice-president of the Montreal Street Railway Company will affect both that company and the Light, Heat & Power Company. In the Montreal Street Railway Company Mr. Duncan McDonald will become general manager, while Mr. W. D. Ross will occupy the new position of managing director, and in order to do so retires from the board of the Light, Heat & Power Company.

MR. FRANK C. RANDALL, who has just been elected vice-president and general manager of the National Electric Company, of Milwaukee, has for a long time been prominently identified with the street railway trade. He obtained his early education at the English High School of Boston, and in 1875 entered the office of his father, who was an importer of special grades of English iron and steel in Boston. After two years in this office he entered the employ of the New York & New England Railroad Company as "Performance of Engine" clerk in the Norwood central shops, and later was appointed chief clerk of the motive department of the same road, at Hartford, for all divisions west of Willimantic. He later left his position to accept that of chief clerk of the motive power department of the Boston & Lowell Railroad and its leased lines. Upon the consolidation of the latter road with the Boston & Maine Railroad Company he severed his connection with the steam railroad business, and decided to enter the manufacturing field. He obtained a position in the shops of the Tripp Manufacturing Company, and after several years of practical work, during which he acquired a knowledge of the manufacture of electric railway car trucks, he was promoted to the position of foreman and later superintendent of the plant of the company. He resigned this position to accept a position as Eastern sales agent of the J. G. Brill Company, and later was made Western sales agent of this company, with headquarters at Chicago. After being in the employ of the J. G. Brill Company about six years he was offered the position of Eastern sales



F. C. RANDALL

agent of the Christensen Engineering Company, which he accepted, and later was appointed general sales agent of this company and its successor, the National Electric Company.

During Mr. Randall's connection with the sales department of

the company the sales of Christensen air brakes increased from less than 200 equipments to the enormous total of over 11,000, which are in use at present time. During his steam railroad experience he gained a valuable knowledge of organization, which, added to his acquaintance of electric railway affairs gained by personal contact with the leading electric traction operating men, enabled him to form a corps of salesmen and engineers, covering the railway field of the entire country, and in the success of this organization he takes great pride. In his new position as vice-president and general manager of the National Electric Company, Mr. Randall will still attend to the duties of general sales agent not only of the air brake, but also of the electrical machinery department of the company.

## EARNINGS OF NEW YORK STREET RAILWAYS

The reports of the street railway companies of New York State for the year ending June 30, 1903, have been filed with the State Railroad Commission, as required by law. Through the courtesy of the commission the STREET RAILWAY JOURNAL has been permitted to make transcriptions of the several reports, and the main figures are given in the table on the opposite page. The total gross earnings from operation were \$48,974,748.77, an increase of \$2,069,560.90 over 1902. Operating expenses were \$28,259,721.28, an increase of \$629,856.31 over 1902. The percentage of dividends declared to capital stock is 3.66 per cent, a decrease of .25 per cent. The total number of passengers carried (including transfers) was 1,267,563,057; the total number carried in 1902 was 1,209,510,539, 58,052,518 more being carried in 1903 than in 1902. The mileage of road increased 128.481 miles. The percentage of operating expenses to gross earnings was 57.70 in 1903, against 58.91 in 1902.

Thirty-nine passengers, twenty-two employees and 111 others (total 172) were killed, and 432 passengers, forty-two employees and 332 others (total 805) injured on the street surface railroads during the year.

The total mileage of the State is 1858 miles. The greatest increase during the year was on the Hudson Valley (17.6 miles), and the Schenectady (21.315 miles). The average number of persons, including officials, employed during the year ended June 30, 1903, on all the street surface railroads of the State (including horse railroads), was 30,028; in 1902, 30,529. The aggregate amount of salaries and wages paid them during the year was \$17,841,895.49; in 1902, \$17,857,825.83. The number of tons of freight carried in 1902 was 394,641, and in 1903, 516,460.

The board's electrical expert devotes considerable space to high-voltage transmission and block signals. In regard to the former he says:

"The question of high-voltage transmission lines has assumed serious proportions. It seems evident that this method of transmitting power will be universally adopted by electric railroads, where there is reliable water-power available within reasonable distance. The higher the voltage used the less cost for construction; for this reason the tendency will be to increase, rather than to reduce, the voltage. The question of the location of these lines on highways or private right of ways; the danger to be caused the public by their use; the means of relieving such danger and other questions in reference to their operation are now being considered by special committees of the American Institute of Electrical Engineers, the National Board of Fire Underwriters, and the New York Street Railway Association."

In speaking of train despatching he says:

"Defects in methods in train despatching in use on electric railroads have resulted in more serious accidents during the past year than from any other cause. Head-on collisions have occurred on two of the roads operating under the most approved system of train despatching employed on any of the roads in this State. These collisions were the result of defects in the methods of running cars by train orders.

"A more perfect method of operating cars by train orders should be adopted by the different high-speed roads to prevent collisions, or some other means, such as block signals, should be used for that purpose."

The report adds:

"The most serious complaints which we have considered during the year were those against the street surface and elevated railroads of New York and Brooklyn. We believe that unbiased consideration of these statements will lead to the conclusion that much has been accomplished by the board toward the alleviation of the conditions of passenger transportation in New York City. When the tunnel railroad in Manhattan and the Bronx is in operation conditions will be much improved. When cars may cross the newly opened bridge to Brooklyn, and when the tunnel to Brooklyn is completed, conditions in Brooklyn will also be much improved."



FINANCIAL REPORTS OF THE OPERATING STREET RAILWAYS OF NEW YORK STATE FOR THE YEAR ENDING JUNE 30, 1903.

NAME	ON JUNE 30, 1903		YEAR ENDING JUNE 30, 1903					
	Capital Stock	Funded Debt	Total Receipts All Sources	Operating Expenses	Charges on Earnings	Dividends Paid		Surplus For Year
						Amount	Per Cent	
	\$	\$	\$	\$	\$	\$		\$
Interurban St. Ry. Co.	52,000,000	37,030,000	15,273,363	7,068,428	8,453,645	.....	..	df. 248,709
Brooklyn Rapid Transit Co.	45,000,000	12,000,000	13,557,814	7,931,079	4,829,952	.....	..	796,783
Manhattan Railway Co.	55,197,922	39,558,000	12,555,197	5,460,794	3,648,859	2,718,000	2 1/2 & 2 3/4	727,544
International Ry. Co.*	16,320,500	10,928,000	3,225,662	1,738,449	765,564	652,820	4	68,829
The Third Avenue R. R. Co.	15,995,800	40,000,000	2,961,659	1,170,594	1,746,538	.....	..	44,526
United Traction Co. (Albany)	4,999,950	4,241,300	1,624,305	1,076,847	299,138	249,997	5	def. 1,677
Coney Island & Brooklyn R. R. Co.	2,000,000	2,000,000	1,605,300	1,009,040	270,288	320,000	16	5,973
Rochester Ry. Co.	5,000,000	4,557,000	1,324,353	692,931	392,882	156,250	6 1/4	82,289
Union Ry. Co. (New York)	2,000,000	2,000,000	1,139,582	820,126	294,949	.....	..	24,308
Brooklyn, Queens County & Suburban R. R. Co.	2,000,000	6,624,000	867,371	434,192	384,757	.....	..	48,421
Forty second St., Manh'nville & St. Nich. Ave. Ry. Co.	2,500,000	2,800,000	833,523	475,733	422,146	.....	..	def. 64,357
Syracuse Rapid Transit Ry. Co.	4,000,000	3,839,000	753,277	421,961	230,901	.....	..	100,415
Schenectady Ry. Co.	600,000	2,000,000	648,763	356,751	119,767	.....	..	172,246
Utica & Mohawk Valley Ry. Co.	2,500,000	2,700,000	621,976	621,976	147,680	.....	..	105,915
New York & Queens County Ry. Co.	3,235,000	3,000,000	619,434	363,994	191,200	.....	..	64,239
Dry Dock, East Broadway & Battery R. R. Co.	1,200,000	2,050,000	566,992	435,599	138,515	.....	..	def. 7,122
Thirty-fourth Street Crosstown Ry. Co.	1,000,000	1,000,000	495,100	297,808	69,821	.....	..	127,471
Central Crosstown R. R. Co.	600,000	250,000	490,331	309,061	107,844	60,000	10	7,426
Fonda, Johnstown & Gloversville R. R. Co.	2,500,000	5,600,000	6,485,343	271,567	169,379	24,000	4	20,399
Hudson Valley Ry. Co.	3,000,000	3,750,000	349,218	338,337	184,708	.....	..	df. 173,827
Richmond Light & R. R. Co.	2,871,750	2,200,000	291,219	163,740	123,597	.....	..	3,882
The Yonkers R. R. Co.	1,000,000	1,000,000	260,723	243,613	64,052	.....	..	46,972
Westchester Electric R. R. Co.	500,000	500,000	238,413	281,514	37,216	.....	..	def. 80,324
Binghamton Ry. Co.	792,360	1,420,000	226,702	126,600	68,100	15,846	2	16,156
Albany & Hudson R. R. Co.	1,750,000	1,500,000	213,551	111,286	123,193	.....	..	def. 20,927
Twenty-eighth & Twenty-ninth St. Crosstown R. R. Co.	1,500,000	1,500,000	186,655	100,702	87,650	.....	..	1,697
Elmira Water, Light & R. R. Co.	† 429,818	.....	184,815	135,751	48,403	.....	..	661
Staten Island Midland R. R. Co.	1,000,000	1,000,000	153,457	94,162	59,189	.....	..	106
The Jamestown Street Ry. Co.	100,000	300,000	139,519	91,831	33,540	.....	..	14,118
Auburn & Syracuse	1,300,000	714,000	121,470	73,794	38,926	.....	..	8,749
New York & Stamford Ry. Co.	500,000	396,000	116,309	75,855	22,056	.....	..	18,938
Long Island Electric Ry. Co.	600,000	600,000	112,901	80,023	35,965	.....	..	def. 3,086
Kingston Consolidated R. R. Co.	400,000	700,000	112,164	64,553	38,725	.....	..	8,886
Ithaca Street Ry. Co.	325,000	325,000	109,090	60,996	22,907	.....	..	25,185
Orange County Traction Co.	325,000	425,000	103,827	67,479	28,201	.....	..	8,147
Poughkeepsie City & Wappinger's Falls El. Ry. Co.	750,000	404,000	98,010	79,187	20,957	.....	..	def. 2,134
Syracuse, Lakeside & Baldwinsville Ry.	500,000	500,000	87,976	53,520	31,542	.....	..	2,915
Niagara Gorge R. R. Co.	1,000,000	1,000,000	82,711	36,642	52,096	.....	..	6,028
Pekskill Lighting & R. R. Co.	350,000	500,000	76,052	30,612	29,125	.....	..	16,315
Hamburg Ry. Co.	200,000	300,000	75,090	60,085	15,679	.....	..	674
Syracuse & Suburban R. R. Co.	400,000	500,000	75,032	44,136	26,436	.....	..	4,460
Olean Street Ry. Co.	300,000	433,500	74,866	38,715	21,228	.....	..	14,923
Geneva, Waterloo, Seneca Falls & Cayuga Lake Tr. Co.	450,000	436,500	73,017	40,682	20,652	.....	..	11,682
Tarrytown, White Plains & Mamaroneck Ry. Co.	300,000	300,000	72,933	76,343	17,349	.....	..	20,760
Black River Traction Co.	105,000	55,000	66,156	68,479	4,845	.....	..	def. 7,168
Oneonta, Cooperstown & Richfield Springs Ry. Co.	1,464,000	1,364,000	64,188	85,123	2,228	.....	..	23,163
Waverly, Sayre & Athens Traction Co.	700,000	150,000	56,821	38,210	11,008	.....	..	7,603
Southern Boulevard R. R. Co.	250,000	250,000	56,718	44,581	18,382	.....	..	def. 6,245
Rochester & Suburban Ry. Co.	420,000	.....	56,316	34,194	27,419	.....	..	def. 5,597
Dunkirk & Fredonia R. R. Co.	150,000	100,000	55,801	31,684	6,941	27,141	a 19	def. 9,964
Van Brunt Street & Erie Basin R. R. Co.	200,000	65,000	53,609	29,898	6,011	10,000	5	7,700
Citizens' Railroad Light & Power Co.	175,000	175,000	51,444	26,877	14,366	.....	..	10,171
Kingsbridge Ry. Co.	8,600	.....	51,441	34,459	1,721	.....	..	15,261
Middletown-Goshen El. Ry. Co.	100,000	275,000	47,093	43,986	2,112	.....	..	994
Cortland County Traction Co.	320,000	180,000	42,551	32,387	8,832	.....	..	1,332
Bennington & Hoosic Valley Ry. Co.	200,000	182,000	39,610	28,314	9,700	.....	..	1,596
Oswego Traction Co.	300,000	288,000	38,373	31,383	13,774	.....	..	6,785
Fulton Street R. R. Co.	500,000	500,000	38,289	30,319	21,668	.....	..	def. 13,697
Corning & Painted Post St. Ry. Co.	100,000	100,000	38,156	22,916	6,999	.....	..	8,231
Elmira & Seneca Lake Ry. Co.	300,000	300,000	36,968	33,941	18,475	.....	..	15,448
Coney Island & Gravesend Ry. Co.	35,400	.....	36,312	32,377	379	.....	..	3,550
The New York & Long Island Traction Co.	1,000,000	.....	34,677	35,256	334	.....	..	def. 914
The Ballston Terminal R. R. Co.	300,000	385,000	30,305	20,909	13,764	.....	..	def. 4,368
Ogdensburg St. Ry. Co.	150,000	150,000	29,200	26,550	9,906	.....	..	def. 7,256
Troy & New England R. R. Co.	180,000	183,725	27,385	18,853	10,210	.....	..	def. 1,678
Port Jervis Electric Light, Power & Gas R. R. Co.	450,000	275,000	27,176	10,187	4,059	.....	..	12,930
Rochester, Charlotte & Manitou R. R. Co.	97,500	81,250	20,011	16,196	4,880	.....	..	1,065
Hornellville & Canisteo Ry. Co.	50,000	80,000	18,837	11,349	3,867	.....	..	3,621
Penn Yan, Keuka Park & Branchport Ry.	94,000	100,000	18,795	15,391	6,585	.....	..	def. 3,481
Plattsburgh Traction Co.	100,000	80,000	18,740	16,289	7,174	.....	..	def. 4,733

\* Not including Crosstown Railroad. † Net investment. a 10 per cent. was paid in stock. b Not including the Amsterdam Division.

## FINANCIAL REPORTS OF THE OPERATING STREET RAILWAYS OF NEW YORK STATE FOR THE YEAR ENDING JUNE 30, 1903.—Continued.

NAME	ON JUNE 30, 1903		YEAR ENDING JUNE 30, 1903					Surplus For Year
	Capital Stock	Funded Debt	Total Receipts All Sources	Operating Expenses.	Charges on Earnings	Dividends Paid		
						Amount	PerCent	
\$	\$	\$	\$	\$	\$		\$	
New Paltz & Poughkeepsie Traction Co.....	100,000	100,000	18,328	12,187	6,314	.....	..	174
Westchester Traction Co.....	300,000	206,000	18,359	19,592	9,348	.....	..	10,582
Buffalo & Williamsville Electric Ry. Co.....	75,000	.....	17,868	10,032	625	.....	..	7,210
The Hornellsville Electric Ry. Co.....	50,000	70,000	16,035	14,422	3,541	.....	..	def. 1,928
Buffalo, Gardenville & Ebenezer Ry. Co.....	39,300	22,000	14,103	11,791	1,803	.....	..	508
Huntington R. R. Co.....	30,000	26,000	13,712	13,390	1,825	.....	..	def. 1,503
Lewiston & Youngstown Frontier Ry. Co.....	134,000	134,000	12,285	12,767	9,979	.....	..	def. 10,460
Buffalo & Depew Ry. Co.....	305,000	350,000	9,938	22,428	19,700	.....	..	def. 32,190
Pelham Park R. R. Co.....	50,000	27,750	8,899	7,148	2,066	.....	..	def. 315
Catskill Electric Ry. Co.....	60,000	54,000	8,117	7,841	3,040	.....	..	def. 2,764
The Nassau County Ry. Co.....	35,000	.....	7,541	6,187	.....	.....	..	1,354
Ontario Light & Traction Co.....	30,000	39,952	7,184	5,118	281	.....	..	1,785
City Island R. R.....	50,000	27,873	6,346	5,865	1,817	.....	..	def. 1,336
Oneida Ry. Co.....	15,000	10,000	6,244	7,110	749	.....	..	def. 1,615
Northport Traction Co.....	45,000	.....	6,037	8,000	111	.....	..	def. 2,075
Ocean Electric Ry. Co.....	35,000	20,000	3,896	2,516	1,301	.....	..	79
Southfield Beach R. R. Co.....	250,000	21,000	3,747	3,114	1,732	.....	..	def. 1,099
Fulton & Oswego Falls St. Ry. Co.....	15,000	15,000	2,216	2,592	1,266	.....	..	def. 1,642
Rome City Ry. Co.....	150,000	123,500	2,102	3,637	6,780	.....	..	def. 8,315

## NEW WORK IN 1904

For several years past it has been the practice of the STREET RAILWAY JOURNAL to obtain at the beginning of the new year an outline of the work planned by the various street railway companies throughout the country. This practice has again been followed this year, and the JOURNAL thus is able to present to its readers the following outline of some of the new work:

PUBLIC WORKS COMPANY, of Bangor, Maine, will build a car house.

ERIE ELECTRIC MOTOR COMPANY, of Erie, Pa., plans to build 4 miles of track.

BENTON POWER & TRACTION COMPANY, of St. Cloud, Minn., is to build a new car house and repair shop.

SOUTH CHICAGO CITY RAILWAY COMPANY, of Chicago, Ill., is in the market for about 60 tons of copper wire.

PASCAGOULA STREET RAILWAY & POWER COMPANY, of Scranton, Miss., will buy a 100-kw alternator, belted.

UNITED ELECTRIC COMPANY, of Dennison, Ohio, within a few months, will contract for 1000 ft. of new track.

SYRACUSE RAPID TRANSIT RAILWAY COMPANY, of Syracuse, N. Y., expects to put up a car house next year.

QUINCY HORSE RAILWAY & CARRYING COMPANY, of Quincy, Ill., will rebuild 2 miles of track with 60-lb. T-rail.

LATROBE STREET RAILWAY COMPANY, Latrobe, Pa., during the next three months will contract for a 5-mile extension.

EL PASO ELECTRIC RAILWAY COMPANY, of El Paso, Tex., will build 1¼ miles of track, and possibly purchase four cars.

GEORGETOWN & LEXINGTON TRACTION COMPANY, of Lexington, Ky., expects to purchase storage battery equipment.

COLUMBUS, BUCKEYE LAKE & NEWARK TRACTION COMPANY, of Newark, Ohio, may possibly build from Etna to Pataskala.

SPRINGFIELD & XENIA TRACTION COMPANY, of Springfield, Ohio, will buy five or six passenger cars and one express car.

INDIAN TERRITORY TRACTION COMPANY, of South McAlester, Ind. Ter., intends to construct about 15 miles of road shortly.

HORNELLSSVILLE & CANISTEO RAILWAY COMPANY, of Hornellsville, N. Y., will probably purchase some car equipments soon.

CUMBERLAND ELECTRIC RAILWAY COMPANY, of Cumberland, Md., expects to purchase two cars during the next two months.

THE LORAIN STREET RAILWAY COMPANY, of Lorain, Ohio, may purchase four new cars and some shaker grates during the year.

TORRINGTON & WINCHESTER STREET RAILWAY COMPANY, of Burrville, Conn., will purchase a boiler. Capacity not stated.

LEHIGH TRACTION COMPANY, of Hazleton, Pa., will purchase ten new cars, equipped. Orders are to be placed within four months.

RADFORD WATER POWER COMPANY, of Radford, Va., will purchase one lathc for repair shop and one two-motor car equipment.

SIOUX CITY TRACTION COMPANY, of Sioux City, Ia., will build six new cars and six trailers and rebuild about 3 miles of old track.

HORNELLSSVILLE ELECTRIC RAILWAY COMPANY, of Hornellsville, N. Y., contemplates purchasing some equipment for its power station.

SYRACUSE & ONEIDA LAKE ELECTRIC RAILWAY COMPANY, of Syracuse, N. Y., will contract for the following within the next six months:

Eleven miles of new track and overhead line, six complete motor car equipments, six trail car equipments, and one snow-plow.

DENISON & SHERMAN RAILWAY COMPANY, of Denison, Tex., expects to do something in the line of amusement attractions for park.

ALTON LIGHT & TRACTION COMPANY, of Alton, Ill., will within the next two months place contracts for two steel bridges, 124 ft. x 117 ft.

BEAUMONT, SOUR LAKE & PORT ARTHUR TRACTION COMPANY, of Beaumont, Tex., will build 10½ miles of track and terminals.

PROVIDENCE & DANIELSON RAILWAY COMPANY, of Providence, R. I., will purchase six passenger cars, with motors and full equipments.

MACON RAILWAY & LIGHT COMPANY, of Macon, Ga., has purchased some new machinery, and is installing same. The old material is for sale.

TEXARKANA LIGHT & TRACTION COMPANY, of Texarkana, Ark., expects to purchase equipment for 150-acre park, with lake and race track.

THE WEST CHESTER STREET RAILWAY COMPANY, of West Chester, Pa., plans to contract for a car house within the next six months.

CHARLOTTESVILLE & ALBEMARLE RAILWAY COMPANY, of Charlottesville, Va., is to purchase a 72-in. x 18-ft. boiler within six months.

THE DURANGO RAILWAY & REALTY COMPANY, of Durango, Col., will buy one or two closed double-truck cars, and possibly a street sprinkler.

JACKSON & SUBURBAN STREET RAILROAD, of Jackson, Tenn., writes that stage settings and scenery will be bought for park opera house.

NORTHAMPTON TRACTION COMPANY, of Easton, Pa., expects to build 3 miles of track and purchase five twelve-bench double-truck open cars.

GRAND RAPIDS, HOLLAND & LAKE MICHIGAN RAILWAY, of Holland, Mich., expects to enlarge its amusement park, adding new attractions.

WASHINGTON, ARLINGTON & FALLS CHURCH RAILWAY COMPANY, of Washington, D. C., is building a 2½-mile extension and a new car house.

SAN JOSE RAILROAD, of San Jose, Cal., within six months will place contracts for 4 miles of new road. Trucks, sand-boxes, etc., are to be purchased.

INTERSTATE TRACTION COMPANY, of Duluth, Minn., will purchase two cars; 3000 ft. of track will be built. Contracts are to be placed within six months.

MADISON TRACTION COMPANY, of Madison, Wis., expects to build a fireproof car house 200 ft. x 200 ft., contract for which will be placed in two months.

CONSOLIDATED RAILWAYS, LIGHT & POWER COMPANY, of Wilmington, N. C., is to erect a large pavilion for excursions, vaudeville shows, etc.

TAZEWELL STREET RAILWAY COMPANY, of Tazewell, Va., has an idea of changing its horse car line to an electric line, but the plans are not yet matured.

INDIANAPOLIS, COLUMBUS & SOUTHERN TRACTION COMPANY, of Columbus, Ind., expects to purchase engine, generator and boilers. Report not definite.

OLYMPIA LIGHT & POWER COMPANY, of Olympia, Wash., will build about 1200 ft. of track. The company may also build new car house and purchase one or two cars.

BINGHAMTON RAILWAY COMPANY, of Binghamton, N. Y., expects to build an extension to Owego, about 12 miles, and complete car house and repair

shop. Foundations for the latter are erected and material bought. The company is considering the addition of a miniature railway to its park; also a "circle swing."

**BERLIN & WATERLOO STREET RAILWAY COMPANY, LTD.**, of Berlin, Ont., may build new power house, 200-kw capacity.

**CARLISLE & MT. HOLLY RAILWAY**, of Carlisle, Pa., will purchase a couple of naphtha launches. Nothing definite decided in regard to extension to Gettysburg Battlefield.

**PORTLAND RAILWAY COMPANY**, Portland, Ore., will build about 16 miles of track during 1904. The company will also build and equip about twenty double-truck cars.

**NORTH ALABAMA TRACTION COMPANY**, of New Decatur, Ala., during the next ten months, will build 2½ miles of line, and purchase six 9 or 10 bench summer cars, complete.

**EAST ST. LOUIS & SUBURBAN RAILWAY COMPANY**, of East St. Louis, Ill., is planning to build some short extensions in East St. Louis, and to purchase some open cars.

**CHICAGO & SOUTH SHORE RAILWAY COMPANY**, of Laporte, Ind., within the next ten months will award contracts for the building of 30 miles of electric railway to South Bend.

**FERRO CARRIL URBANO DE COLIMA**, Colima a Villa de Alvarez, State of Colima, Mex., will purchase brake shoes, registers or punches, and a merry-go-round, steam or horse.

**CORSICANA TRANSIT COMPANY**, of Corsicana, Tex., will build 2 miles of new track and purchase two cars.

**OSWEGO TRACTION COMPANY**, of Oswego, N. Y., will build ¼ mile track in pavement, and rewire 3 miles overhead with 00 wire. Contracts are to be awarded during the next six months.

**CHAUTAQUA TRACTION COMPANY**, of Jamestown, N. Y., will purchase 60 miles of transmission wire for a potential of 16,000 volts, 18 miles of trolley lines, and 18 miles 500,000-cm feeder.

**INDIANAPOLIS & MARTINSVILLE RAPID TRANSIT COMPANY**, of Indianapolis, Ind., will contract within the next four months for an extension of 24 miles of road into Bloomington.

**PAN-HANDLE TRACTION COMPANY**, of Wheeling, W. Va., reports that an extension will be built in the spring, of about 1¼ miles. All supplies are purchased with the exception of the trolley wire.

**BALLSTON TERMINAL RAILROAD COMPANY**, of Ballston Spa, N. Y., will build from Wayville, N. Y., connecting with Boston & Maine Railroad to Johnstown and Gloversville, N. Y. Power is to be rented.

**VICKSBURG RAILWAY & LIGHT COMPANY**, of Vicksburg, Miss., expects materially to increase the capacity of its present plant, or perhaps build an entirely new one. The question has not been definitely decided.

**GUELPH RADIAL RAILWAY COMPANY**, of Guelph, Ont., anticipates building during 1904 about 10 miles of track and purchasing power house apparatus (just what is not stated), and snow-plows, motors, sand-baxes, etc.

**SHAMOKIN EXTENSION ELECTRIC RAILWAY COMPANY**, of Shamokin, Pa., will place contracts within the next six months for building and equipping 24 miles of road; a car house and a power house will also be built.

**SHEBOYGAN LIGHT, POWER & RAILWAY COMPANY**, of Sheboygan, Wis., has in contemplation an extension of 26 miles. A power plant is under construction. The company expects to build theater, hotel, race track, etc.

**PITTSBURG RAILROAD COMPANY**, of Pittsburg, Kan., during 1904 may, conditions being favorable, purchase a new 300-kw generator and engine to suit, and possibly new boilers and heaters. Also make some extensions to track.

**WESTERNPORT & LONACONING RAILWAY COMPANY**, of Cumberland, Md., expects to build a large pavilion for dancing, also to lay out a park and baseball grounds at Reynolds, Aleghany, Md., same to be ready by spring.

**FRESNO CITY RAILWAY COMPANY**, of Fresno, Cal., expects to build 4½ miles of standard gage line and enlarge car house to accommodate eight more cars. A 250 to 300 kw motor generator set and four to six new cars will be purchased.

**BUFFALO CONSTRUCTION COMPANY**, of Buffalo, N. Y., will award contracts during 1904 as follows: For the building of 50 miles of track and one bridge 540 ft. long (viaduct), ten cars, 60 ft., equipped with heaters, registers, etc.

**GALVESTON CITY RAILWAY COMPANY**, of Galveston, Tex., expects to spend about \$30,000 in street paving that has been outlined by municipal government. The company will also build a paint shop, 30 ft. x 120 ft., one story, during 1904.

**WICHITA RAILROAD & LIGHT COMPANY**, of Wichita, Kan., during next year will build 1 mile of new road and a new car house 50 ft. x 135 ft. Four new open trail cars will be purchased, and a new boiler may be installed in the power station.

**GRAND RAPIDS RAILWAY COMPANY**, of Grand Rapids, Mich., will build about 2 miles of extensions. Material and equipment will be purchased for six single-truck passenger cars, which are to be assembled in the company's own shops.

**PAWCATUCK VALLEY STREET RAILWAY COMPANY**, and the **WESTERLY & HOPKINTON RAILWAY COMPANY**, of Westerly, R. I., report that they will place contracts during the next few months for the building of 6 miles of new road; Westerly & Hopkinton Railway, a new power house and an addition to car house, and will purchase generators, engines and boilers; also five new cars.

**GETTYSBURG TRANSIT COMPANY**, Gettysburg, Pa., between March 1 and May 1, expects to rebuild entire overhead construction for 10 miles of single track. Will purchase arc headlights, sand boxes, air brakes, registers, trucks, motors, etc.

**MICHIGAN TRACTION COMPANY**, of Kalamazoo, Mich., reports that it will make extensions in Battle Creek and Kalamazoo, and build a new car house and a new bridge. Six new single-truck semi-convertible cars, complete, are to be purchased.

**BERKSHIRE STREET RAILWAY COMPANY**, of Pittsfield, Mass., is building an addition to main car house, of brick, 62 ft. x 85 ft.; also a stock room 49 ft. x 22 ft., a blacksmith shop 20 ft. x 22 ft., and a machine shop 52 ft. x 22 ft., all of brick.

**PEOPLE'S RAPID TRANSIT COMPANY**, of Toledo, Ohio, during 1904 will build 50 miles of new track, a power station, repair shop and several small bridges, and will purchase the necessary power station apparatus and repair-shop machinery for same.

**KANAWHA VALLEY TRACTION COMPANY**, of Charleston, W. Va., will build about 6 miles of interurban road and a girder bridge. Two interurban cars and some park attractions will be purchased. Orders will be placed during the next four months.

**DANBURY & BETHEL STREET RAILWAY COMPANY**, of Danbury, Conn., may build some 2 miles of extension during the coming season, but this has not been definitely decided as yet. Some supplies and rolling stock and equipment are also to be bought.

**INDIANAPOLIS COAL TRACTION COMPANY**, of Indianapolis, Ind., will build about 100 miles of track, car houses, power stations and sundry buildings, and purchase engines, boilers, etc.; also rolling stock and equipments. All this is to be done in 1904.

**BRISTOL & PLAINVILLE TRAMWAY COMPANY**, of Bristol, Conn., contemplates extension of 1¼ miles in spring. The company is constructing car house, 92 ft. x 140 ft., and will erect repair shop, office building, etc., in spring. Six open cars are to be purchased.

**JOHNSTOWN PASSENGER RAILWAY COMPANY**, of Johnstown Pa., expects to relay 1000 tons of 95-lb. girder rail next summer. An extension is being built to the power house. A generator and an engine have been purchased for installation in the extended plant.

**LOWELL, ACTON & MAYNARD STREET RAILWAY COMPANY**, of Maynard, Mass., will build 14 miles of track during 1904. Six open and six closed cars will be purchased, to be equipped complete with motors, brakes, sand-boxes, headlights, registers, fenders, etc.

**CEDAR RAPIDS & IOWA CITY RAILWAY & LIGHT COMPANY**, of Cedar Rapids, Ia., during January or February will build sub-station buildings, car house and repair shops, and purchase engine and generator, 600 kw to 800 kw, fare registers and park attractions.

**THE SPRINGFIELD, TROY & PIQUA RAILWAY COMPANY**, of Springfield, Ohio, will build a car house and repair shop, a freight house and a two-span steel bridge. About five or six passenger cars will be purchased. Contracts to be placed during next six months.

**BATON ROUGE ELECTRIC & GAS COMPANY**, of Baton Rouge, La., during the next three months will place contracts for a 150-kw 550-660-volt generator, and a 400-hp steam or gas engine; if the latter, a producer plant also. Expects to sign summer theater company.

**LIBERTY & JEFFERSON ELECTRIC RAILROAD COMPANY**, of Liberty, N. Y., will build 16 miles of road; transmission line of 12 miles, and purchase the required amount of rolling stock and equipment for 16 miles of road. Contracts to be awarded within six months.

**RUTLAND STREET RAILWAY COMPANY**, of Rutland, Vt., during 1904, will build 8 miles of road, from Fair Haven, Vt., to Whitehall, N. Y., and purchase a stock of amusement attractions for a small park. The company may also buy some rolling stock and equipments.

**LEWISTOWN & REEDSVILLE ELECTRIC RAILWAY COMPANY**, of Lewistown, Pa., will place contracts during the next six months for half a mile of single track, 60-lb. T-rail, and for one new car house. Two new double-truck cars, equipped complete, will be purchased.

**ADRIAN STREET RAILWAY COMPANY**, of Adrian, Mich., will relay one-half mile of track, with 60-lb. T rail and build a new freight and passenger station. The company will buy a second-hand 6 or 8-bench open car complete. Contracts are to be placed within six months.

**UNION ELECTRIC COMPANY**, of Dubuque, Ia., anticipates rebuilding 20 miles, 70-ft. T-rail; ties 6 ins. x 8 ins. x 8 ft.; one brick and steel central station, and one brick and steel car house. The company has not determined whether it will purchase any additional rolling stock.

**BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY**, of Birmingham, Ala., will build a few miles of track and some viaducts, also an addition to its power station. Material for the latter and for the additional equipment has been ordered. Twenty closed cars will be bought.

**WILKESBARRE & HAZLETON RAILWAY COMPANY**, of Hazleton, Pa., will contract for a 3½-mile extension, two sub-stations, repair shop, car house, office building, etc., within the next four months, and purchase equipment for the sub-stations, and increase present power-station equipment.

**CONSOLIDATED TRACTION COMPANY**, of Indianapolis, Ind., is building from Indianapolis to Crawfordsville, parallel to the Big Four road. The company expects to build from Crawfordsville to Danville, Ill., within six months, and from Crawfordsville to Lafayette, Ind. Estimates should be submitted without delay, as the company will place contracts immediately for all the equipment necessary for these lines.

**SANTA CRUZ, CAPITOLA & WATSONVILLE RAILWAY COMPANY**, of Santa Cruz, Cal., within three months will place contracts for 3 miles of extensions, three new bridges, new car house and power house. The company will buy double trucks, arc headlights, fenders, three new cars and motors.

**CONCORD, MAYNARD & HUDSON STREET RAILWAY COMPANY**, of Maynard, Mass., is as yet undecided as to what it will buy in the way of extra power-house equipment; probably about 1000-hp engine and generator to match. Six to nine miles of road will be built and three or four cars purchased.

**TOLEDO, BOWLING GREEN & SOUTHERN TRACTION COMPANY**, of Findlay, Ohio, during 1904 will build a new power house complete and purchase the necessary dynamos, boilers, engines, etc., for same. The company will also buy six interurban cars and six small car-bodies for city service.

**WARREN & JAMESTOWN STREET RAILWAY COMPANY**, of Warren, Pa., will build 21 miles of single track line; also car house and a power station. Several bridges and sub-stations will be constructed, and six complete car equipments will be purchased. Contracts will be awarded during the next two months.

**WINNIPEG ELECTRIC STREET RAILWAY**, of Winnipeg, Man., during 1904, will build a new car house, addition to boiler room and some double track in city. Will purchase railway generator, alternating-current generator, new boilers, coal conveyors and twelve new cars complete with motors and trucks.

**THE WABASH & ROCHESTER RAILWAY COMPANY**, of which T. W. Tuttle, of Geneva, Ohio, is manager, reports that it will build from Wabash to Rochester during the coming season, and erect some more new buildings. Will also purchase some new machinery and rolling-stock equipment. Details are not given.

**NEWPORT & PROVIDENCE RAILWAY COMPANY**, of Newport, R. I., has placed the contract for building 12 miles of new track, car house and repair shop. Power will probably be rented. Eight open cars and six closed cars are to be purchased. George E. Macomber, of Augusta, Maine, is treasurer of the company.

**MONTEREY & PACIFIC GROVE RAILWAY COMPANY**, of Monterey, Cal., reports that it will place contracts during the next six months for building 11 miles of single track, and that it will purchase a steam turbine outfit, 400-kw alternating current, five sets double trucks, two motor, and five No. 49 Westinghouse equipments.

**BOSTON & WORCESTER STREET RAILWAY COMPANY**, of Boston, Mass., expects to place contracts within the next six months for 10 miles of track, 75-lb. T rail with joints, and broken stone ballast. Will change a power station at Marlboro, Mass., to a sub-station, and purchase a G. E. 2000-kw turbine, 1000-hp boilers and five semi-convertible cars.

**MICHIGAN & INDIANA TRACTION COMPANY**, of Battle Creek, Mich., will award contracts within six months for the building of road from Battle Creek to Lansing and Grand Ledge, and for the necessary power station, car houses and other buildings. Everything needed in the way of power station apparatus and rolling stock equipment will be purchased.

**THE CHELAN TRANSPORTATION & SMELTING COMPANY**, of Chelan, Wash., during the next three months will place contracts for the building of 14 miles of new track and all necessary buildings for a line of this size. Complete rolling stock will be purchased for same as a mining road for hauling ore, supplies and passengers. The roadbed is finished.

**AKRON, CANTON & MASSILLON RAILWAY**, of Akron, Ohio, will place contracts within the next four months for the building of 31 miles of road to connect the three cities named. The road will be first class in every way, with a view of making fast time between points. All material and equipment will have to be purchased. Address communications to Thomas L. Childs.

**JOLIET, PLAINFIELD & AURORA RAILROAD COMPANY**, of Joliet, Ill., will build 10 miles of track. The company has contracted for rails, ties and poles. A brick car house and repair shop will be built at Plainfield, and tools for repair shop will be purchased. The company also expects to buy something in the line of park attractions, but no decision has been reached on this question.

**KANSAS & OKLAHOMA INTERURBAN RAILWAY**, of Arkansas City, Kan., is to award contracts for 33 miles of track, the necessary buildings, twelve cars, from 100 to 200 freight cars, 40,000 lbs. capacity, and the necessary machinery for power house, etc., etc. Expect to start construction work about April or May. Communications should be addressed to L. H. P. Northrup, general manager.

**HUMBOLDT TRANSIT COMPANY**, of Eureka, Cal., expects to build within city of Eureka about four miles of new track, and extend the line 12 miles more for freight and passenger service. Will also build a new car house, power station and repair shops in Eureka, and purchase 1000-hp steam auxiliary plant, about fifteen passenger cars and twenty freight cars. Orders to be placed within six months.

**SANDUSKY SOUTHWESTERN RAILWAY COMPANY**, of Wapakoneta, Ohio, will build 70 miles of road, connecting the cities of Wapakoneta, Kenton, Lima and Belfontaine and the county seats of Auglaize, Hardin Allen and Logan counties. One power house of 1500-kw output, and four sub-stations will be built in the vicinity of Lake View, Ohio. Will purchase two alternating units of 750-kw capacity each; two cross compound Corliss condensing engines or two steam turbines. Also twenty four-motor cars, 75 hp, of the double-end vesibule type.

**GRAYS HARBOR ELECTRIC COMPANY**, of Aberdeen, Wash., will soon build a small car house and repair shop. The company would like to duplicate as nearly as possible its 24 x 48 Allis-Corliss double-eccentric engine, with 18-ft. x 36-in. wheel. The company wants second-hand engine as above, and would also like to hear of good second-hand interurban cars of standard make, with up-to-date equipments, including 38-B Westinghouse motors.

**HARRISBURG & MECHANICSBURG ELECTRIC RAILWAY COMPANY**, of Harrisburg, Pa., will award contracts within the next six months for the following: For building 16 miles of single track; a new power house, and an extension of present car house 100 ft., with new offices, large repair shops, etc. The company will also improve its rolling stock, and make additions to the power station and repair shops. Just what the latter will consist of is not stated.

**URBANA, MECHANICSBURG & COLUMBUS ELECTRIC RAILWAY COMPANY**, of Columbus, Ohio, expects to build an extension of 9 miles, which will necessitate the building of several bridges of spans varying from 10 ft. to 500 ft., and several small trestles of from 50 ft. to 200 ft. in length. Several cars, motor equipments, electric locomotive, dump cars and equipment, and electric launches will be purchased. Contracts are to be awarded during the next four months.

**THE EASTERN CONSTRUCTION COMPANY**, of Cleveland, Ohio, during 1904 will complete the building of the Cleveland & Sharon Traction Company, from Middlefield, Ohio, to Kinsman, Ohio, thence to Sharon, Pa.; also from Kenilworth, Ohio, to Warren, Ohio. The necessary car houses, power stations, repair shops, buildings, bridges, etc., will be built, and complete apparatus for power station and repair shops, rolling stock and equipments will be purchased. Some park attractions are to be bought, but these probably not until 1905.

**BUFFALO & DEPEW RAILWAY COMPANY**, of Depew, N. Y., will contract for the following during the next six months: Building 60 miles of road, T, tram-headed, girder and grooved girder rail; one main power house and three sub-stations. The company will purchase the necessary rails, ties, poles, brackets, trolley and feed-wire, etc., and complete power-station equipment, including alternating-current dynamos, direct connected; steam turbines or engines, and boilers. Also twenty of the latest type interurban cars, rotary snow-plows, freight cars, etc.

**CINCINNATI, GEORGETOWN & PORTSMOUTH RAILROAD**, Cincinnati, Ohio, expects to build from Georgetown to West Union, Ohio, the latter place being the county seat of Adama County, and the only county seat in Ohio without railroad connections. Two new sub-stations are to be built, and one 1000-hp engine, with boilers to correspond, will be added to power house; also such electric machinery as may be necessary. Twenty-five thousand ties, five passenger cars, ten box cars and ten center dump ballast cars, will be purchased. Orders to be placed within three months.

**BRITISH COLUMBIA ELECTRIC RAILWAY COMPANY**, of Vancouver, B. C., during 1904 will build 1 mile of single track in Vancouver and relay 1 mile with 80-lb. T-rail. The company will complete new car houses and repair shops and equip same with labor-saving machinery. Intends to build 1000 ft. of bridge over an arm of the sea. Among equipment to be purchased will be a 1000-kw 700-volt 60-cycle generator for direct connection to water-wheel, and step-up and step-down transformers; also air brakes for the company's interurban cars, acetylene or arc headlights, and two motor equipments for 22-ft. car bodies.

**W. B. UPTON COMPANY, INC.**, Washington, D. C.—Mr. Upton has been appointed chief engineer in charge of the construction of the Great Falls & Old Dominion Railroad Company, which proposes to build 14 miles of double track electric railway from Georgetown, D. C., crossing the Potomac River over the Aqueduct Bridge, and thence to the Great Falls on the Virginia side of the river. The company also expects to construct a crosstown line in Washington, D. C., using the underground electric system from Georgetown, D. C., to the new Union Station, and beyond to the northeast portion of the city, besides another crosstown line to the Navy Yard. A large power house will be constructed to provide the power, and probably a number of sub-stations.

**THE INDIANAPOLIS & CINCINNATI TRACTION COMPANY**, of Indianapolis, Ind., during the season just closed has completed about three-fourths the grading from Indianapolis to Rushville, and will be able to complete the entire work rapidly next spring and lay the track, and have that section of the road in operation some time during the month of June. The roadbed and bridge abutments are being constructed for a double track. It has been definitely decided to use the third-rail system. During next season the company expects to press the work forward and have the line in operation as far as Connersville by the close of the year. The power house at Rushville is well under way. To the equipment of this plant will be added either a 1500-kw or 2000-kw unit, with the necessary boilers, etc. The repair shops and car houses necessary will also be built during the year.

**KANSAS CITY RAILWAY & LIGHT COMPANY**, at a meeting of the directors on Dec. 18, voted \$1,000,000, to be applied upon improvements now under way by the Metropolitan Street Railway Company. It is stated that very much better service will be had very soon. The new power-house is sufficiently large to accommodate machinery to operate a street car line and light a city of one and one-quarter million people. It is expected that operations will begin somewhere between Jan. 15 and Feb. 1. The ultimate capacity of the power plant will be some 40,000 kws. The directors also authorized the purchase of about forty new cars for summer use. The following directors attended the meeting: P. A. Valentine, Chicago, Ill.; Louis C. Krauthoff, C. L. Blair and John B. Dennis, of New York; Bernard Corrigan, H. C. Flower, J. F. Downing, Stuart R. Knott, E. F. Swinney, L. E. James, Hugh C. Ward, J. J. Heim and P. E. Chappel, of Kansas City.