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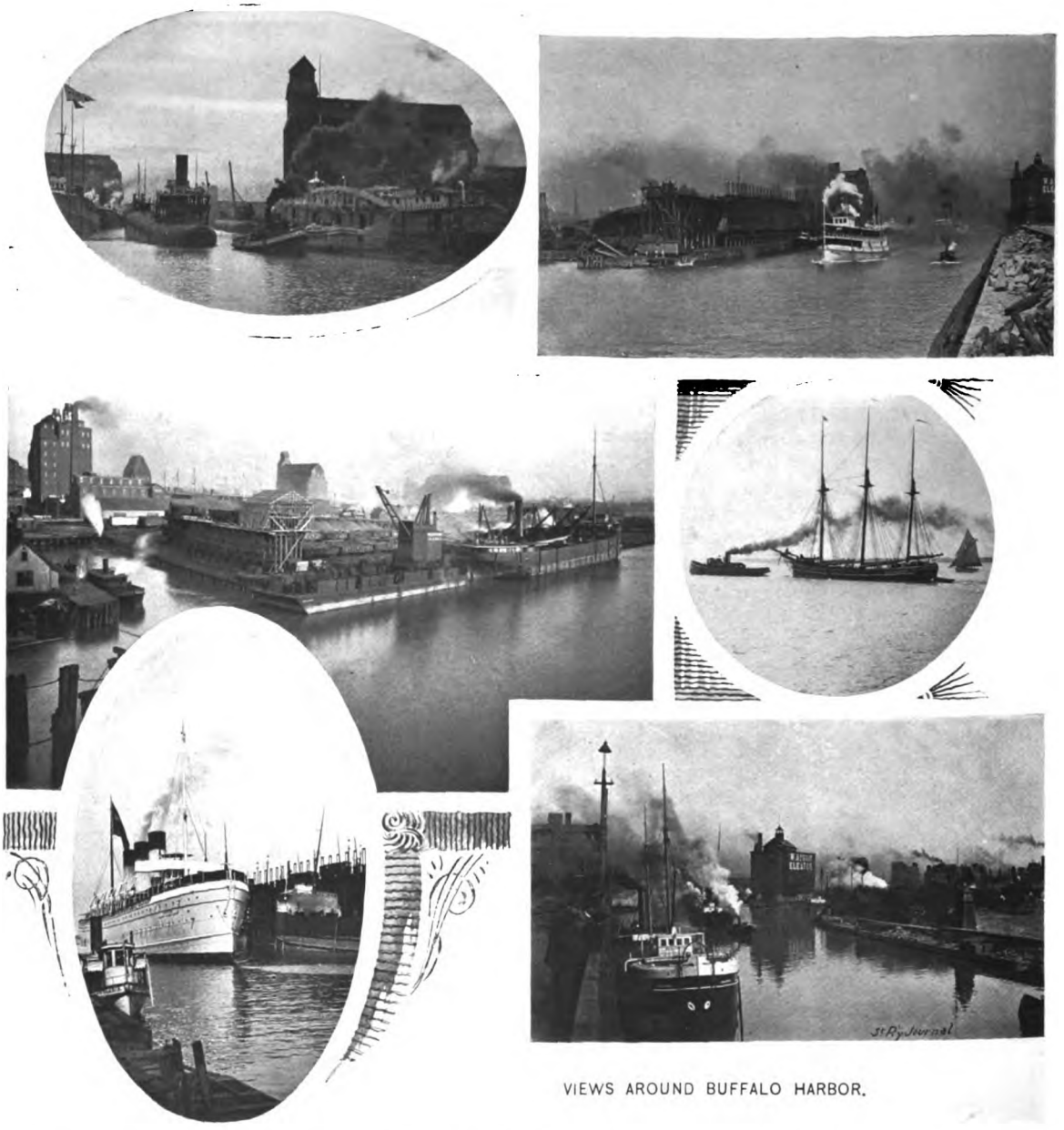
THE · ELECTRIC · RAILWAYS · OF · THE · · · · · · · · · · NIAGARA · RIVER · REGION

TO properly understand the commercial character and future possibilities of the territory situated between Lakes Erie and Ontario it is necessary to briefly review the conditions which have affected its industrial growth up to the present time. The city of Buffalo, which in 1895 had a population of 336,000, is located at the extreme western end of Lake Erie; at this point the waters of the four great lakes, Superior, Michigan, Huron and Erie, enter the Niagara River and flow first northwest, then north a distance of 36 miles to Lake Ontario. In this distance the river makes a total descent of 326 ft., about 50 ft. in the rapids above the falls, 166 ft. at the falls and 110 ft. in the lower rapids. The commerce of the upper lakes, therefore, finds its eastern terminus at Buffalo, comparatively little passing through the Welland Canal to Lake Ontario. This city has naturally become, therefore, an extensive entrepôt for the grain, minerals, lumber and other products of the great Northwest and at the same time the vast trans-shipping point for the freight brought by rail from the East for transmission on the lakes.

VIEW AT CORNER OF MAIN AND NIAGARA STREETS, BUFFALO.

The extent of the commerce carried on on these inland bodies of fresh water is surprising to those who have not had their attention called to the fact. The lakes cover an area of 84,000 sq. miles and have 3600 miles of navigable shore line, which is but 200 miles less than the entire U. S. coast bordering on the Atlantic and Pacific Oceans, and their commerce exceeds by 2,000,000 tons

annually the total foreign and coastwise commerce of the Atlantic, Pacific and Gulf seaboard of the United States. The port of Buffalo during the season of navigation is said to be as large as the port of London, which is the largest in the world. Added to this it should be mentioned that twenty-six railroads enter Buffalo, which, with the location of the city at the lake terminus of the Erie Canal, gives unequaled transportation facilities to the East and South.



VIEWS AROUND BUFFALO HARBOR.

These favorable conditions for shipment, combined with the proximity of the city to the Pennsylvania and Ohio coal mines and the natural gas fields of Pennsylvania and Ontario, and its nearly central position in an easterly and westerly direction with the center of population east of the Rocky Mountains, has made Buffalo the center of great manufacturing interests. The development of the water power at Niagara Falls and its transmission by electrical means to the city has recently still further stimulated the manufacturing interests of the community, and while the majority of the new factories using Niagara power will undoubtedly be located nearer the Falls, yet the industrial development of the city cannot but be greatly stimulated by the reduction in the cost of power which the introduction of the transmission circuits from the Falls has accomplished. Among the industries for which Buffalo has become famous are the manufacture of engines and railroad supplies, marine machinery, agricultural implements, hardware, bridges, etc.

The exploitation of Niagara power in Buffalo is being undertaken by the Cataract Construction Company, which is now engaged in extending the transmission line into the heart of the city at an expense of over $150,000. The only user of the power in Buffalo is the Buffalo Railway Company, but the owners of Great Northern Elevator have contracted for 1250 h. p. in that huge structure, now being built; the Electric Grain Elevator will employ

600 and the Buffalo General Electric Company 3000 h. p. The latter company will use this power in lighting the city, and expects to have its apparatus in readiness by Nov. 15. In all 10,000 h. p. of Niagara power will be in use in Buffalo, it is thought, by the coming winter.

The climatic conditions of the city compare favorably with those of others in the same zone. The proximity to Lake Erie tempers the extreme variations in temperature experienced further inland, and greater heat than 80 degs. in summer or more severe cold than 10 degs. above zero in winter is comparatively unknown.

The site of the city is comparatively level, and in the residential section most of the houses are surrounded by considerable ground. As a consequence the area per inhabitant is large compared with many other cities of the United States, being 164 sq. miles per 1000 inhabitants. A good idea of the density of the population of New York, Chicago, Cincinnati and Cleveland as compared with Buffalo can be gained from the engraving on page 591 showing the relative area per capita. The business district is comparatively small and in it a large number of very handsome office buildings have been erected during the past five years. Among the largest and most expensive are the D. S. Morgan Building, Guaranty Building, Mooney & Brisbane Building, Erie County Bank Building and Ellicott Square Building. The latter, which is claimed to be the largest office building in the world, fronts on four streets, one of them Main Street, and the cost, including site, is said to have been $3 350,000. The corridors and central space are tiled with marble mosaic, and the latter is roofed with glass, making a splendid arcade around which the stores and offices are grouped. The building was completed in 1896.

1.—Guaranty Building.
2.—City and County Hall.
3.—Ellicott Square Arcade.
4.—Ellicott Square Building.

OFFICE AND MUNICIPAL BUILDINGS IN BUFFALO.

The city also contains a very handsome City and

County Hall, recently completed at a cost of $1,500,000, two large public libraries, Music Hall, and other fine public buildings.

The large area over which the city extends has had an important stimulating effect upon the development of its street railway system. All the lines within the city limits were operated up to within a short time by the Buffalo Railway Company, which with the Crosstown Street Railway Company, whose lines it operates, is the successor of the original systems of the city. Most of the lines of this company run for some portion of their routes over Main Street, the principal thoroughfare which divides the city into two sections, locally called the East Side and the West Side. The ownership of the street railway system in Buffalo is in progressive hands and in many instances the lines have been extended in advance of the population into portions of the city which have been built up as a result. The relation between the development of the street railway system and the increase in property valuations is shown in an interesting way in the series of diagrams on page 589. In the maps the railway system as it existed in 1880, 1885, 1890 and at present is given, and the increase in valuations in the different districts in the same years is graphically represented by lines below.

Section I is the business district of Buffalo into which all the street railway lines converge. The business district proper is exceedingly small in area considering the large area which it serves, and as a matter of fact, a portion of Section 1, on the west, lying along the Niagara River, is residential in character. Naturally enough this section, though small, has by far the largest assessed valuation of the six, but its progressive increase in valuation since 1880, though material, is proportionally smaller than in all the other sections.

Section II is largely given over to railroads and dock facilities, and in it is considerable waste and unoccupied land together with residential areas of the poorer kind. This section was the last of all within the city limits to have electric railway facilities and it is now at a comparatively early stage of development although its assessed valuation is nearly five times that of 1880 and has increased since 1890 105 per cent.

Section III is a combined railroad, manufacturing, residential and business district. Its resident population is largely dependent on its factories, and the business sections are purely local in character. Extending electric railway facilities has here caused a progressive increase in assessed valuation along normal lines, the valuation to-day being about three times that of 1880, and showing an increase of 37 per cent over that of 1890.

Section IV is an almost purely residential district taken up in a large measure by the German American citizens of Buffalo. The valuation of this section has largely increased and is at present over four times greater than in 1880, and 65 per cent greater than in 1890.

Section V is also a purely residential district of the best class found in Buffalo, containing on the one hand a few such streets as Delaware Avenue, with their costly and elegant houses, and elsewhere large areas in houses ranging in value from $5000, to $30,000. This district has always been quite well served by street railways, so that the room for improvement in assessed valuation has not been so great as in other sections; nevertheless, the valuation to-day is three times that of 1880, and 48 per cent greater than that of 1890.

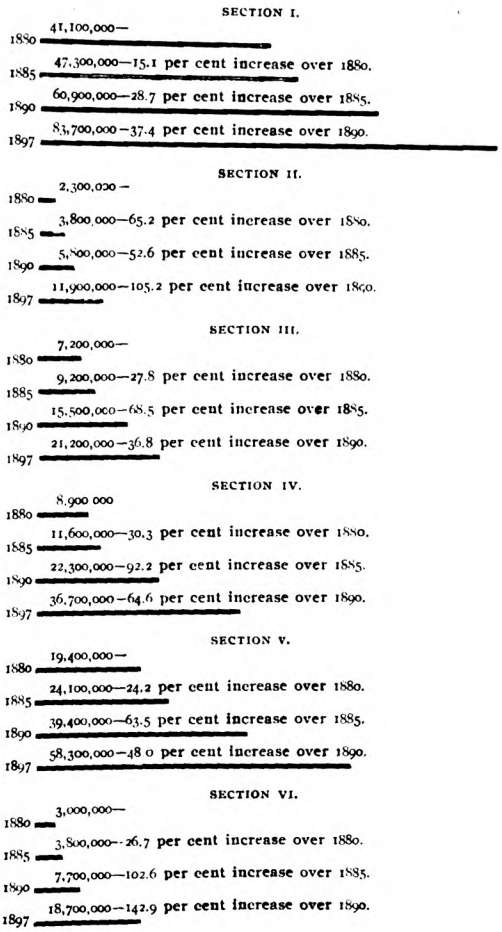
Section VI contains Buffalo's beautiful park, together with large areas of land until recently unoccupied. Here electric railway facilities have done more than in any other section to improve real estate values, and it is seen that the valuation in 1897 is over six times that of 1880, and 143 per cent greater than in 1890.

Summarizing the results in all these sections forming the entire city area of Buffalo, it will be seen that no section has failed to show a substantial increase in assessed valuations during any five year period since the old horse railway days; the business section has increased less in value than the others, and the outlying and comparatively unsettled sections have shown the largest proportional increase.

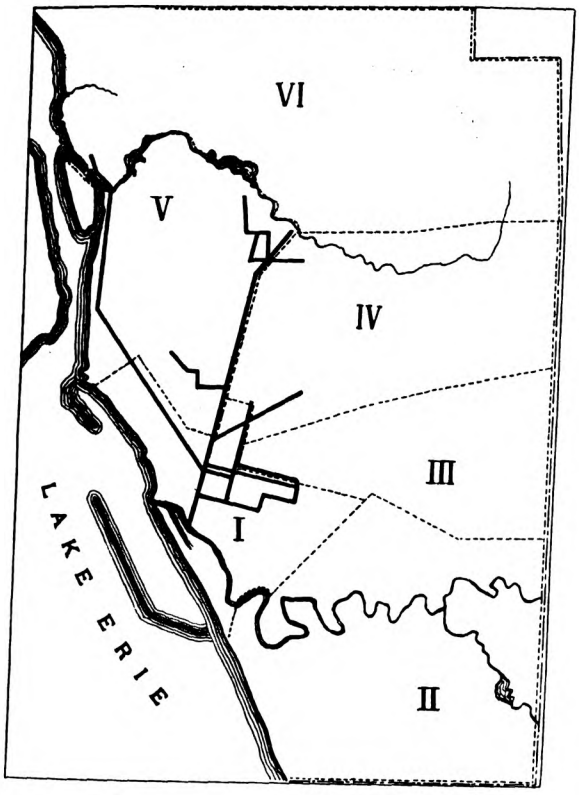
The Buffalo Railway system, especially in its operating features, is a high example of a modern city road, as is evinced by the fact that during the year ending June 30, 1896, the cost of power per car mile was .0078 cents, less than that of any other electric line in New York State reporting to the State Board of Railroad Commissioners. As the station and some parts of the line were built in the early days of electric railroading, the company does not enjoy the full benefits which modern engineering knowledge has made possible, but all of its recent construction has been of the most approved and modern type.

The only other company operating an entirely inde-

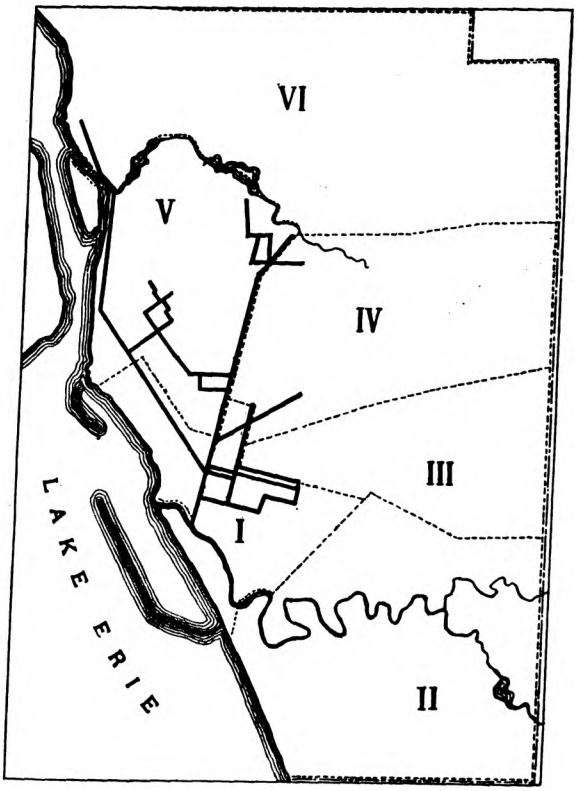
REAL ESTATE VALUATIONS IN BUFFALO, BY SECTIONS, SHOWING PER CENT INCREASE.



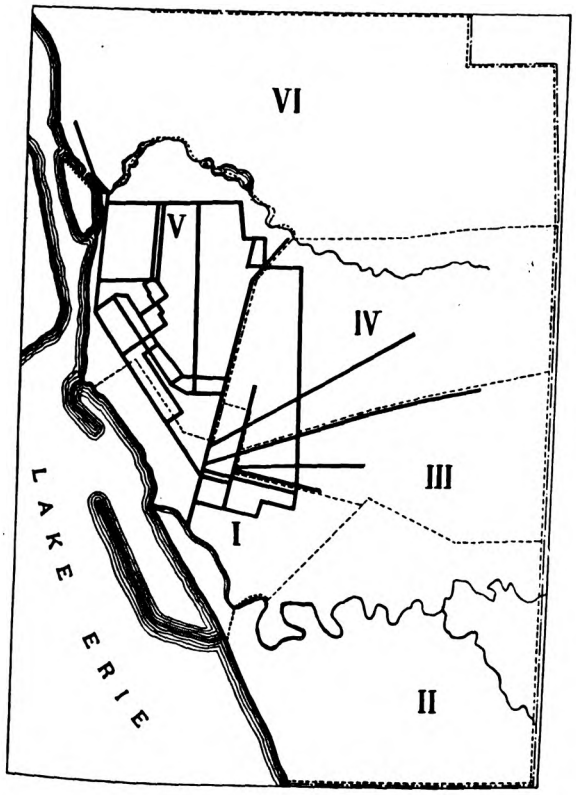
Buffalo Railway System in 1880.



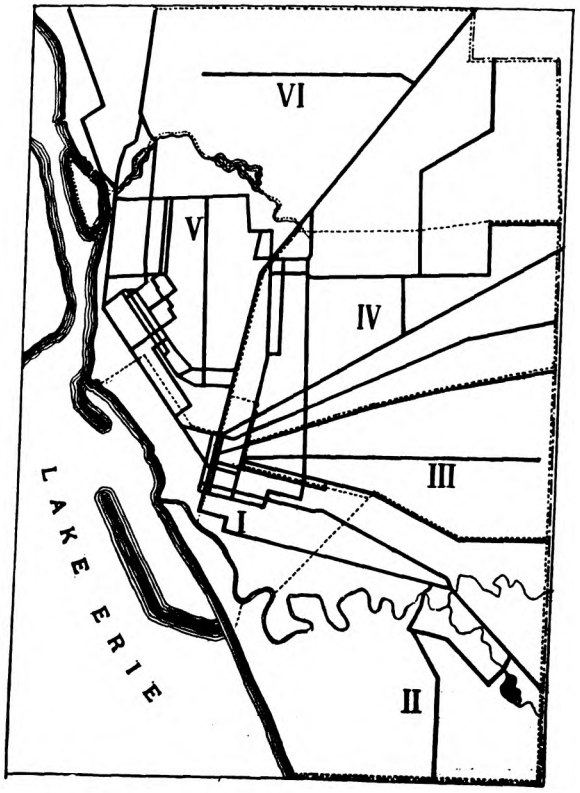
Buffalo Railway System in 1885.



Buffalo Railway System in 1890.



Buffalo Railway System in 1897.



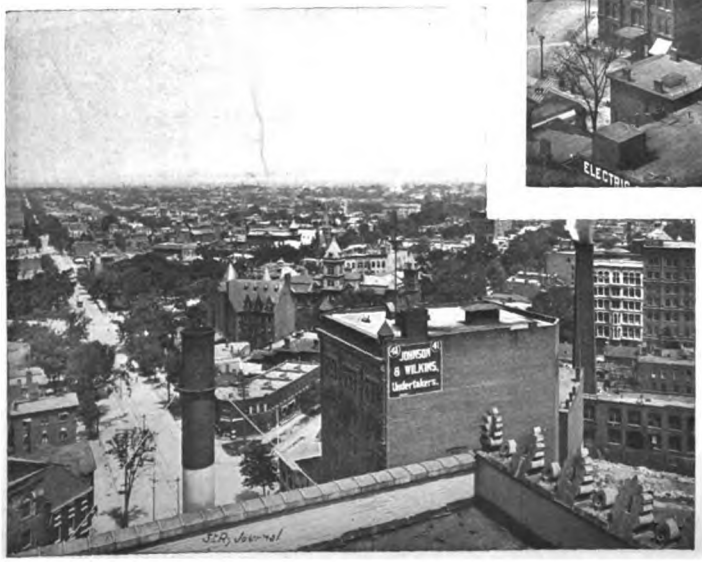
DIAGRAMS SHOWING GROWTH OF BUFFALO STREET RAILWAY SYSTEM.

pendent system in the city of Buffalo is the Buffalo Traction Company, whose lines were to have been put in operation the first part of October. This company is a recent

MAIN STREET DURING G. A. R. CELEBRATION.

organization of local capitalists and has received a franchise for an extensive system in Buffalo, embracing over 66 miles of street, although at present only about 15 miles of track have been built. The streets covered by its franchise are not so valuable from a traffic standpoint as those of the Buffalo Railway Company, whose lines already occupy the chief radiating avenues and streets.

A good instance of the carrying possibilities of the Buffalo Railway Company's system was shown during the convention in that city, during August last, of the Grand Army of the Republic. At that time it was estimated that 300,000 strangers visited the city, and during one day of the encampment the Buffalo Railway cars carried, without mishap or accident, more then twice the number of passengers than on any two consecutive days in its previous history. The traffic on several other days during encampment week averaged nearly as many passengers. The engraving on this page will give a general idea of the gala appearance of the city at that time.



VIEW OF RESIDENTIAL PORTION OF CITY FROM MORGAN BUILDING.

BUFFALO SUBURBAN LINES.

The fact that the Buffalo Railway Company has no suburban lines of its own has led to the establishment of a number of suburban lines reaching from Buffalo city limits to neighboring towns and villages. These are eight in number, and are owned by the following corporations:

Hamburg Railway Company.
Buffalo, Gardenville & Ebenezer Railway Company.
Buffalo, Bellevue & Lancaster Railway Company.
Buffalo & Williamsville Electric Railway Company.
Buffalo, North Main Street & Tonawanda Electric Railway Company.
Buffalo, Kenmore & Tonawanda Electric Railroad Company.
Buffalo, Tonawanda & Niagara Falls Electric Railroad Company.
Buffalo & Niagara Falls Electric Railway Company.

Of the lines owned by these companies that of the latter is the most extensive and important.

Taking these lines up in the order mentioned, the

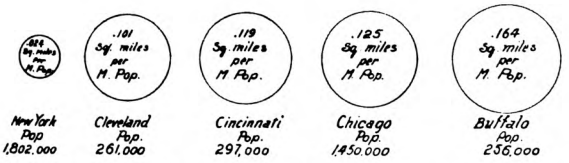
VIEW OF HARBOR FROM GUARANTY BUILDING.

Hamburg Railway is a 2½ mile single track line extending south from the city line of Buffalo to Blasdell. It has been recently built, having been put in operation Aug. 23, 1897, and it is the intention next year to extend it some 8 miles to Woodlawn Beach, an attractive shore resort on Lake Erie.

The Buffalo, Gardenville & Ebenezer Railway connects at the city line with the Seneca Street branch of the Buffalo Railway Company, and extends east to Gardenville, then south through Ebenezer to Lyon's Grove, a popular private outing resort on Cazenovia Creek. The line, which has 4⅔ miles of single track, was built mainly to give means of transportation to a territory hitherto in-

accessible except by infrequent steam railroad train service. It is operated partly by steam power and partly by water power.

The Buffalo, Bellevue & Lancaster Railway starts at the city line and the terminus of the Broadway branch of the Buffalo Railway Company, and immediately strikes off over private right of way easterly, crosssing the Delaware, Lackawanna & Western, Erie and Lehigh Valley Railroads toward Bellevue. This is a little village which has grown up around the power station and car houses of the company and the manufacturing plant of the National Radiator Manufacturing Company. Here is established, in a bend of the Cayuga River, the company's park, "Bellevue", and east of this river, which is crossed by the railway, lies "Railway Grove," also the company's property. One mile east of Bellevue the road branches, one side continuing through Depew and the other turning south through Woodlawn into the south side of Lancaster. Depew is a manufacturing town of 2800 inhabitants and has been recently built, containing in 1893 only 100 people. It has been made the site of the New York Central Railroad shops and locomotive works, and also contains a number of other factories including those of the Union Car



DIAGRAMS SHOWING RELATIVE AREA PER 1000 POPULATION IN BUFFALO AND OTHER CITIES.

Company, Gould Coupler Company, Buffalo Forge Works, National Car Wheel Company, Buffalo Brass Works and others. The northern line runs from Depew through Lancaster to the north and connects with the southern branch in the center of that village. Lancaster is also a manufacturing town and contains 3800 inhabitants. In addition to the two parks mentioned, there are two others on the line of the railway, and several others proposed. The cars make a speed of 25 miles per hour between stops on the company's own right of way, and by a traffic arrangement with the Buffalo Railway Company run into the center of the city. Since February, 1894, the company has also carried the mail between Buffalo and Bellevue, and Lancaster and Bellevue, at a profit to the company. The line has a length of 13 miles of main track and 2 miles of second track and sidings.

The Buffalo & Williamsville Electric Railway extends a distance of 4½ miles from the north end of Main Street, Buffalo, to Williamsville, and was put in operation Apr. 5, 1893. The majority of the stock is owned by residents of Williamsville, which is a small town with a few manufactures and a considerable agricultural and residential community.

The Buffalo, North Main Street & Tonawanda Electric Railway has its southern terminus near the northern end of the Main Street line of the Buffalo Railway Company, and extends to Tonawanda, a distance of 6 miles. The line was built several years ago during a period of inflated land values. Although the only line from Tonawanda connecting with Main Street, Buffalo, probably the most desirable line in that city from a traffic standpoint, the line has not been a profitable one. Important improvements in roadbed and rolling stock are now being projected by the owners, however, by which it is hoped the larger part of the valuable traffic between Tonawanda and Buffalo will be secured.

SOLDIERS' MONUMENT AND BUFFALO LIBRARY.

The Buffalo, Kenmore & Tonawanda Electric Railroad is another line built in the early days of electric railroading, and connects at the Buffalo city line with the Delaware Avenue line of the Buffalo Railway Company. It was also built during the boom times and its apparatus is not now up to the standard of modern construction. The property has recently been acquired by the Buffalo Traction Company, so that the outlook is favorable towards its reconstruction and improvement. With the Elmwood Avenue & Tonawanda Electric Railway, which it operates, it has a mileage, all single track, of 9 miles.

The Buffalo, Tonawanda & Niagara Falls Electric Railroad, the third line connecting Tonawanda and Buffalo,

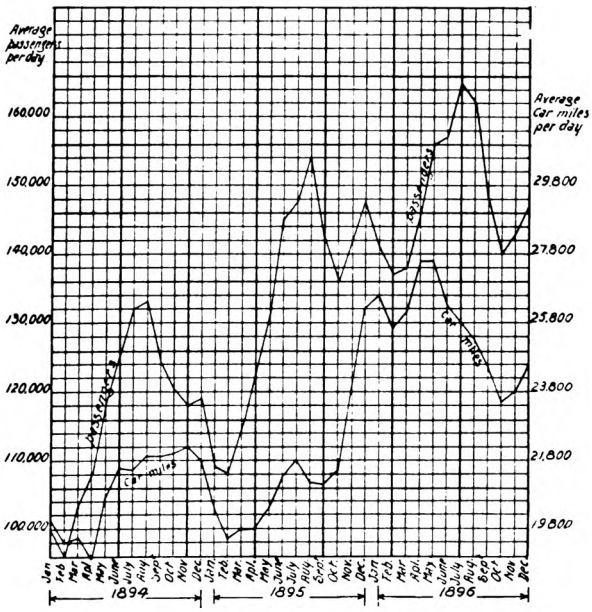
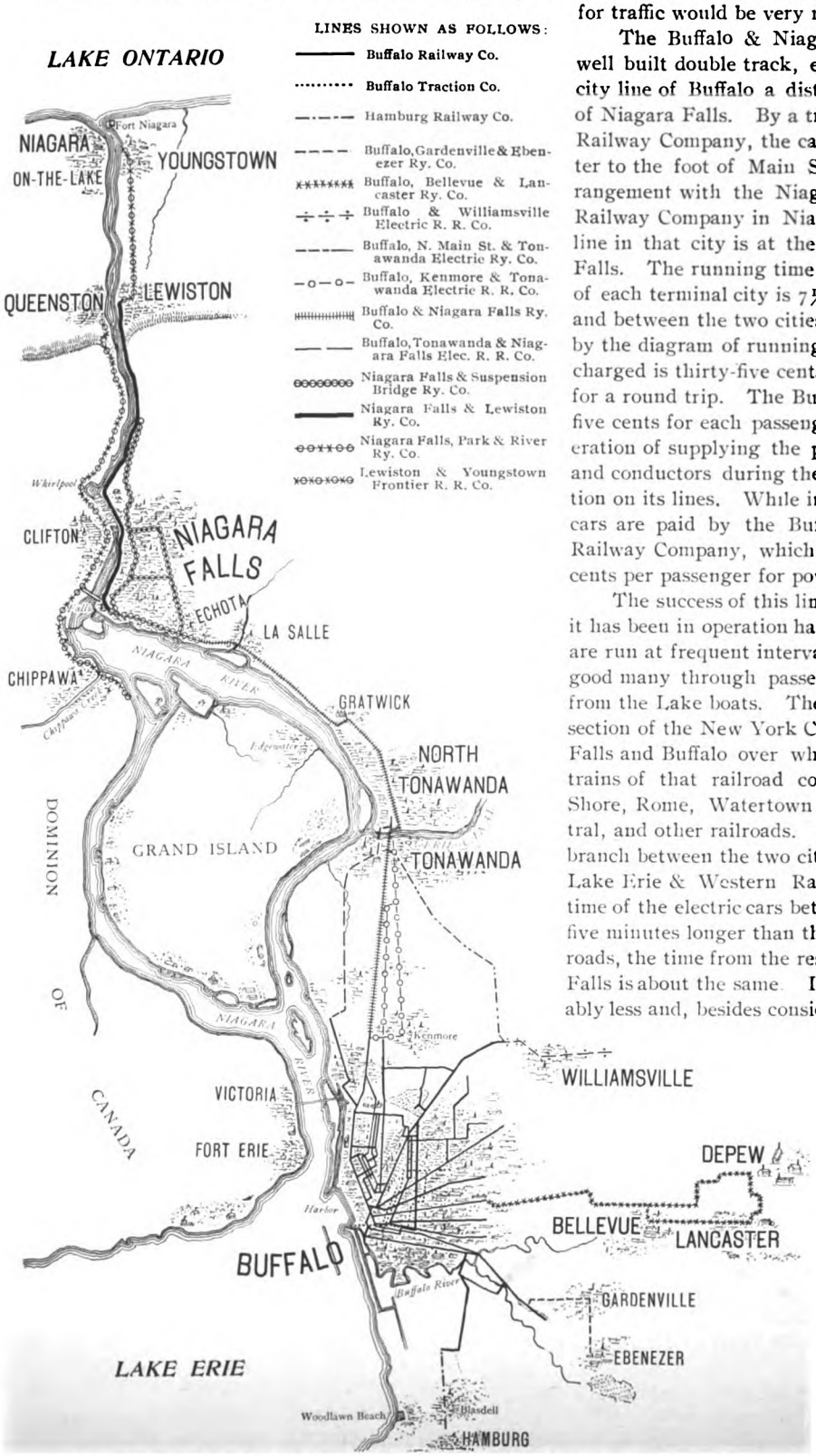


DIAGRAM OF PASSENGERS CARRIED AND CAR MILES RUN—BUFFALO RAILWAY SYSTEM.

connects at the latter city with the Niagara Street line of the Buffalo Railway Company. This line was a consolidation of the Tonawanda Street Railway Company and the Tonawanda Electric Railway Company, and was originally

projected to reach to Niagara Falls, and had this been done, the company would have secured a considerable part of the through traffic which, of course, it now misses. The roadbed and station are somewhat primitive in character, but the cars are comparatively modern in type and in good condition. It is stated that the owners project the extension of the line to Lewiston, in which case the opportunity for traffic would be very much improved.



MAP OF THE NIAGARA RIVER REGION, SHOWING ELECTRIC RAILWAY LINES.

The Buffalo & Niagara Falls Electric Railway is a well built double track, electric line extending from the city line of Buffalo a distance of 17 miles to the city line of Niagara Falls. By a traffic agreement with the Buffalo Railway Company, the cars run over the tracks of the latter to the foot of Main Street in Buffalo, and by an arrangement with the Niagara Falls & Suspension Bridge Railway Company in Niagara Falls, the terminus of the line in that city is at the State Reservation close to the Falls. The running time of the cars within the city limits of each terminal city is 7½ miles an hour including stops, and between the two cities is 20 miles an hour, as shown by the diagram of running speeds on page 593. The fare charged is thirty-five cents for a single trip, or fifty cents for a round trip. The Buffalo Railway Company receives five cents for each passenger carried on its lines in consideration of supplying the power and paying the motormen and conductors during the time while the car is in operation on its lines. While in Niagara Falls the crews of the cars are paid by the Buffalo & Niagara Falls Electric Railway Company, which pays the local company three cents per passenger for power and the use of its tracks.

The success of this line during the two years in which it has been in operation has been large. Combination cars are run at frequent intervals, and the company receives a good many through passengers from steam railroads and from the Lake boats. The line parallels a double track section of the New York Central Railroad between Niagara Falls and Buffalo over which run the through and local trains of that railroad company, as well as of the West Shore, Rome, Watertown & Ogdensburg, Michigan Central, and other railroads. It also parallels a single track branch between the two cities belonging to the New York, Lake Erie & Western Railroad. Although the running time of the electric cars between terminals is about thirty-five minutes longer than the express trains on the steam roads, the time from the residence district of Buffalo to the Falls is about the same. In addition, the fare is considerably less and, besides considerable through traffic, the line carries a great many local passengers.

TONAWANDA

This place, which lies midway between Buffalo and Niagara Falls, is divided into two districts by the Erie Canal, North Tonawanda and Tonawanda, each of which maintains a distinct municipal government. It is said to be the second greatest lumber market in the world. Its manufacturing interests are also important and include those of iron, canal boat supplies, agricultural instruments and carrousels, while the towns are rapidly growing in population, having increased from 1400 in 1880, to about 18,000 at present. The district is

being rapidly built up between Tonawanda and Buffalo with which the former place will probably ultimately be united. The terminus of the Erie Canal is in Tonawanda.

The only place of importance between Tonawanda and Niagara Falls is La Salle, 17 miles from Buffalo. This town possesses an historical interest from the fact that it was at this place that the early French explorer, Robert

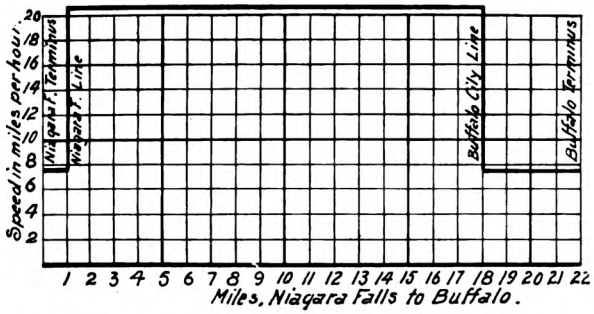


DIAGRAM SHOWING CAR SPEEDS—BUFFALO & NIAGARA FALLS RAILWAY.

13 PER CENT GRADE IN CUT—NIAGARA FALLS & SUSPENSION BRIDGE RAILWAY.

De La Salle built, in 1679, the first boat made by a white man that sailed on the Lakes. The town is the center

HYDRAULIC POWER STATION—NIAGARA FALLS POWER CO.

of a rich fruit bearing region and close to it in the Niagara River, lies Cayuga Island, the site selected by the Pan-American Exposition Company for its exposition in 1899.

· · NIAGARA · FALLS · ·

This spot has been an object of interest and admiration to the civilized world ever since the announcement of its discovery by French explorers early in the sixteenth

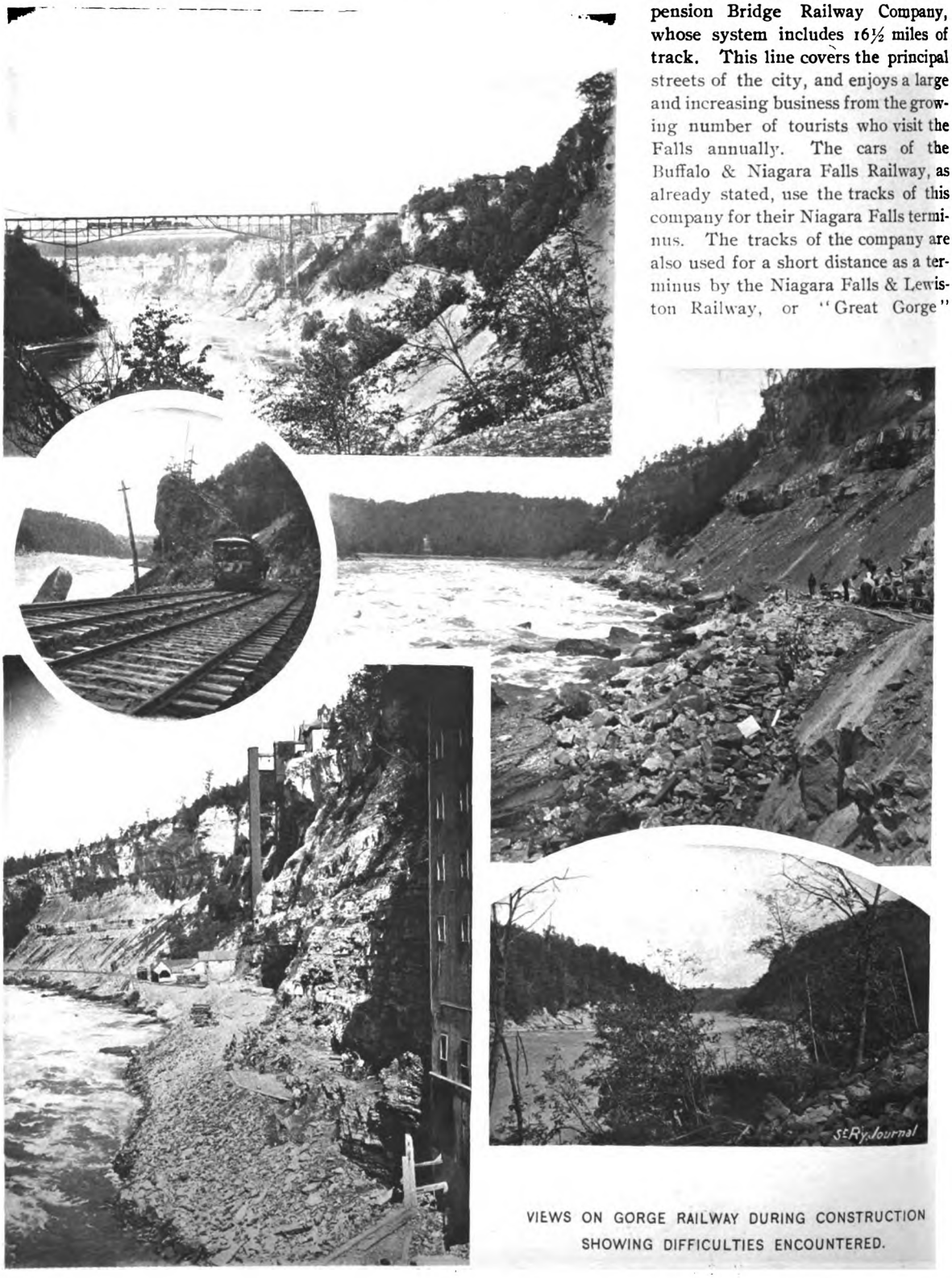
FORT NIAGARA, ON LAKE ONTARIO.

century. It is annually visited by thousands of sightseers from all parts of the world who have found an inexpressible charm and grandeur in its many varying aspects in summer and winter. In 1883, the Legislature of the State of New York passed an act to authorize the selection of a State Reservation in the village of Niagara Falls to preserve the scenery at the Falls, and in 1885 an act to provide for the payment of awards for the land selected. The Reservation comprises a tract of 107 acres, including Goat Island and Prospect Point, the main places of vantage on the American side, and this insures perpetual immunity against encroachment upon the points of greatest interest to visitors. In 1885, the Legislature of the Province of Ontario, Canada, passed an act providing for the appointment of commissioners to select a park on the Canadian side, and Queen Victoria's Niagara Falls Park, which covers an area of 154 acres, extending along the Canadian side of the Falls, was opened in 1888.

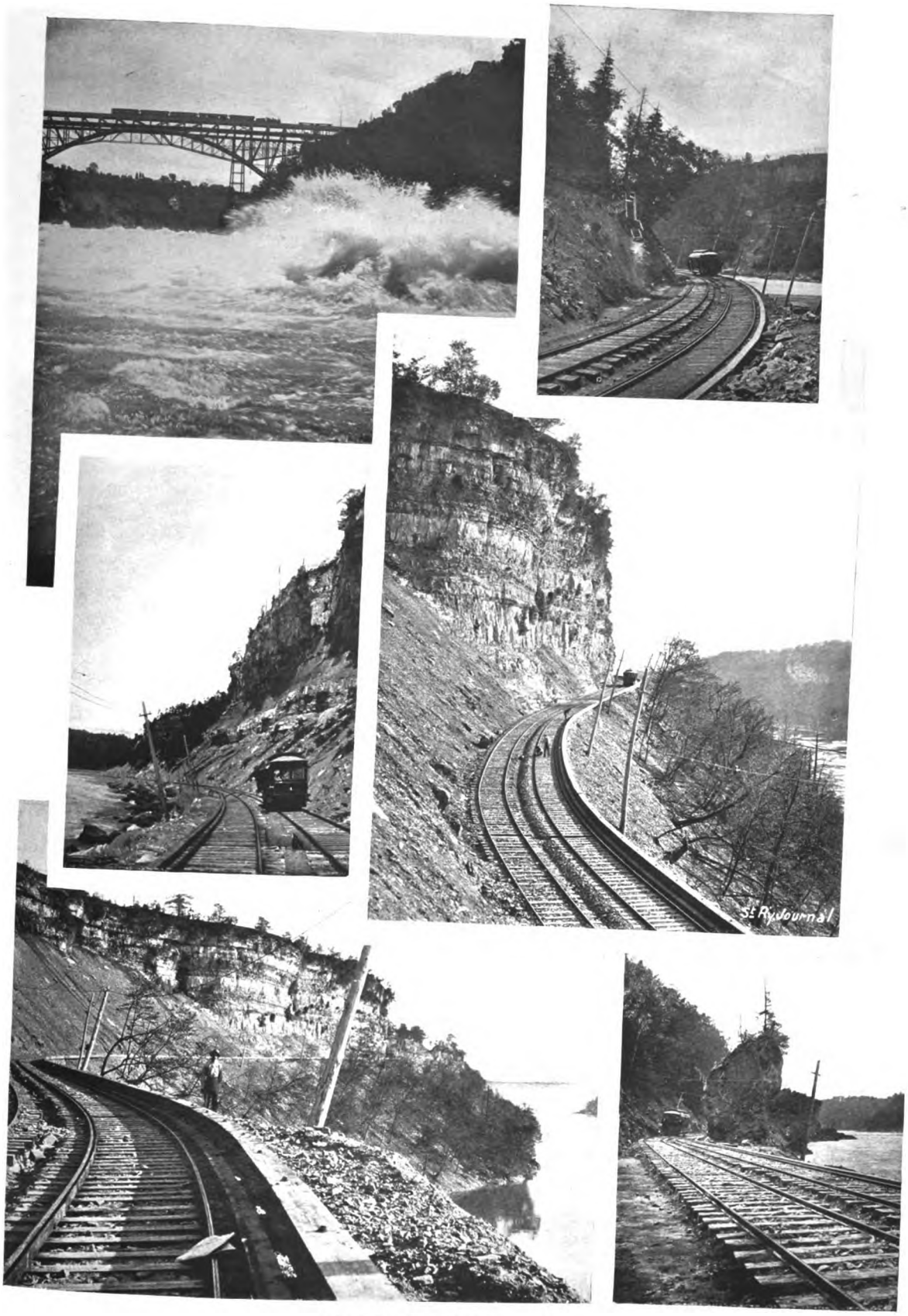
Up to within about ten years ago the extortionate prices charged sightseers for transportation to the interesting points about Niagara Falls were famous. The opening of the State Park and establishment under the authority of the State Commissioners of a cheap and well regulated system of stages at the points included in the State Reservation did

considerable to mitigate the evil. During the last five years, however, the other points of scenic interest have been made most accessible by the establishment of electric railways, so that it is now possible for visitors to the Falls to visit all the points of interest for a reasonable charge, and in a much more satisfactory way than ever before.

The electric railway system in Niagara Falls itself is operated by the Niagara Falls & Suspension Bridge Railway Company, whose system includes 16½ miles of track. This line covers the principal streets of the city, and enjoys a large and increasing business from the growing number of tourists who visit the Falls annually. The cars of the Buffalo & Niagara Falls Railway, as already stated, use the tracks of this company for their Niagara Falls terminus. The tracks of the company are also used for a short distance as a terminus by the Niagara Falls & Lewiston Railway, or "Great Gorge" route. This line, undoubtedly the greatest scenic electric railway in the world, extends the entire length of the



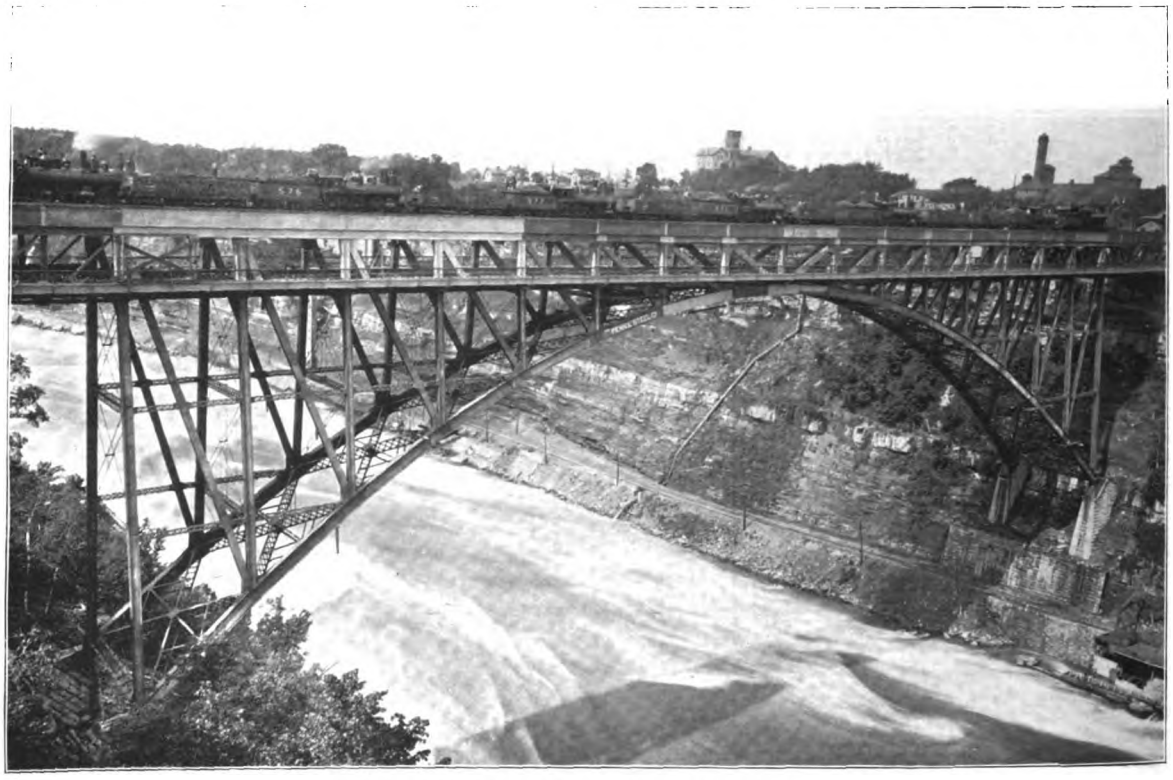
VIEWS ON GORGE RAILWAY DURING CONSTRUCTION SHOWING DIFFICULTIES ENCOUNTERED.



VIEWS ON THE GORGE RAILWAY.

Niagara River Gorge, on the American side for the most of the way within 20 or 30 ft. of the river, and is double tracked throughout. No better way to see the whirlpool and lower rapids which exist in the Niagara River can be imagined than by a trip over this line, and the number of passengers carried is enormous.

The engineering difficulties in the construction of this line were great, and it is undoubtedly the most expensive and difficult piece of surface electric railway construction which has ever been attempted. The line starts from the Tower Hotel opposite the State Reservation in the village of Niagara Falls and descends through a deep cut under the New York Central tracks to the face of the Niagara River canyon below the Falls which it descends until close to the river's edge.



SPAN GIRDER BRIDGE ACROSS NIAGARA RIVER.

The line is a little over 7 miles in length and consists of a series of grades and curves, there being only 700 ft. of level track. The steepest grade is 9 per cent. The construction was begun at Lewiston, Apr. 11, 1895, and completed to the Buttery elevator in seventy-five days, when operation was commenced. The cost of construction and equipment was $500,000, and the right of way, owing to the necessity of purchasing the properties of the elevators at the whirlpool, lower rapids and other points, $530,000. In spite of the expense of construction, the company showed a surplus of earnings from July, 1895, to January, 1897, one and one-half years, $85,000. From January, 1897, to July, 1897, there has been a net gain compared with the same months of the previous year of $13,000.

Across the river from the Niagara Falls & Lewiston Railway, lies the system of the Niagara Falls Park & River Railway, a Canadian corporation. This line, which is doubled tracked, skirts the edge of the Canadian bank from Queenston to Chippawa, a distance of 13½ miles, and is largely patronized by excursionists on account of the beautiful views which it affords.

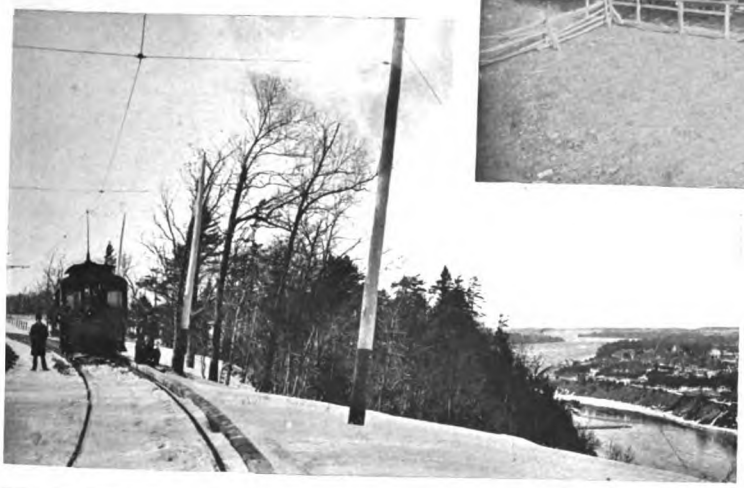
Outside of the railways there are many points about Niagara Falls to attract the engineer. Of these, the two immense power plants are probably of the greatest interest. As is well known, the hydraulic power of Niagara Falls is made available in two ways. The latest power station, that of the Niagara Falls Power Company, is located at Echota, distant about a mile above the Falls. At this point a wheel pit, 18 ft. in width and 178 ft. in depth, has been sunk. The present length of the wheel pit is 140 ft., but it is intended ultimately to extend it to a length of about 400 ft. From the foot of this pit a tunnel through the solid rock, 6700 ft. in length, 21 ft. in height and 18 ft. 10 ins. in width, leading into the Niagara River below the Falls, was constructed. This tunnel has a capacity for acting as a tailrace for 100,000 h. p. The present equipment of the station is three units of 5000 h. p. each, but other units are being added to increase the capacity to 50,000 h. p. The difficulties of obtaining good insulation at the turbines necessitated the extension of the shafts the entire height of the penstock to the surface of the ground where the generators are installed. The generators themselves are of the two-phase type, with a frequency of 25 cycles per second and 2400 volts. Part of the electric power generated at this station is being used, as will be described, by the Buffalo Railway Company, the Buffalo & Niagara Falls Railway Company and the Niagara Falls & Suspension Bridge Electric Railway Company.

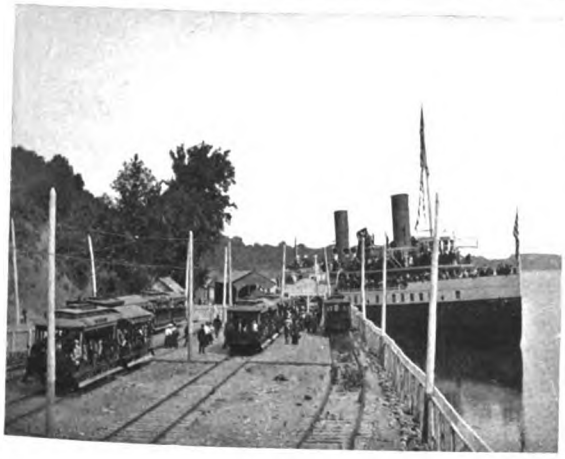
The Niagara Falls Hydraulic Power & Manufacturing Company is the owner of another power plant situated on the Niagara River a short distance below the Falls, the

water being conducted to the power house by a canal 4400 ft. in length, 100 ft. in width and 14 ft. in depth. The company is now furnishing about 11,000 h. p. to a number of users, including the "Gorge" railroad and the Lewiston & Youngstown Frontier Railroad, and when the work on its canal is completed will have a capacity of about 100,000 h. p. with the present depth of the canal.

The electric power station is located at the foot of the cliff and close to the river, and is a handsome stone building, 100 ft. wide and 120 ft. in length, but capable of extension to 180 ft. in length. It contains at present four horizontal Leffel wheels of 2000 h. p., each operating under a head of 196 ft. Each is connected to two 600 k. w. General Electric generators. One generating unit operates at 550 volts for railway and miscellaneous power service, the other three are used by the aluminum works and are of the alternating type 280 volts and 2000 amps. each. The present penstock is the largest in the world and is 8 ft. in diameter and is made of 1 in. steel tube. The penstock for the addition now being built is 11 ft. in diameter and composed of 1½ in. steel tubes. The company is now installing a 2500 h. p., double, horizontal wheel which will be directly connected to two generators. The Lombard governors are used on all the turbines in this station and are giving very good satisfaction.

The three bridges spanning the gorge below the Falls come next in interest from an engineering standpoint. The latest, the steel arch bridge, was recently completed by the Pennsylvania Steel Company for the Grand Trunk Railway, taking the place of the original railway suspension bridge.





VIEWS ON THE LINE OF THE NIAGARA FALLS, PARK & RIVER RAILWAY.

· · LEWISTON · ·

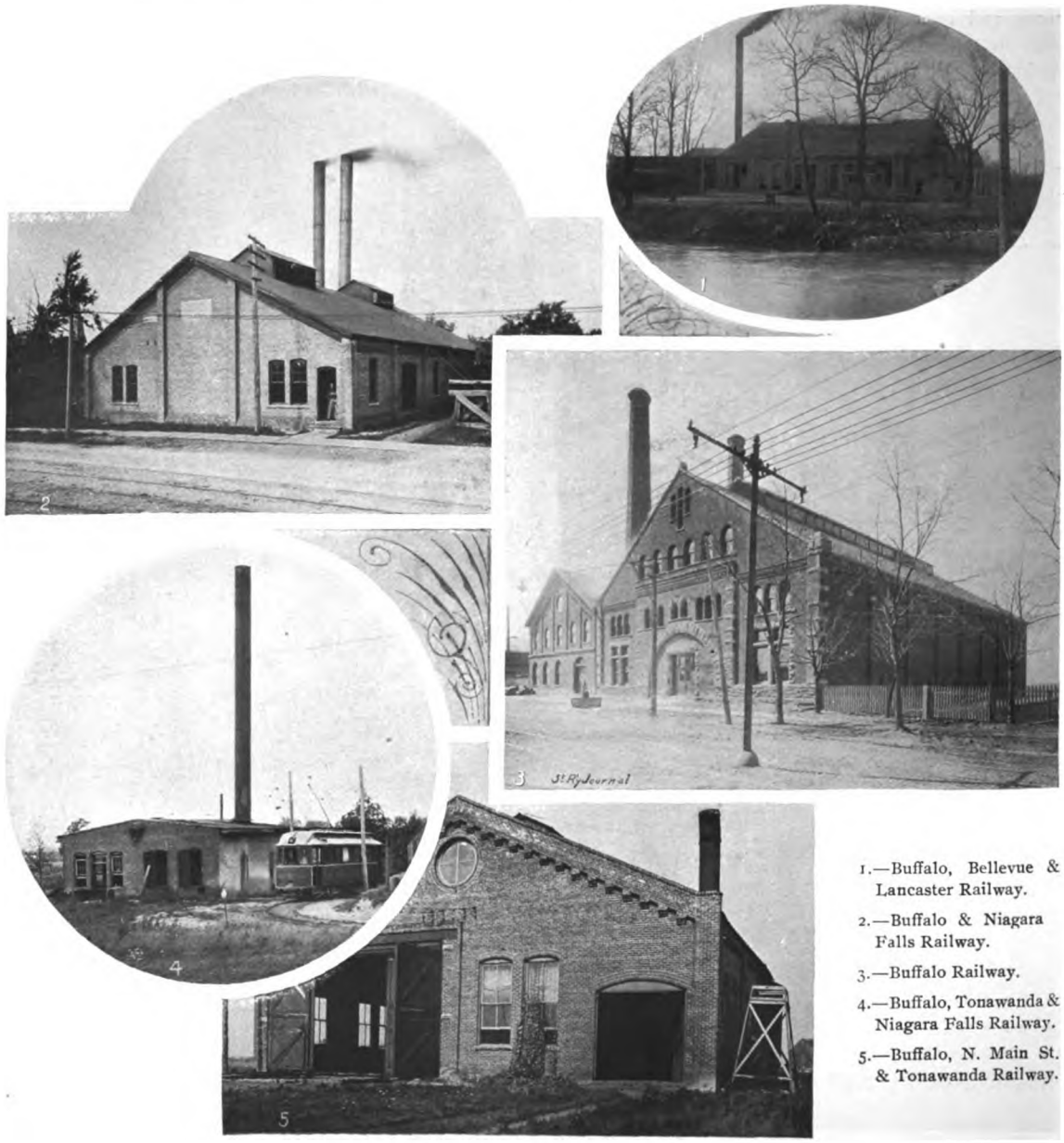
Lewiston stands at the head of navigation below Niagara Falls, with which it is connected by the Niagara Falls & Lewiston Railway, and the New York Central steam line. It is also connected by a boat line with Toronto across Lake Ontario, and by ferry with Queenston across the river on the Canadian side. It is a pretty old fashioned village with many historic associations. Among those who have been residents of the town are General Win-

field Scott, Daniel Webster, who held court here at one time, and James Fenimore Cooper who laid here the scene of one of his novels. The town is at the foot of the Niagara escarpment, and from this point to Lake Ontario, a distance of 7 miles, the region is low and fertile and noted for its production of fruit.

From Lewiston to Youngstown, which is at the mouth of the Niagara River, the only means of communication is furnished by the Lewiston & Youngstown Frontier Railroad, an electric railway built within a year. The road is an air line, and with scarcely a curve the cars speed by miles of apple, peach and pear orchards, until they reach Youngstown, an historic settlement and full of old Colonial architecture. This line does a considerable freight business in addition to its passenger business, employing for this purpose an electric locomotive.

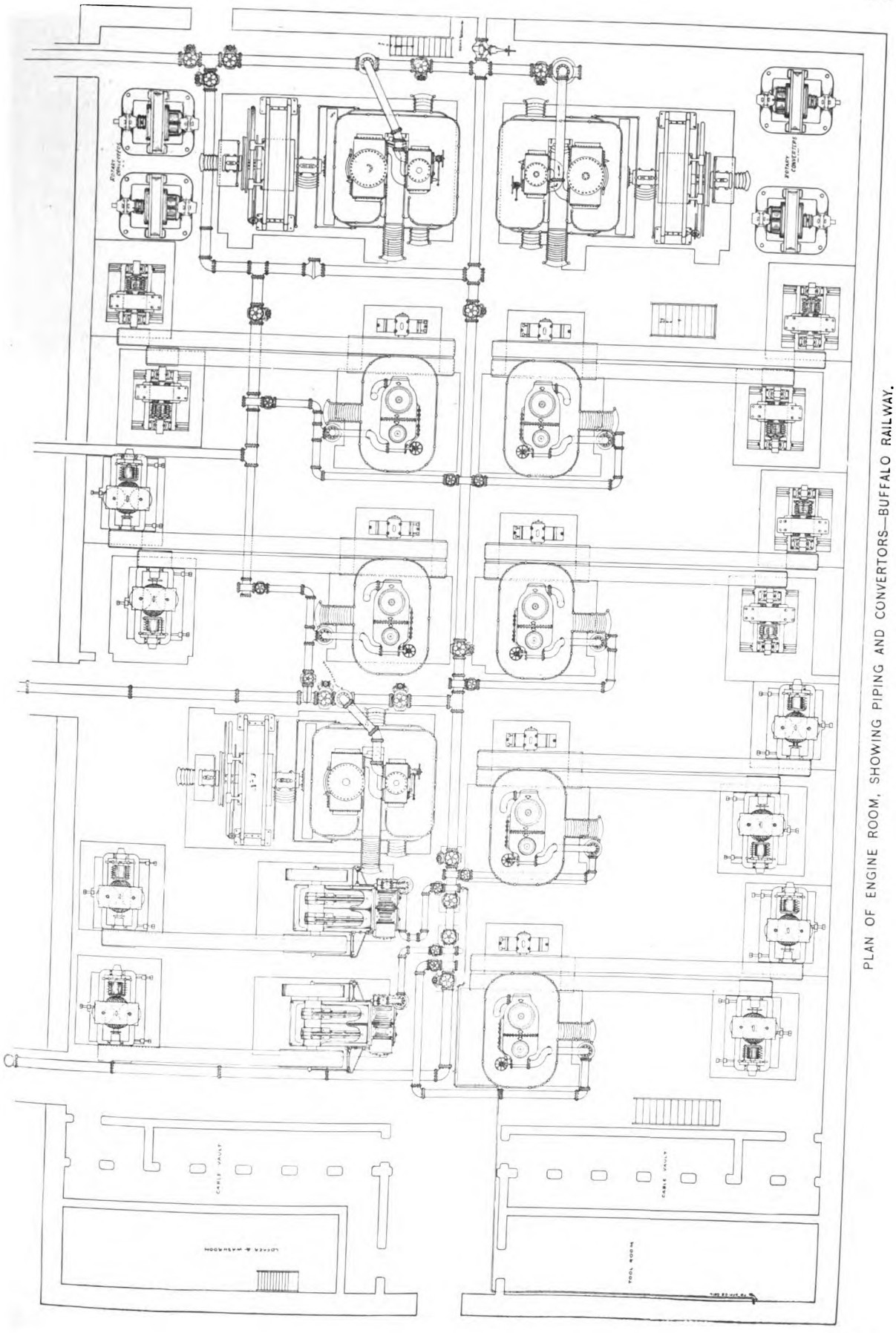
POWER . . STATIONS

The subject of the generation of electric power for railway service in Buffalo and Niagara Falls is extremely interesting from the fact that Niagara power is already used to a considerable extent and promises to meet with rapidly increased adoption. As yet, however, most of the lines outside of the city of Niagara Falls are generating power in their own stations. The exceptions are the Buffalo Railway Company which, in addition to its own steam plant, has now in use two 400 k. w. rotary converters, and is installing two others, and the Lewiston & Youngstown Frontier Railroad Company, which is taking all of its



1.—Buffalo, Bellevue & Lancaster Railway.
2.—Buffalo & Niagara Falls Railway.
3.—Buffalo Railway.
4.—Buffalo, Tonawanda & Niagara Falls Railway.
5.—Buffalo, N. Main St. & Tonawanda Railway.

GROUP OF STEAM POWER STATIONS.



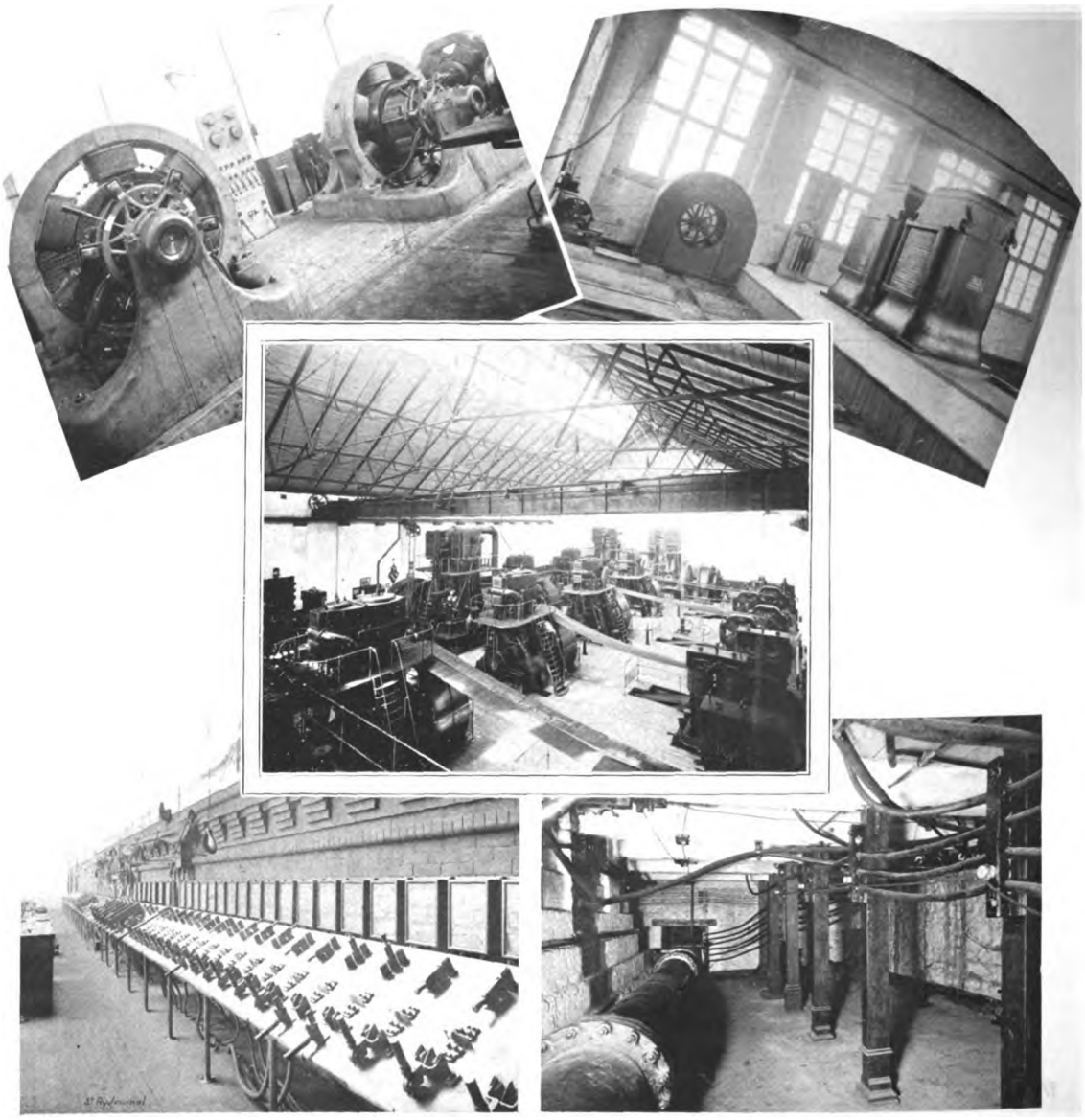
PLAN OF ENGINE ROOM, SHOWING PIPING AND CONVERTORS—BUFFALO RAILWAY.

power, about 200 h. p., from a direct current circuit from the power station of the Niagara Falls Hydraulic Power & Manufacturing Company, without the use of converters.

The systems in Niagara Falls using hydraulic power, are the Niagara Falls & Suspension Bridge Railway, and the Buffalo & Niagara Falls Electric Railway, from La Salle to the Falls, which take power from the Niagara Falls Power Company, and the Niagara Falls & Lewiston

ent arrangement had to be made on account of the long distance of transmission—26 miles.

In the exploitation of the power of the Falls in Buffalo, two companies are concerned, both offshoots of the Niagara Falls Power Company, which generates and disposes of the electric power. The Cataract Construction Company attends to all the construction work in connection with the power, and the Cataract Power & Conduit



VIEWS IN THE POWER STATION OF THE BUFFALO RAILWAY.

Railway which takes its power from the Niagara Falls Hydraulic Power & Manufacturing Company. The usual arrangement made with the power companies is for the latter to supply the current at the pressure required (500 to 550 volts) and for the railway companies to supply the necessary feeders to take the current away from the stations. The price charged for this service by the power companies is not announced, but is in the neighborhood of $25 per average horse power per year.

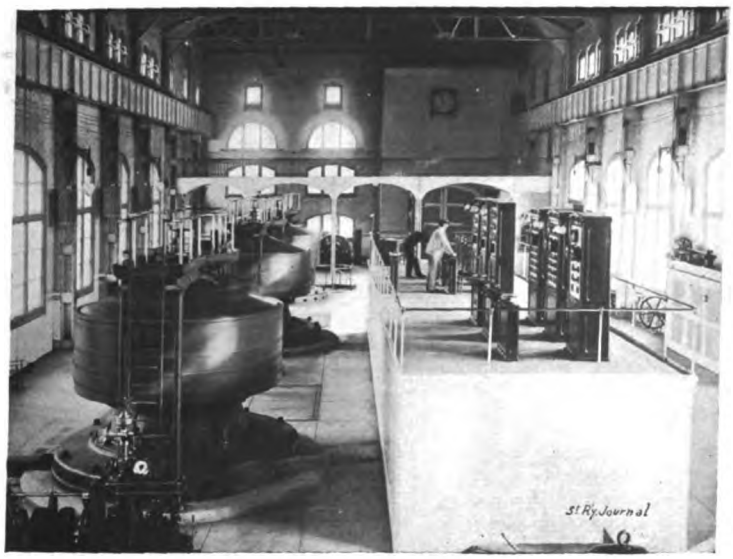
In the case of the Buffalo Railway Company, a differ-

Company, as stated, controls its distribution within the limits of Buffalo. The latter, in the case of the Buffalo Railway Company, supplies the transformers and appurtenances, but the rotary converters and appurtenances are the property of the Buffalo Railway Company. While the price paid for the power is not announced, it is safe to say, from the fact that new converters are being installed, that it is less than the cost of generating electricity by steam power in the same station.

Full particulars of the transmission circuit transform-

ers and rotary converters were described in the STREET RAILWAY JOURNAL for December, 1896, and July, 1897. The line between Niagara Falls and Buffalo, which was built by J. G. White & Company, uses the three phase system, with a pressure of 10,000 volts, converted at Buffalo by step-down transformers to 370 volts, at which pressure it is changed by the six pole rotary converters to continuous current of 500 volts for connection to the feeder lines of the railway company. The actual number of kilowatt hours consumed by the Buffalo Railway during May—July, 1897, is shown by the following table:

	May.	June.	July.
Kilowatt hours, steam . . .	696,749	677,937	771,699
Kilowatt hours, converters .	465,142	459,645	459,970
Total	1,161,891	1,137,582	1,231,669
Lbs. of coal burned.	3,610,000	3,134,000	3,368,000
" " " per steam k. w. h.	5.18	4.62	4.36



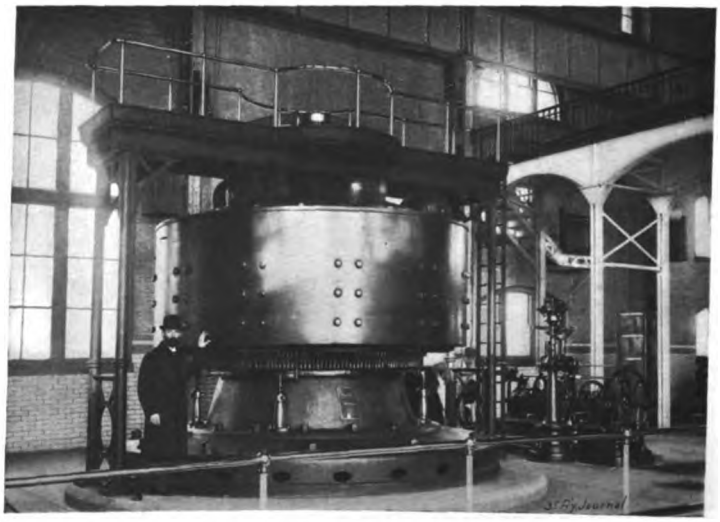
MAIN GENERATOR ROOM—NIAGARA FALLS POWER CO.

The power station of the Buffalo, Gardenville & Ebenezer Railway is supplied partly by water power and partly by steam power, and the Niagara Falls & Lewiston Railway is considering the proposition of installing its own hydraulic power station, taking power from the Niagara River at the Whirlpool. Twenty-five feet of head can be secured here in less than 3000 ft., and, of course, the volume of water is practically unlimited.

A view of a number of the steam power stations of the different roads is given on page 598. Most of them were built six or seven years ago, and all, with the exception of the Buffalo Railway Company's station, employ horizontal high speed engines connected by belts to generators. In this class of station the Ball engine is most popular, these engines being used in the stations of the Buffalo & Niagara Falls Railway, Buffalo, Bellevue & Lancaster Railway, Buffalo, North Main Street & Tonawanda Electric Railway and the Hamburg Railway Company. The Buffalo Railway Company has also two 300 h. p. Ball units in its power station. The Noye engines are used by the Buffalo, Tonawanda & Niagara Falls Electric Railroad, the Buffalo, Kenmore & Tonawanda Electric Railroad, the Buffalo & Williamsville Electric Railway and the Buffalo, Gardenville & Ebenezer Railway. The power station of the Buffalo Railway Company is equipped throughout, with the exception of the two 300 h. p. units already mentioned, with Lake Erie direct connected vertical engines. Of these the company has furnished three of 1250 h. p. with cylinder dimensions 20 ins. and 44 in. × 30 in. stroke each driving an 800 k. w. generator, and six of 600 h. p. with cylinder dimensions 17 ins. and 33½ in. × 28 in. stroke, each driving by belts two 200 k. w. generators. The vertical engines are reported to be giving good satisfaction, and one objection sometimes urged against their use—the difficulty of reaching the controlling throttle—has been avoided by the employment of an extension handle from the header valve reaching to near the floor. General Electric generators are used exclusively by all the companies.

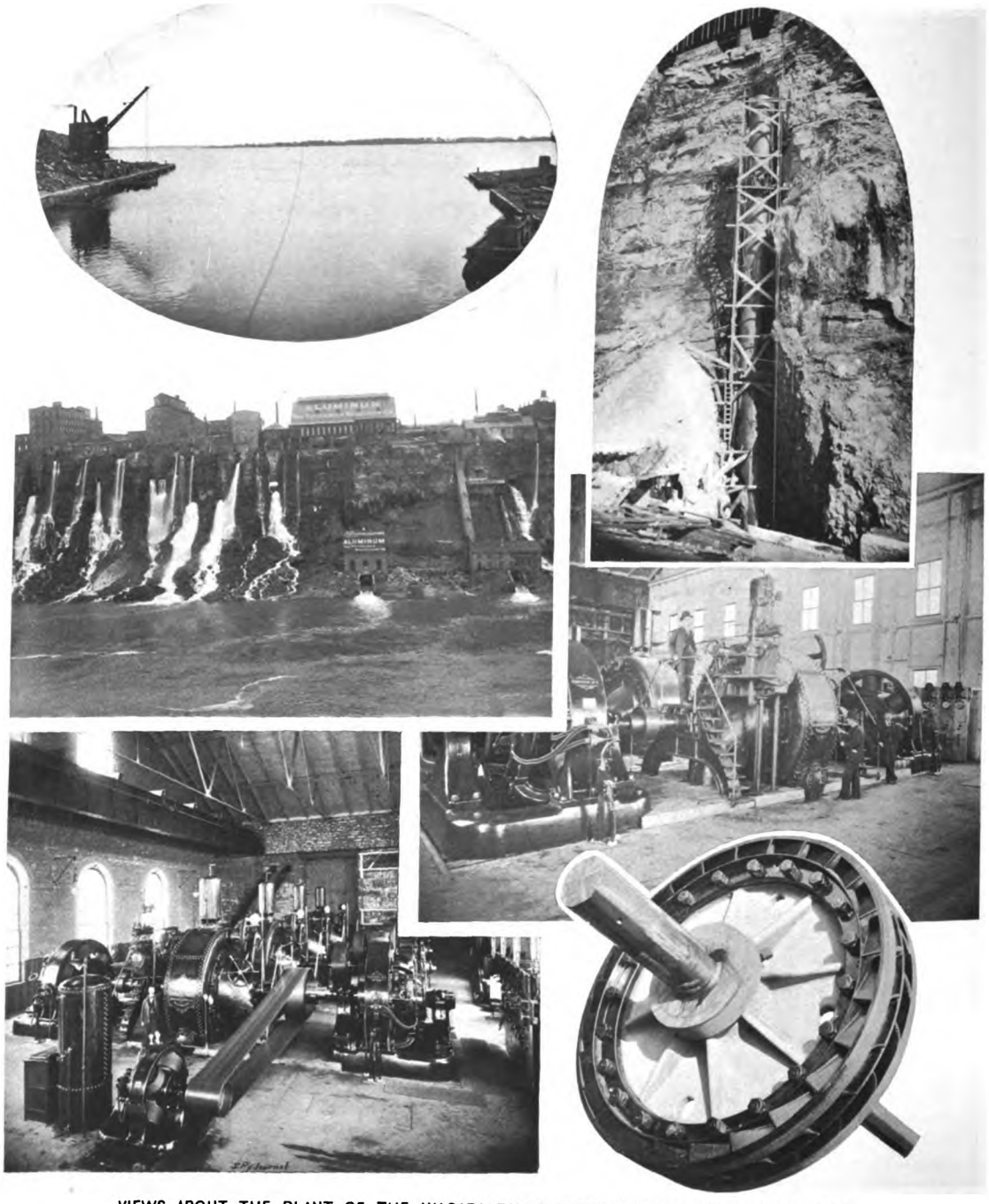
The power station of the Buffalo Railway Company is equipped throughout with Babcock & Wilcox boilers, with the exception of one unit of return tubular boilers. The boilers are fitted with Roney stokers supplied by Westinghouse, Church, Kerr & Company. The Buffalo, Bellevue & Lancaster Railway uses one battery of Babcock & Wilcox boilers. The other stations are all equipped with return tubular boilers.

Arrangements are made in the case of the largest stations for receiving the coal directly from the steam roads by means of spurs. The Buffalo Railway Company has a most complete coal handling plant by which the fuel is conveyed from a dump, into which the cars discharge the fuel, by an electrically operated bucket chain elevator to a storage room immediately in the rear of the power station, having a capacity of 2500 tons. From this point it is raised by a second bucket conveyor, also operated by an



5000 H. P. GENERATING UNIT—NIAGARA FALLS POWER CO.

electric motor, to the top of the boiler room, and thence by a mechanical belt to a hopper of five tons capacity. From this hopper the coal is drawn into a second hopper, of one ton capacity, mounted on wheels and running along elevated tracks in front of the boilers by means of electric



VIEWS ABOUT THE PLANT OF THE NIAGARA FALLS HYDRAULIC & MANUFACTURING CO.

power. This hopper dumps directly into the stoker hoppers. An ash conveyor carries the ashes to the rear of the station where they are dumped directly into cars and hauled away. Full particulars of this coal conveyor are given in the STREET RAILWAY JOURNAL of November, 1895.

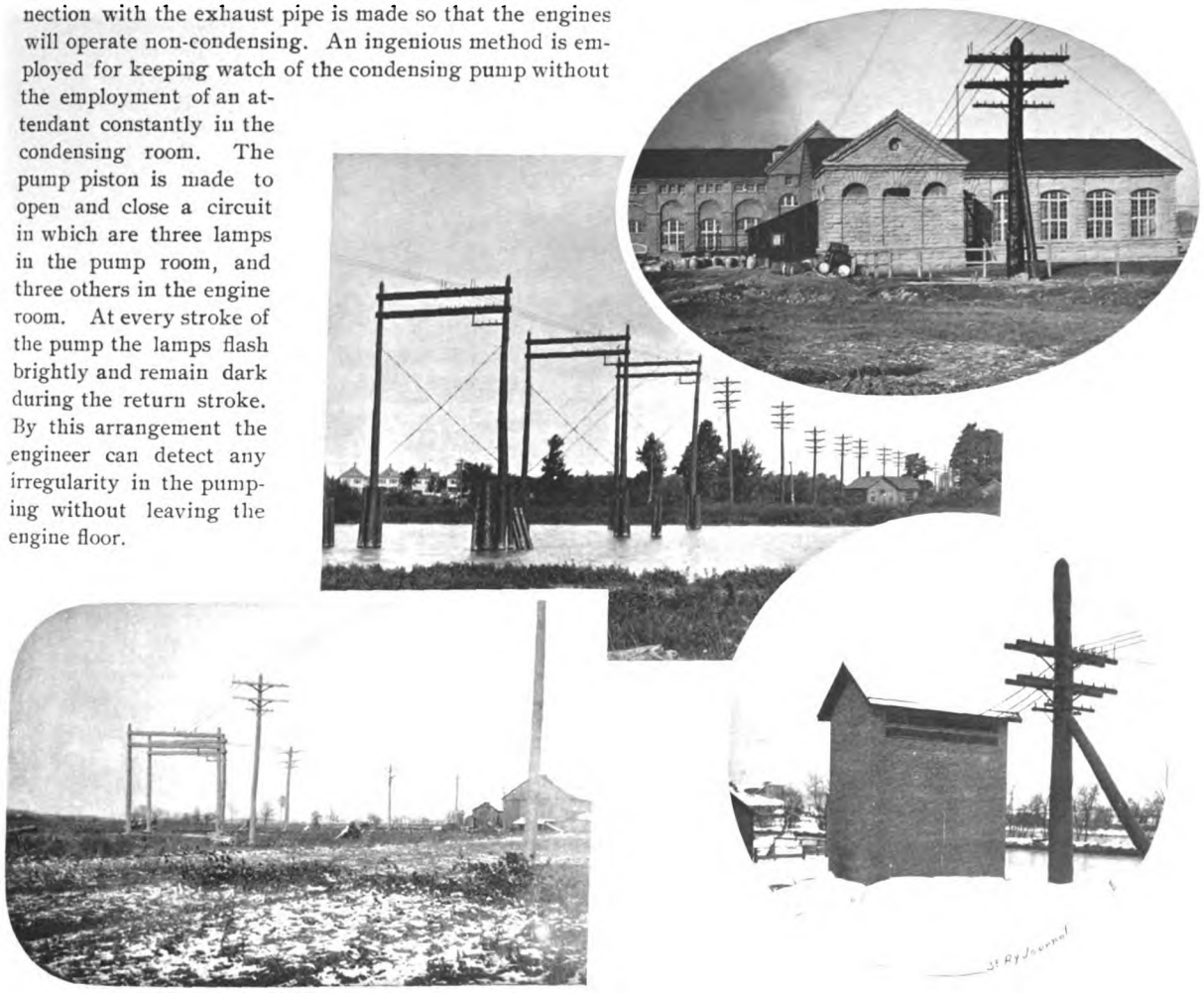
Among the miscellaneous appliances, the Buffalo Railway Company uses Snow pumps and Worthington condensers, Stratton and Cochrane separators, Goubert heaters; the Buffalo & Niagara Falls Railway, Worthington condensers, Snow and Buffalo pumps, and Phœnix heaters; the Buffalo, Bellevue & Lancaster Railway, Berryman and Canadian heaters, Snow pumps, no condensers; the Buffalo, North Main Street & Tonawanda Electric Railway, Snow pumps and Goubert heaters, no condensers or separators; the Buffalo, Kenmore & Tonawanda Electric Railroad, Barr pumps, Goubert heaters; the Buffalo, Gardenville & Ebenezer Railway, Worthington condensers, Worthington and Snow pumps, and Otis heaters; the

Buffalo & Williamsville, Smith-Vaile pumps and Wainwright heaters.

A complete ground plan of the engine room of the Buffalo Railway Company's power station is given on page 599. The station's condensers and pumps are located in a special room whose floor is 45 ft. below that of the engine room. The well is 10 ft. in diameter and 25 ft. deep, and the water for condensing is drawn from the Erie Canal, 200 ft. away. In case of any accident to the condensing apparatus, an automatic valve is arranged in the exhaust pipe so that as soon as the pressure in the exhaust main rises to 1½ lbs. above the atmospheric pressure, connection with the exhaust pipe is made so that the engines will operate non-condensing. An ingenious method is employed for keeping watch of the condensing pump without the employment of an attendant constantly in the condensing room. The pump piston is made to open and close a circuit in which are three lamps in the pump room, and three others in the engine room. At every stroke of the pump the lamps flash brightly and remain dark during the return stroke. By this arrangement the engineer can detect any irregularity in the pumping without leaving the engine floor.

TRACK CONSTRUCTION

The track of railways composing the system under discussion presents almost every conceivable variety in character possible, the Buffalo lines being a good example of modern city construction, the lines between Buffalo and Niagara Falls of interurban construction, and the Gorge road that of special construction made necessary by peculiar conditions.

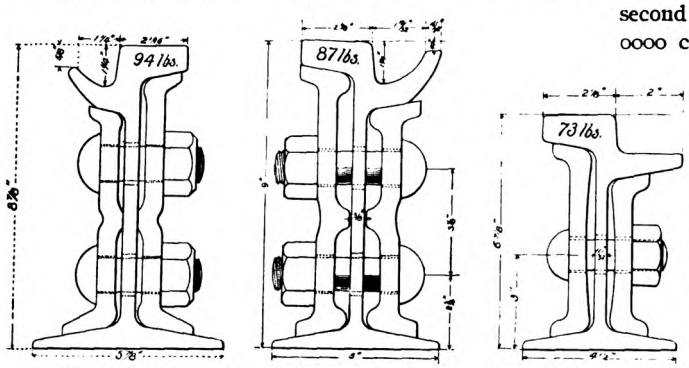


VIEWS OF THE ELECTRIC POWER TRANSMISSION LINE—NIAGARA FALLS TO BUFFALO.

The two rotary converters at present in use and which are of 850 k. w. each, are located in the northwestern corner of the power station and with their switches and all appliances occupy a space of only 24 ft. × 14 ft. In the corresponding space in the southwest corner of the building a duplicate equipment is now being installed. The transformers, which are three in number, are directly underneath the converters. The maintenance of these transformers at a temperature which would not be injurious to the insulation was an important problem and has been solved by artificially cooling them by means of a rotary blower driven by a 5 h. p. multipolar, direct current motor. The air is admitted to the interiors of the convertors and passes out through openings provided for it.

The standard track construction of the Buffalo Railway Company includes the use of a special 9 in. semi-grooved girder rail, weighing 94 lbs. to the yard, laid on yellow pine or white oak ties spaced 2½ ft. centers, with 32 in., twelve bolt angle plates. The bonds are of a special type invented by the master mechanic of the company, Robert Dunning, and are illustrated on page 604. They are attached to the base of the web. The standard special work is of steel, with hardened centers, and that in use was supplied by Wharton and Johnson. A number of manufacturers are represented in the track construction, the last order having been given to the Johnson Company. While most of the Buffalo Railway track is on ties, several miles have recently been laid on concrete stringers without

the use of ties. This construction has been used on streets paved with asphalt. The method employed is to excavate a longitudinal trench for each rail, 24 ins. wide at the top, 15 ins. wide at the bottom, and 17 ins. deep. The rails are laid along the line of route, then bolted together, bonded and tied together with tie rods, for which transverse trenches are made. The rails are then suspended over the trenches by special devices in the position in which they are to finally be, are lined and surfaced. The concrete, which consists of fine broken stone, sharp sand and Portland cement, is then tamped under the rails up to and over the base of the rails. The stone toothing is then put in on each side of the rails, set in concrete or rich mortar, and grouted. This construction is found to cost about $2000 a mile less than tie construction in streets already paved, and so far as the experience of the company has yet shown is quite as durable and satisfactory. The return circuit is very complete, and underground return feeders are extensively used.



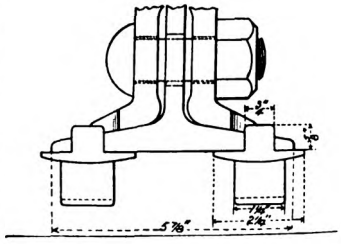
Buffalo Railway Co. Buffalo Traction Co. Buffalo & Niagara Falls Electric Railway Co.

SECTIONS OF RAILS IN USE.

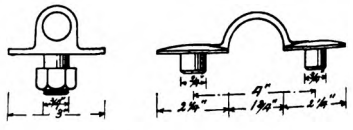
During 1891 and 1892, the Buffalo Railway Company installed about 12½ miles of feeder conduits. Each conduit contained from eight to twelve ducts. Two types of duct were used—wooden pulp pipe of the Indurated Fibre Company, and cement lined pipe of the Standard Underground Cable Company. The pipes are imbedded in concrete, grouted and terminate in manholes located about 400 ft. apart. All manholes drain into sewers. The feeders used are the best rubber covered cables of the General Electric Company. No extension of the original conduit construction has been made, although additional feeders have been drawn into some of the ducts, which were at first unused. The general manager of the company states that as compared with overhead feeders he much prefers the latter on account of the lower cost of maintenance.

The rails of the Buffalo Traction Company are laid on steel ties which rest on concrete foundations. Under each rail is a concrete stringer 6 ins. deep and 12 ins. wide which affords a continuous bearing for the rail throughout its length. Across these concrete stringers are rolled steel channel bars, 5 ft. 9 ins. long and about 7 ins. wide on top. They are laid flat side up, with the flanges resting on concrete and are spaced 10 ft. apart, center to center. The rail is held to these joints by forged steel brackets. After the track is laid and bolted to the ties the space between the top of the concrete stringer and the base of the rail is filled with a mortar composed of one part Portland cement, two parts sand and five parts stone chips put in place from one side and pushed under the rail with tamping bars until exposed about 4 ins. outside of rail base. This mortar is then shaped trough form on each side of rail and the trough is poured with Portland cement grout until the base of rail is covered. The concave side of channel ties are also poured full with this grout. The rails are grooved, 9 ins. high, and weigh 87 lbs. per yard. The curves have circular central portions with transition curves at both ends. The initial radius in plain curves is 300 ft., compounded every 3 ft. The inner rail only of each track is a guard rail. The rails and special work were supplied by the Pennsylvania Steel Company. The rail joints are 32 ins. long and have twelve 1 in. bolts. The rails are 60 ft. long. Each second pair of rails in each track are cross connected by No. 0000 copper bonds and in double track line the tracks are similarly cross connected not more than 250 ft. apart. At each joint are two No. 0000 short copper bonds fastened into the rail web under the angle plate. In about twenty-five different places along the lines are return cable taps of 500,000 c. m. cable connected to all the rails at that point and led in ducts designed to prevent electrolytic corrosion of the cable to the side of the street and there connected into an insulated overhead return cable. The return cable taps are connected to the rails with special bond terminals having not less than double the capacity of the cable. The overhead appliances are of the General Electric type. The trolley wire is No. 00 hard drawn copper. The span wires are ⅜ in. galvanized iron stranded.

The Buffalo & Niagara Falls Electric Railway Company uses throughout a 73 lb. 6⅞ in. girder rail of the type shown on this page. It was rolled by the Cambria Iron Company. The section was particularly designed for use on this road, the object sought being the greatest economy of material in the height decided upon with no more waste material in the tram than was absolutely necessary to provide a running surface for vehicles, as imposed by the municipal franchises. The rails are laid on white oak ties of standard steam railroad size, and spaced 24 in. centers. All track is laid on a 2 in. ring broken stone ballast. This on unpaved streets is laid for a width of 18 ft. and from within 3 ins. of the top of the rail to a depth of 6 ins. below the rail, making a total depth of 15 ins. well tamped. A top dressing is made of gravel. Throughout the greater part of its length the track ballast is drained by means of 6 in. to 8 in. tile pipes laid end to end, and connected with the sewer mains or other drains. They are laid in broken stone in the bottom of a trench midway between the two



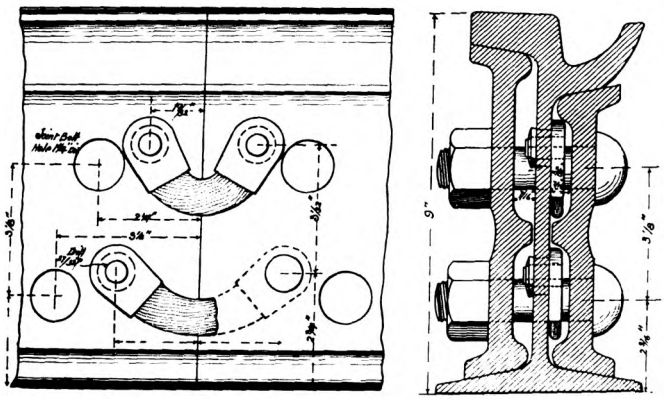
SECTION OF RAIL BASE WITH BONDS —BUFFALO RAILWAY.



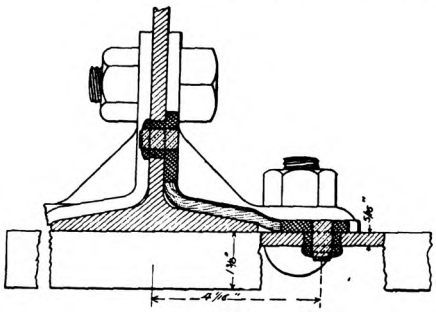
BOND—BUFFALO RAILWAY.

tracks and separated from the base of the track ballast by a layer of cinders.

The Buffalo, Bellevue & Lancaster Railway has also a stone ballasted track with from 45 lb. to 56 lb. T rail, and 1½ miles of 94 lb. girder rail. The ties are 6 in. × 8 in. × 8 ft., laid 2½ in. centers. One mile of track has been laid with opposite joints, but broken joints are considered preferable. The present joints break 8 ft. apart, but 15 ft. is considered more desirable. Chicago and Syracuse bonds are used; the latter are employed on recent work as they are located under the angle plates, and the company does not suffer from their loss through theft.



SECTION AND SIDE ELEVATION OF JOINT WITH BOND—BUFFALO TRACTION CO.

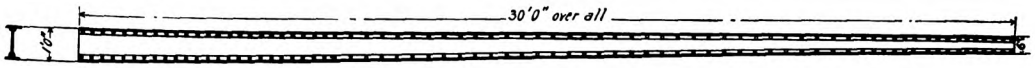


METHOD OF BONDING TO CROSS TIE—BUFFALO TRACTION CO.

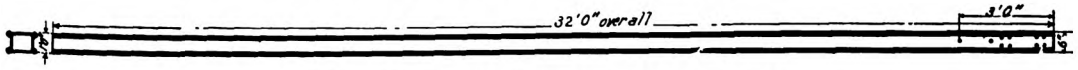
With the exception of the Buffalo & Niagara Falls Railway, all of the interurban lines use T rail in their suburban stretches, the weight running from 45 lb. to 60 lb. to the yard, and for the most part the track is unballasted.

The track construction of the Niagara Falls & Lewiston Railway is the most interesting from an engineering standpoint, on account of the immense amount of special problems presented during the descent from Prospect Park to the grade line established near the base of the Niagara Canyon, and the continuation of the line along the Gorge. In the construction of this road a path was first graded, following as nearly as possible a little above the proposed grade line. The material, of which the talus at the foot of the Gorge is composed, is loose rock accumulated by contributions from the cliff above, with only sufficient earth to fill the spaces between the stones. As it was impossible to determine accurately the quantity of material which would have to be removed, the contract for the track construction was let for 10 per cent of the labor employed, and as soon as this was done, from 600 to 1000 men were put to work at a number of different points along the route. The construction from the Buttery elevator to the city of Niagara Falls was much the most difficult and treacherous of any part of the work. The rock gangs were lowered with ropes from the top of the bank to the first ledge, which in most instances was 100 ft. above the grade line. Blasting operations were carried on mostly by hand, as it was difficult to get steam drills in position to work. Fortunately there was no difficulty in disposing of waste material, this all being thrown into the river without appearing in any way to disturb the same or in the slightest particular to change the form of the rapids below. The vertical cutting averaged nearly 100 ft., and the engineer estimates roughly that about 100,000 cu. yds. of rock were thrown into the Niagara River. At different points along the route a considerable amount of retaining wall had to be built, and at several points embankments had to be projected into the river.

The most difficult point of all was undoubtedly that near the foundation of the Grand Trunk steel arch bridge where the removal of the loose earth and stone was objected to by the bridge authorities, and two sustaining walls, ranging in height up to 27 ft., were constructed, one to keep the earth above the electric track from falling on it, and the other to prevent the earth from under the electric track from sliding into the river. The blasting here had to be carried on with a great deal of circumspection, and a series of holes was drilled back of each set of blast holes before any blast was fired. The track is carried under the bridge piers on a plate girder bridge composed of two spans 54 ft. and 72 ft. in length. The footings, of course, of the abutment and piers of this bridge are under water and are laid on bags of hydraulic cement placed between the boulders and rammed into the crevices. As a further precaution, rods of iron were drifted several feet into the rock and left standing to be built into the masonry. On the inner shore tie walls were built into the bank. There are also a number of trestles along the road. At several points the upper edge of the cliff overhangs the track, but the amount of this is not large and no accident or serious interruption to traffic has been occasioned by slides. Such events are always preceded by premonitory symp-



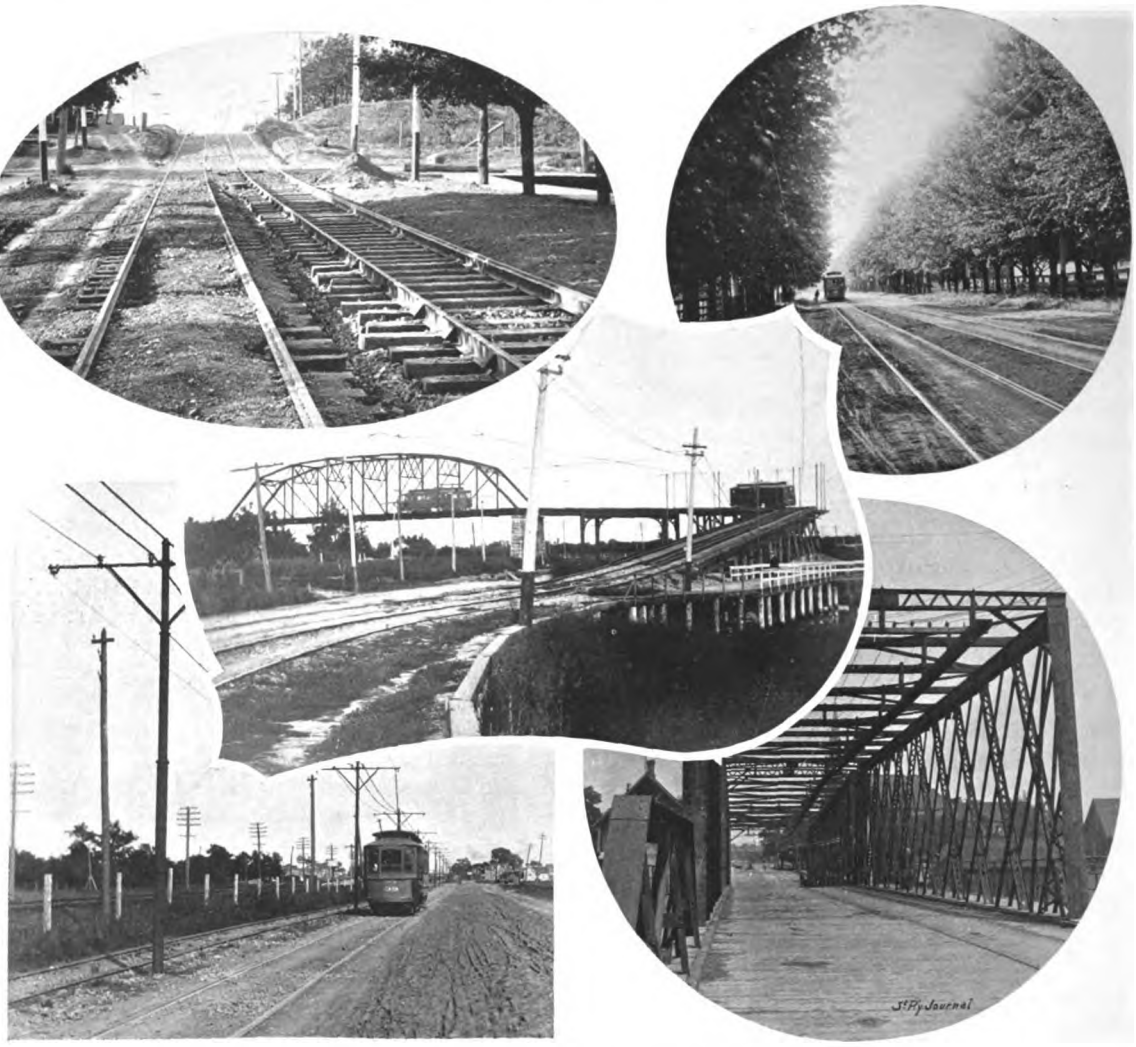
STANDARD SPAN WIRE POLE—BUFFALO TRACTION CO.



STANDARD PULL-OFF POLE—BUFFALO TRACTION CO.

toms and can be watched for and guarded against. The rails are bonded with Brown plastic bonds. On the side nearest the river the outside rail is protected by a 6 in. × 8 in. guard stringer, extending the full length of the line. Each section of this guard is mitred into the adjoining and is fastened to every alternate tie by lag screws.

The track of the Niagara Falls & Suspension Bridge Railway, the local line in Niagara Falls, is laid with 60 lb. to 73 lb. Johnson girder rail, laid on white oak ties 6 in. × 9 in. × 8 ft. The track is bonded with Chicago bonds and ballasted.



VIEWS ON THE LINE OF BUFFALO & NIAGARA FALLS ELECTRIC RAILWAY CO.

Overhead Construction

The overhead construction on the lines in the territory under discussion is mostly span wire, although the Buffalo Railway Company and the Niagara Falls & Suspension Bridge Railway Company have double bracket poles on certain portions of their lines and one or two of the suburban lines use single bracket construction. The bracket poles on the modern lines are almost universally equipped with flexible hangers. The city lines almost throughout use iron poles, which in Buffalo are of the composite construction, this having been found cheaper and more satisfactory than tubular poles. The Buffalo Railway Company originally used lattice poles, but its standard span wire pole is now a channel pole consisting of a center web tapering to the top and two outside flanges on each side riveted to the web. In the heavier poles a box construction is employed. Somewhat similar poles are used by the Buffalo Traction Company. They are supplied by the Buffalo Bridge & Iron Works and are of four types as follows:

	Length.	Set in concrete.	Maximum deflection at top of pole.
Type No. 1, single track side pole.	30 ft.	6 ft.	4 ins.
" No. 2, double track side pole.	30 "	6 "	4 "
" No. 3, pull-off pole.	32 "	7.5 "	4 "
" No. 4, heavy strain pole.	33 "	7.5 "	8 "

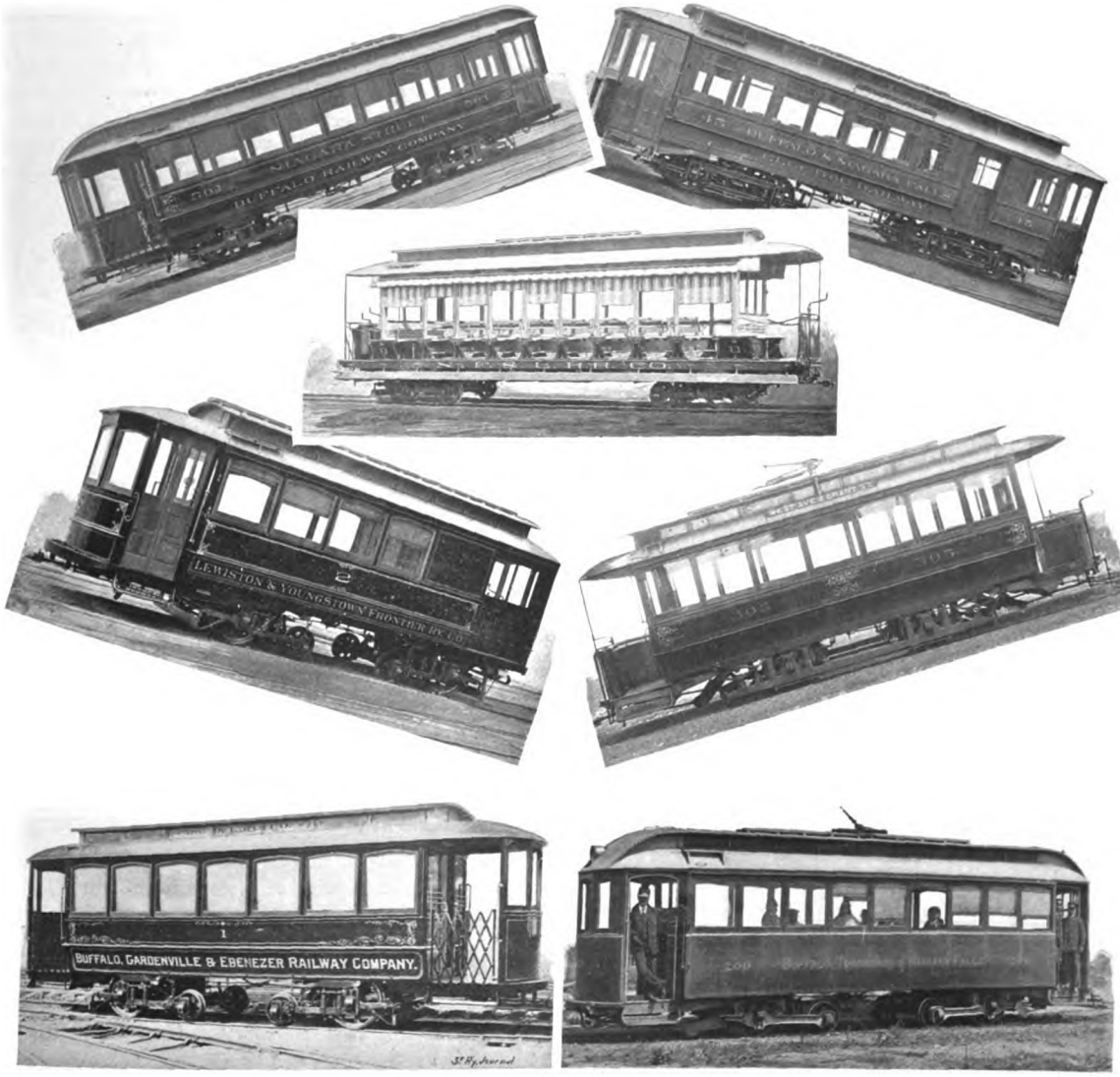
The side poles are set 125 ft. apart on straight line work and the maximum deflection of span wires in straight line construction is 10 ins. in 40 ft. spans, and proportionately in greater or less spans. The cross arms are of cast

iron with bolts clamped around the poles with wrought iron screw pins cast into the arm. The poles on the Buffalo & Niagara Falls Electric Railway are octagonal yellow pine in the towns, and stripped cedar in the country, and are spaced 125 ft. apart, and span wire construction is used. The poles are set 6 ft. in the natural soil and are tamped, and painted with tar asphalt to a height of 6 ft. from the ground, and with white lead above.

The wooden poles used on the different suburban lines

ROLLING . . STOCK

Almost every variety of electric car is used on some one of the roads in the territory between Lake Erie and Lake Ontario. The shortest are 16 ft. in body length, and cars of this kind are employed on the Tonawanda Division of the Buffalo, Tonawanda & Niagara Falls Electric Railroad and on the



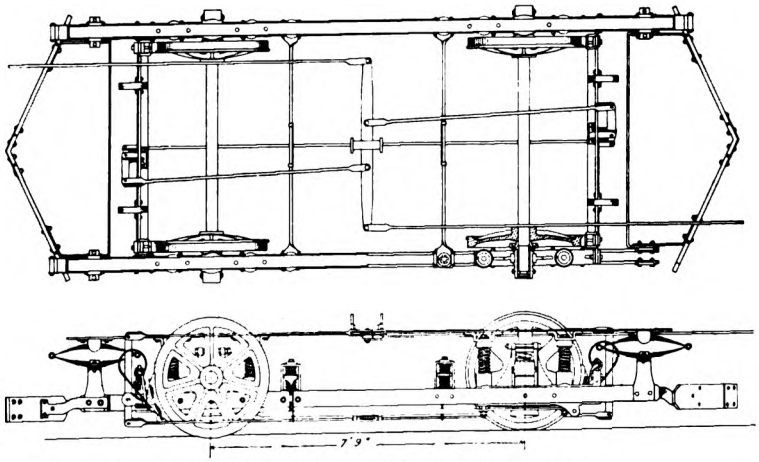
STANDARD TYPES OF CARS—BUFFALO, NIAGARA FALLS AND VICINITY.

leading from Buffalo are generally of cedar or pine, and in some cases have not been painted. The bad results of this are evident in the resulting deterioration of the poles.

On the Gorge road where span wire construction is used, the cliff end of the span wire is usually attached to stakes driven deep into the slope. The company is seriously considering the employment of the third rail instead of the overhead system of distribution; first, because the settlement of the slope throws the overhead line out of adjustment, and second, because of the scenic advantages of getting rid of an overhead construction.

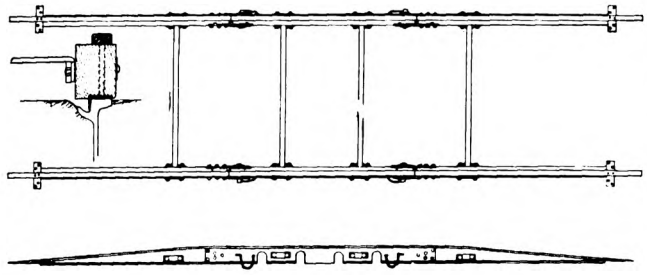
Buffalo, North Main Street & Tonawanda Electric Railway. The standard single truck car of the Buffalo Railway Company is 21 ft. in body length, with 4 ft. platforms, and the general manager of that company considers this size to be as long as can be well used with a four wheel truck. The seats are longitudinal, and in some cars the entrance is at the side of the platform nearest the steps. The tendency of the Buffalo Railway Company is, however, toward the use of long double truck cars. The management has found that as many long cars can be run on a given trackage as short cars and that they can be as easily handled by the same number of men, so

that as they have a greater carrying capacity there is a distinct advantage in their use. The standard eight wheel car of the Buffalo Railway Company has a 24 ft. body and measures 33 ft. over all. Cross seat cars are not considered



STANDARD FOUR WHEEL TRUCK—BUFFALO RAILWAY CO.

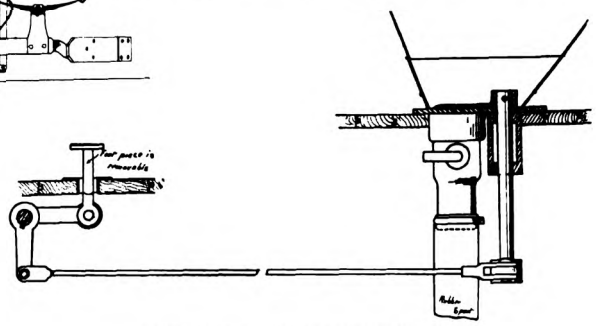
desirable for city traffic by this company. The standard cars of the Buffalo & Niagara Falls Electric Railway are 28 ft. in length over end panels at sill, and 36 ft. over all. They are 8 ft. wide, which allows space for transverse seats and a center aisle. A number of these cars are fitted with baggage and smoker compartments at one end. The cars



HOSE BRIDGE—BUFFALO RAILWAY CO.

of the Buffalo, Bellevue & Lancaster Railway vary from 24 ft. to 31 ft. body length. The Hamburg Railway cars are 18 ft. body length. The closed cars of the Niagara Falls & Lewiston Railway are almost duplicates of the cars in operation on the Buffalo & Niagara Falls Electric Railway, and have tables between the seats for picnic purposes. The Niagara Falls & Suspension Bridge Railway operates both open and closed cars and also two combination cars, which, however, have not proved very popular for the service in Niagara Falls, where either the open or the closed compartment, depending upon the weather, is most popular. The Lewiston & Youngstown Frontier Railroad uses double truck cars exclusively, of both the open and closed types. The Niagara Falls, Park & River Railway has several observation cars with longitudinal seats arranged like theatre tiers, so that passengers can view the Gorge and Falls more easily. The Buffalo Traction Company is using 21 ft. single truck cars, finished generally after the style used on the cars of the Buffalo Railway.

The cars used throughout the different systems are nearly all of Brill manufacture—a high testimonial to the satisfaction which the construction of this company has given in service. The Jackson & Sharp Company was the manufacturer of the cars on the Buffalo, Gardenville & Ebenezer Railway, and some on the Niagara Falls & Suspension Bridge Railway. The Laclede Car Company also built a number of short single truck closed cars of the Buffalo Railway and the Buffalo & Williamsville Railway, and J. M. Jones' Sons are represented by the closed cars of the Hamburg Railway and the open cars of the Niagara Falls & Suspension Bridge Railway. The cars of the Niagara Falls, Park & River Railway are of Canadian manufacture. Spring rattan seats are used very gener-



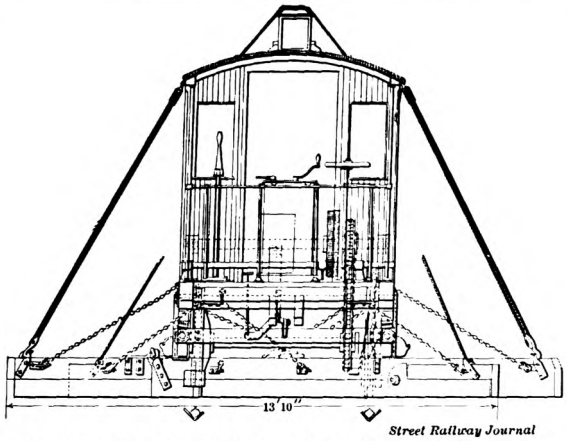
SAND BOX—BUFFALO RAILWAY CO.

ally. They are of the Hale & Kilburn and Scarritt manufacture. The Railway Register Manufacturing Company supplied the registers used by the Buffalo Railway, Buffalo & Niagara Falls Electric Railway and several other lines. The New Haven Car Register Company, Meaker Manufacturing Company and Sterling Supply & Manufacturing Company are also represented. In the way of swivel trucks the Brill maximum traction truck and the Brill No. 27, seem to be the most popular, the former for the city lines, the latter where high speed is a requisite. The No. 27 truck has been given a very careful test on the Buffalo & Niagara Falls Electric Railway where the conditions in the way of high speed and heavy loads have been most severe. The cars are noticeable for their very easy riding quali-

NO. 27 TRUCK—BUFFALO & NIAGARA FALLS RAILWAY CO.

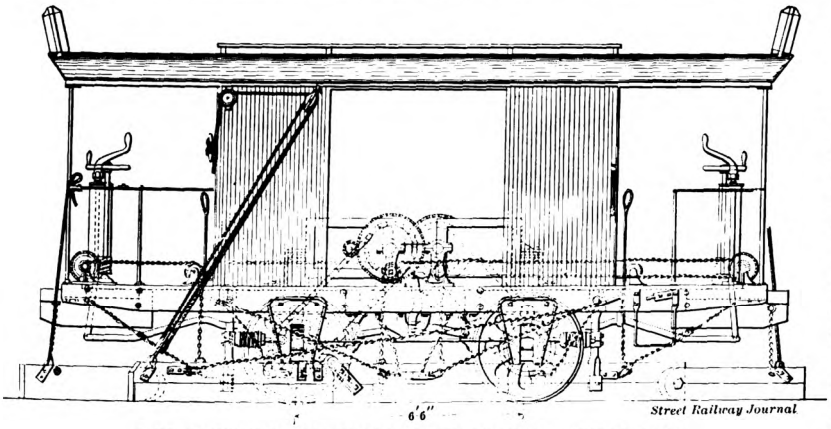
ties, especially on curves, and the management cannot speak in too high terms of their merits. It is noticeable that all the curves having a radius of 95 ft. or greater are traversed at full speed, and none except those leading on

and off the bridges and off switches has guards even on the inside rail. The outer rail of the curves, however, is elevated according to the same formula as that used as in steam railroad construction. The new single truck cars of the Buffalo Traction Company are equipped with the Peckham truck. The four wheel trucks of the Buffalo Railway are manufactured in the shops of the company from designs of its master mechanic and have given such good satisfaction that they have been adopted as standard for future work. The chief merits are simplicity and cheapness. The side bars are of rolled steel separated by an I beam under each pedestal. There are also two McGuire trucks on the Buffalo, Bellevue & Lancaster Railway.



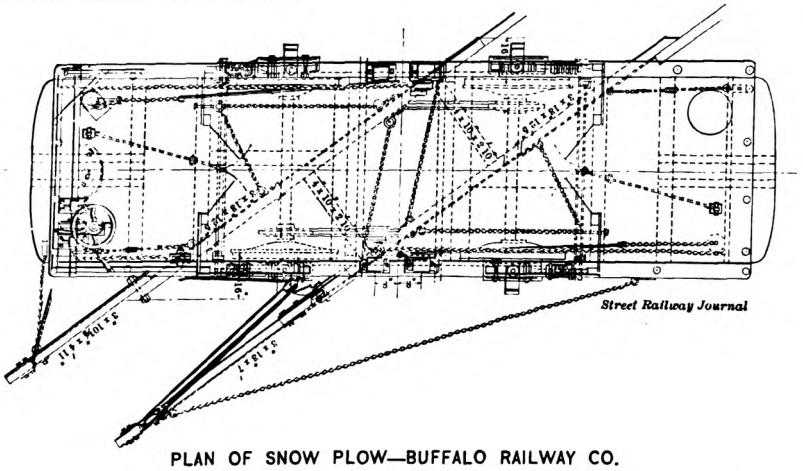
END ELEVATION OF SNOW PLOW—BUFFALO RAILWAY CO.

SNOW SCENE—BUFFALO & NIAGARA FALLS RAILWAY.



SIDE ELEVATION OF SNOW PLOW—BUFFALO RAILWAY CO.

Ruggles rotary plows are used by a number of the different lines. The Buffalo Railway Company and the Buffalo & Niagara Falls Electric Railway have also share plows of their own manufacture which are giving good service. Plans of the former are given on this page.



PLAN OF SNOW PLOW—BUFFALO RAILWAY CO.

The Lewiston & Youngstown Frontier Railroad, and the Buffalo, Bellevue & Lancaster Railway operates each an electric locomotive with satisfactory financial results. That of the former is of 200 h. p., is equipped with General Electric motors and was built by the J. G. Brill Company. That of the latter was originally intended for a snow plow and is equipped with two W. P. 50 motors with twelve turn armatures. It has been in daily use since January, 1893, and the average load hauled is 24 tons, not including the weight of the cars, itself weighing 6½ tons. It has hauled fifteen flat cars around a curve of 75 ft. radius and has hauled 101,000 lbs. up a 4 per cent grade around a 50 ft. radius curve. It is used principally for hauling crushed stone for street purposes from a quarry owned by the company and for transferring coal to the company's power station.

Electric heaters are generally employed, those of the Consolidated Car Heating Company's type being the most numerous.

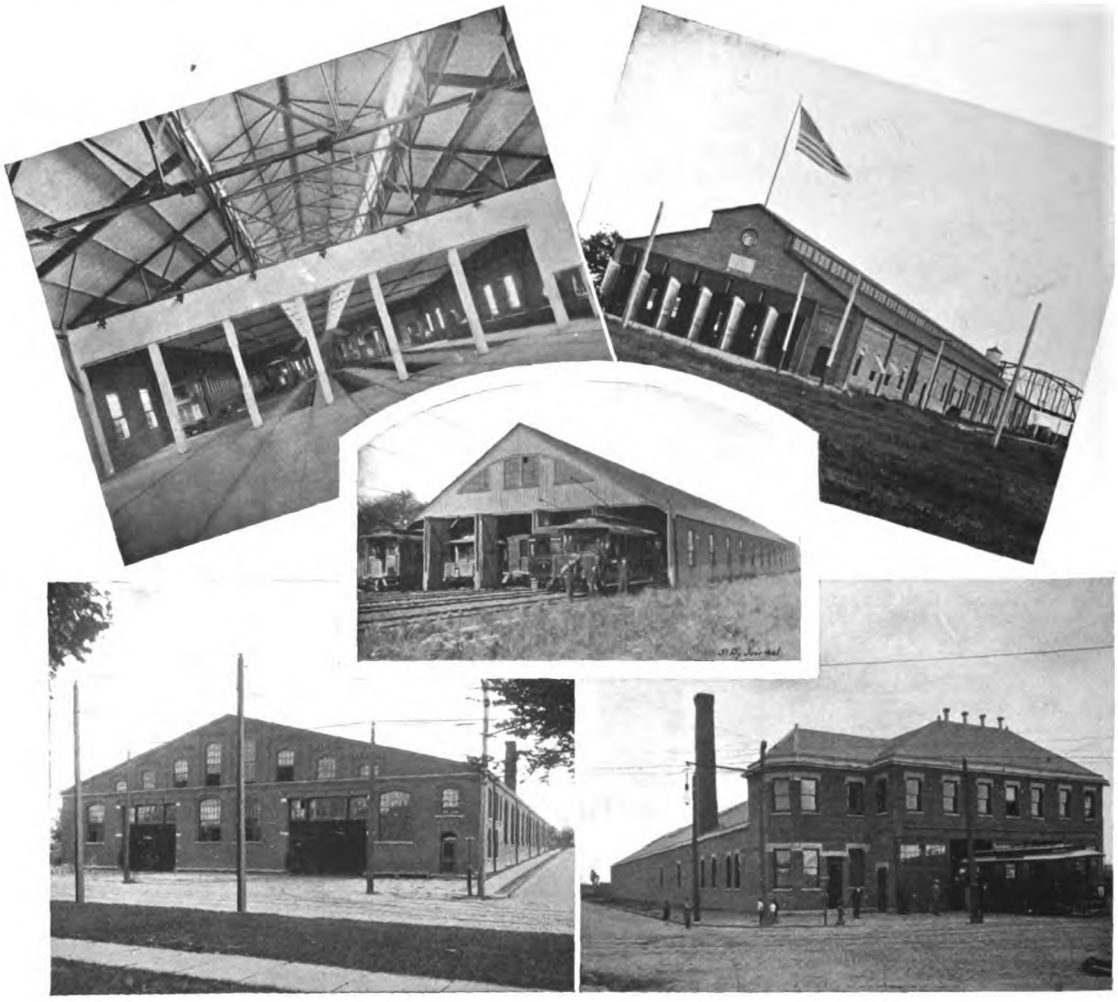
Almost every type of General Electric motor is represented, and this make is used exclusively by all the roads except the Niagara Falls & Lewiston Railway, part of whose cars are equipped with Westinghouse motors. On the Buffalo & Niagara Falls Electric Railway a special controller had to be employed from the fact that

four G. E. 1000 motors are used on each car, and a low maximum speed with full number of points was desired within the city limits of Buffalo and Niagara Falls, whereas between these points the cars had to make a much higher speed. The result was accomplished by the use of a K 4-12 controller which is fitted with two controller handles, one for the high speed and one for the low speed. The change of controller handles is made at the city limits in each case, the motorman depositing one controller handle in a box, under the supervison of an inspector, before taking the other handle. This precludes the surreptitious use of the high speed handle within the city limits by motormen who are anxious to make up lost time—an important point in evidence in possible damage suits.

Air brakes have been used on a number of lines, and the manager of the Buffalo Railway Company speaks very highly of their value. This company uses on its Niagara Street line, the axle driven Genett air brake now manufactured by the Standard Air-Brake Company and has also a few Christensen equipments. Thirty-three inch wheels are used almost exclusively by the different companies, and the wheels of this diameter all weigh about 360 lbs. each, slight additions to this being caused by unusually wide tread or longer hubs required by some companies. The wheels are manufactured almost exclusively by the New York Car Wheel Works, whose wheels give very high records so far as life of wheels is concerned. The Buffalo Railway Company has each of its wheels cast with a small boss on one end of the spokes on which a serial number is stamped, and gives 50,000 as the average life of its wheels; the Buffalo, Bellevue & Lancaster Railway, whose wheels have a less severe service, gives the average life of its New York car wheels as 108,000 miles with a maximum record of 144,000 miles. The Buffalo & Niagara Falls Electric Railway has not as yet worn out any wheels, so cannot quote any mileage.

The fenders used on the different cars are of the Buffalo type, and all cars are equipped with fenders except those of the Niagara Falls & Lewiston Railway Company. The Dunning drawbar is used on all the Buffalo Railway cars.

The Buffalo Railway Company is using an ingenious form of sand box, invented by the company's master mechanic and designed to prevent the trouble from freezing up of the sand in winter. The arrangement of the box is shown on page 608; the chief feature is that the valve



Interior—Buffalo & Niagara Falls Electric Railway. Exterior—Buffalo & Niagara Falls Electric Railway.

Niagara Falls, Park & River Railway

Forest Avenue—Buffalo Railway. Hertel Avenue—Buffalo Railway.

VIEWS OF CAR HOUSES.

is arranged to move inside the car instead of underneath the floor. A hose bridge of the same company is also shown. This consists of several parts which can easily be fitted together. One is illustrated on page 608.

In all repairs of its old cars, and in all new cars which it builds, the company combines on the platform the sockets for the gong, sand box and scraper levers and the brake staff in one malleable iron casting which is set into the platform floor. By this means uniformity in the location of these appurtenances on the platform is secured and the latter is rendered stronger than if separate holes were bored for each rod.

Another device which has been found useful by the Buffalo Railway Company is an emergency truck. This is of the bogie type with 16 in. wheels and is made light so that it can easily be carried in an emergency wagon. It is so arranged that it can be slipped under the front platform of a car which has become temporarily disabled by a broken spring or axle, enabling the car to be quickly hauled to the car house or repair shop.

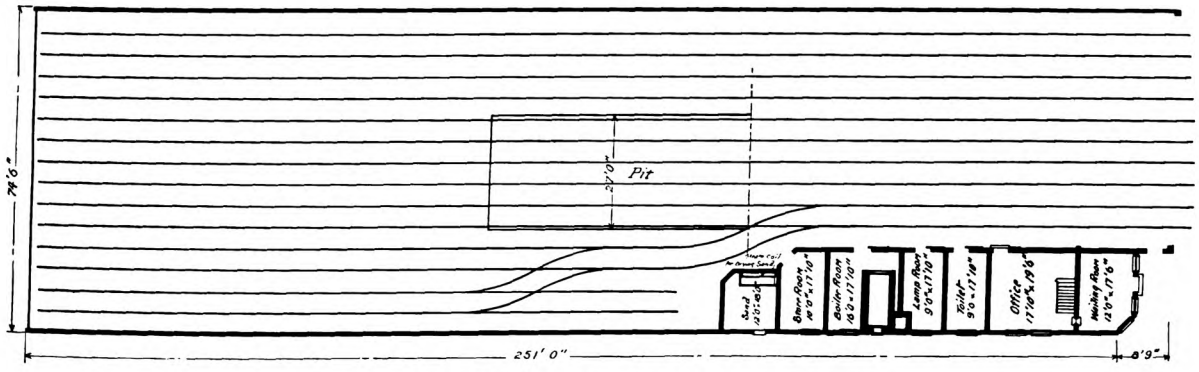
CAR . . . . HOUSES

General views of several of the car houses of the different systems are given on page 610. Of these one of the largest is that of the Buffalo & Niagara Falls Electric Railway, whose car house is located at La Salle. It is 370 ft. × 72 ft. and contains seven T rail tracks with room for forty cars and pits for twelve cars. The floor is concreted throughout and the western or rear end of the car house is arranged so that it can be closed off in winter by means of sliding doors to provide a warm compartment for the cleaning of cars, inspection of motor equipment, etc. The offices are located at the right of the entrance. The roof is of corrugated iron with 1 in. sheating. Heavy iron doors are avoided by making the doors only large enough to accommodate a car, the trolley passing into and out of the building through special slots over the doors. These are provided with double spring doors so that they close after the passage of a car.

The Hertel Avenue car house of the Buffalo Railway Company is the latest built by that corporation and is an excellent example of modern car house construction. It is a steel and brick structure with temporary corrugated iron back for removal in case of the extension of the building in that direction. The entrance tracks are all gauntleted to make the riding of the cars on the main line more easy. The floor, which has not yet been made, will be of concrete. The whole house is heated in winter with hot water pipes from a boiler room extending all around the walls and pits. All of the car houses of this company which are equipped with transfer tables use electric transfer tables. The largest two car houses of the Buffalo Railway Company are those at Forest Avenue and Cold Spring. Close to the latter car house are located the repair shops of the company. These are very complete as the company manufactures a great deal of the material used, repairs its own car bodies, paints them, etc. In this connection a valuable feature of practice may be mentioned. The date of the revarnishing and repainting of a car is always marked on the car in an inconspicuous place. An official of the company can readily tell therefore on noticing a car in the street how recently it has been repainted and when revarnished.

All of the car houses of the Buffalo Railway Company contain special accommodations for the employes, and the comfort of the latter is looked out for in a variety of ways. The rooms for motormen and conductors are fitted with individual lockers, tables at which games can be played, punching bags, and in some cases Indian clubs and boxing gloves, and the men are encouraged to spend their spare time in these quarters.

MOTORMEN'S ROOM—HERTEL AVENUE CAR HOUSE.



PLAN OF HERTEL AVENUE CAR HOUSE—BUFFALO RAILWAY CO