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Kensington-Delavan Grade Crossing Elimination

Erie and Lackawanna Railroads Jointly Eliminate Two Important Street Crossings at Grade, at Buffalo, N. Y.

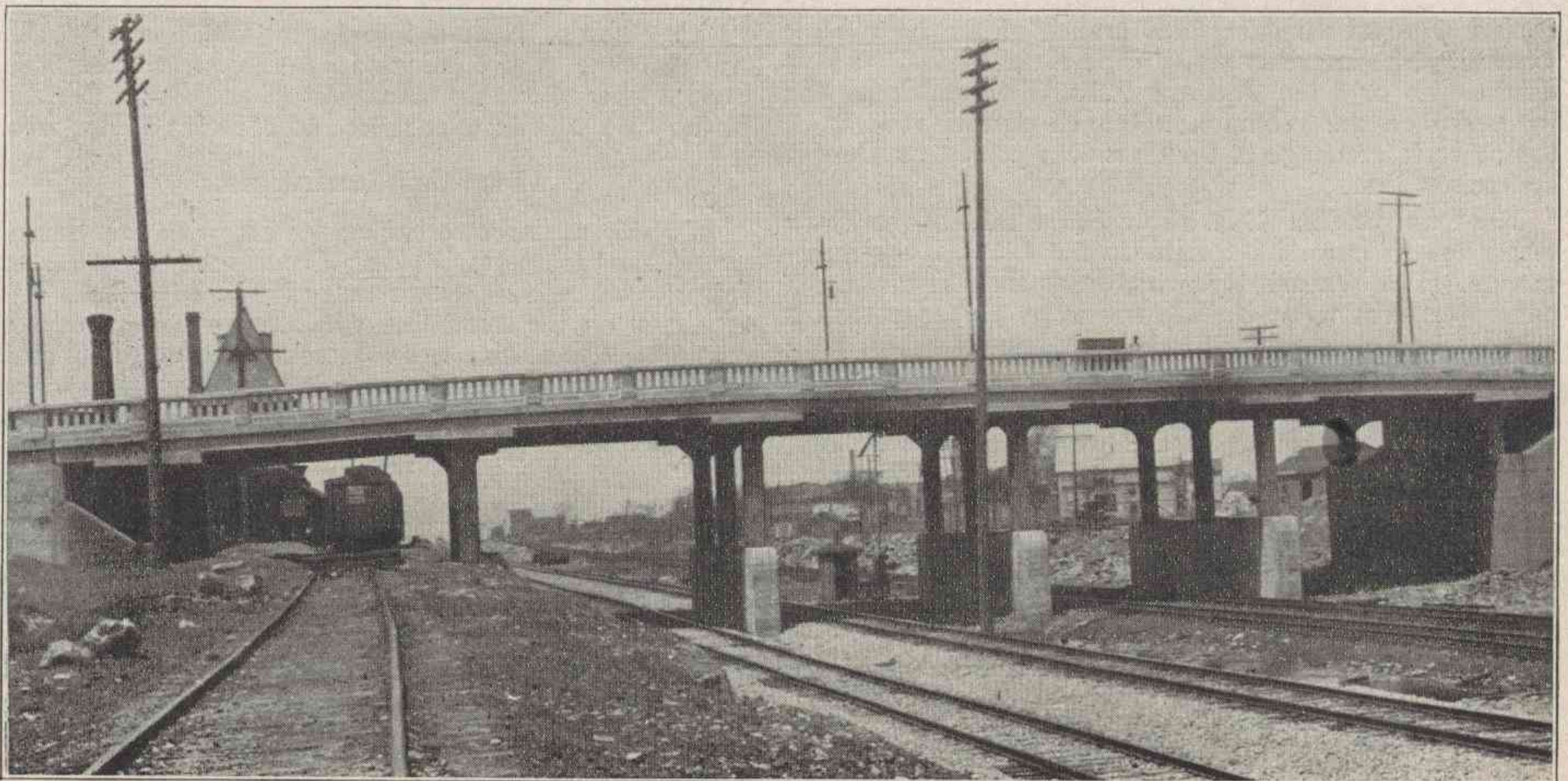
Buffalo, N. Y., probably has the most systematic plan for the elimination of its grade crossings of any city in this country. About 40 years ago the legislature constituted a body to be known as the Grade Crossing Commission of the City of Buffalo, with jurisdiction over all crossings south of William street and west of Bailey avenue. Later this jurisdiction was extended to include all crossings within the city limits. When the Terminal Station Commission of Buffalo was created jurisdiction over such crossings as are in the territory affected by the station plans was transferred to this body. In the early years of its existence the Grade Crossing Commission secured the elimination of many important crossings which were, for the most part, near the center of the city. With the widening of its jurisdiction it was found desirable to make a comprehensive plan covering all crossings remaining at grade. This plan was completed in 1912 and, although slightly modified from time to time to meet changing conditions, has been consistently and continuously carried out since that time. The commission, and particularly its chief engineer, Edward B. Guthrie, has carried on its work in a spirit of fairness to the railroads and with excellent judgment.

As in almost every community there has been an effort to inject politics into the relations between the public body and the railroads. To the credit of the commission it has never been swayed by such considerations, but has consistently assumed a judicial attitude in all matters between itself, the public and the railroads.

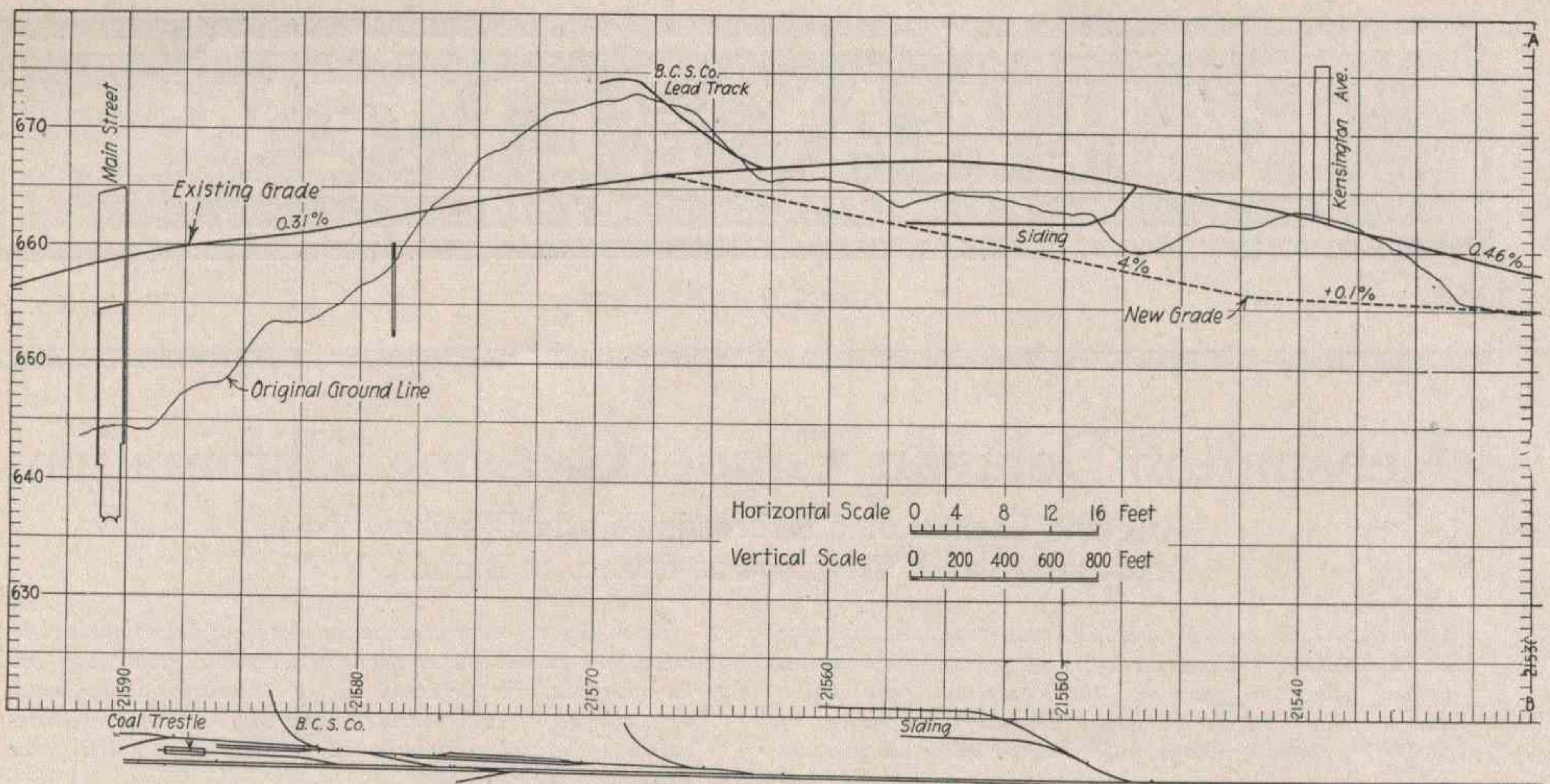
The work described below is in an outlying section but, because of the peculiar street arrangement in this part of the city, nearly all streets crossing the Erie and Lackawanna railroads are important and busy. Many of them lead out into suburban territory and, therefore, carry a heavy vehicular traffic. The number of train movements on both lines is large, the trains are nearly all freight trains, and the delays to street traffic created as much desire for grade separation as did the risk of accident.

One of the interesting features is the method of financing. The Erie protested it was anxious to proceed with the work, but was unable to finance its share of the cost. The city thereupon proceeded to finance the project for the Erie, under an arrangement whereby the cost will be paid off in 20 annual installments.

The main line of the Delaware Lackawanna & West-



Kensington Avenue Viaduct Looking North.



Profile, Delaware Lackawanna & Western R. R., Covering

ern R. R. passes through the village of Sloan, N. Y., just outside the easterly city limits of Buffalo. From here it continues into the city to the passenger terminal located at the foot of Main street, and beyond to North Pier at the mouth of the Buffalo river, at which point are the facilities for transshipment of coal to lake carriers. At Sloan, or East Buffalo as it is better known, the company maintains a large switching yard, engine terminal and shops.

East Buffalo is the junction point for the Black Rock line which runs to Black Rock, formerly an independent village on the Niagara river, but for many years a part of the city. At Black Rock business is interchanged with the Canadian National, Pere Marquette, Michigan Central and Wabash railways. There is also a considerable interchange with the Niagara Falls branch of the New York Central. The interchange with the New York Central is destined to or from Niagara Falls, Tonawanda or the industries on the Wonaloncet branch of that road. All the other interchange is for Canadian points, or Detroit and points west.

The Pennsylvania R. R. also uses the rails of the Black Rock line to move its freight to the Black Rock interchange. The Wabash Ry. which uses the Lackawanna's passenger terminal at Buffalo routes its passenger trains over the branch. As the Black Rock interchange of both the Pennsylvania and Lackawanna is heavy, there are a large number of train movements over the line.

All of the important east and west streets in the city, north of Main street, are crossed by the branch which was constructed at the time the Lackawanna entered the city. At the time of construction overhead bridges were built and grades separated at Broadway, Main street and Military Road. All other streets then opened, were crossed at grade. Those opened subsequently, except Elmwood avenue and Lovejoy street, have been put across at grade.

THE GRADE CROSSING COMMISSION

About 40 years ago the legislature passed a law constituting the Buffalo Grade Crossing Commission with juris-

diction over grade crossings within the city limits. Since that time jurisdiction over such crossings as are in territory affected by the plans of the Buffalo Terminal Station Commission has been transferred to the latter body. The Grade Crossing Commission a number of years ago worked out a comprehensive program of crossing elimination which has been followed as consistently as conditions have permitted.

In 1912 the Lackawanna and the commission entered into a contract covering all the crossings on the Black Rock line, save those at Black Rock proper, where three other railroads are jointly interested. The contract in question covered eight crossings, and it was stipulated that no eliminations would be required for a period of five years except at Delaware avenue, the principal artery between Buffalo, Kenmore and the Tonawandas. Delaware avenue was eliminated in 1913, the street being carried under both the Lackawanna and Black Rock line of the Erie which are parallel and adjacent at this street.

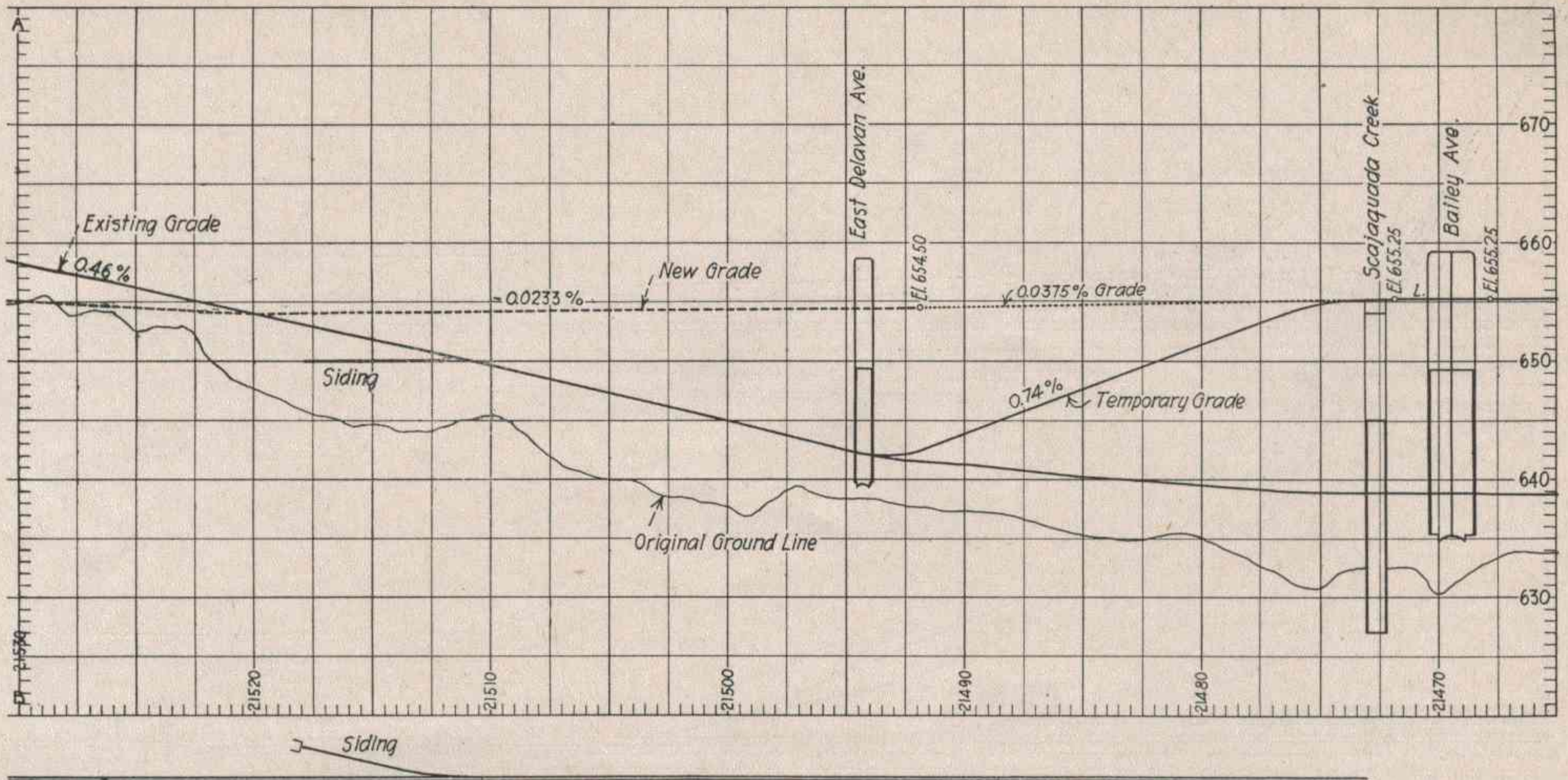
PREVIOUS ELIMINATION

In 1915, under a verbal agreement with the commission, four crossings, Walden, Doat Genesee streets and Bailey avenue were eliminated in lieu of certain other crossings on the main line which were then under discussion. When this work was completed no grade crossings remained between East Buffalo and Delaware avenue except at Delavan and Kensington avenues.

DELAVAN AVENUE

Delavan avenue is the only east and west street which runs entirely through the city. Bailey avenue, which it intersects only a few hundred feet east of the Lackawanna, is a north and south street and the longest in the city. It is the only direct route between certain sections of the north and south sides. The result is a heavy traffic over the crossing. In addition a large school is located at the intersection of the two streets and a great number of children were compelled to cross and recross the tracks daily.

At Delavan avenue the Niagara Falls branch of the



Kensington-Delavan Grade Crossing Elimination.

Erie R. R. comes in from the south and parallels the Lackawanna tracks to a point north of Main street where it crosses underneath. The two lines are so close that it was necessary the elimination be undertaken jointly. About the time of the Walden-Bailey track elevation on the Lackawanna the Erie had brought its elevation to Ferry street, a very busy street and the first one south of Delavan on its line.

KENSINGTON AVENUE

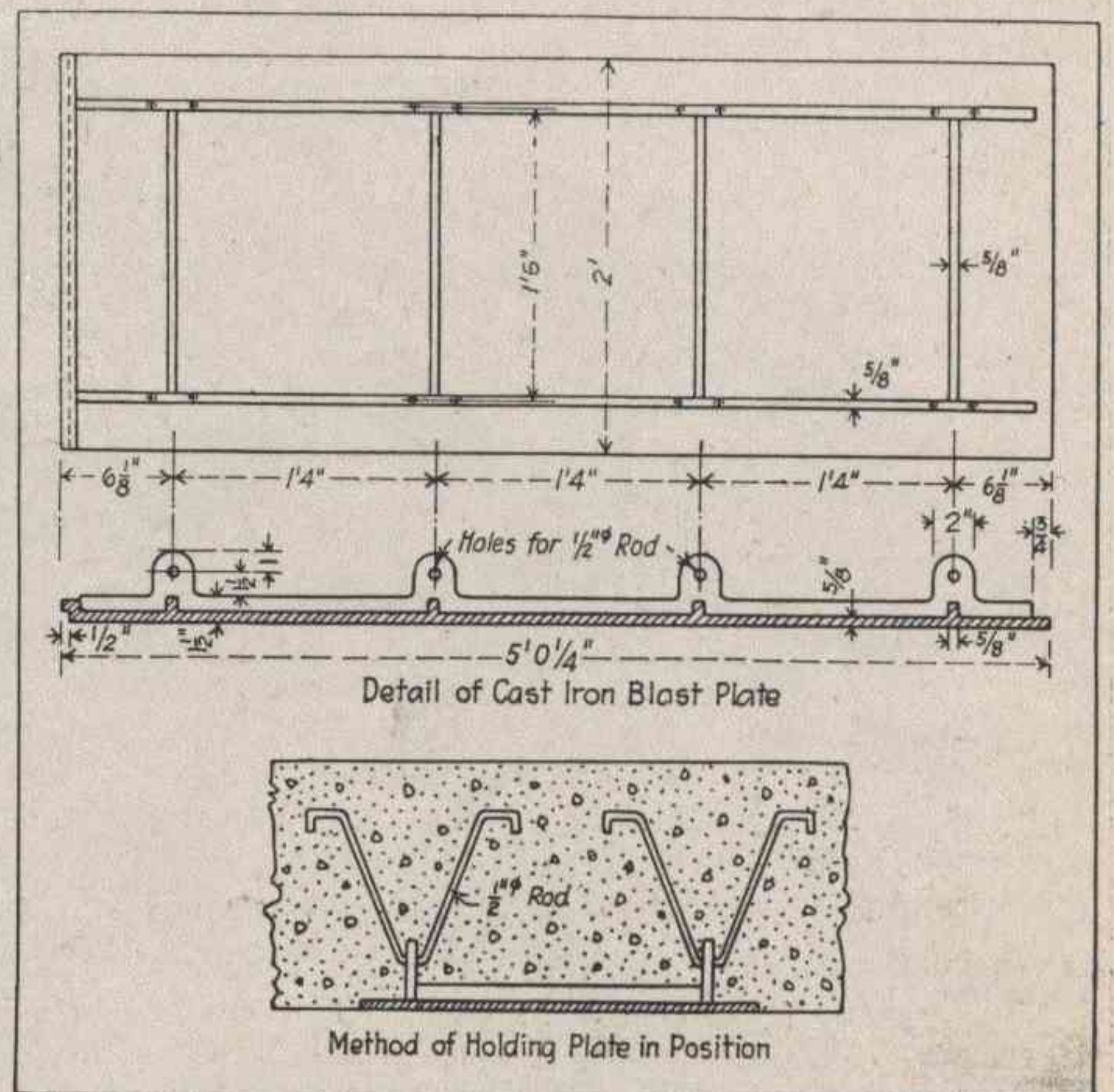
Kensington avenue is the next street opened across the tracks of the two railroads north of Delavan. This street has a double track street car line and taps a section of the city which is rapidly developing as a residential and subordinate business district. This street has a heavy vehicular traffic and, outside of the school children, more pedestrians cross the tracks than at Delavan. The foot passengers, however, are largely bunched in the morning and evening hours because several manufacturing plants are in the vicinity.

Even before the contract, above referred to, was made there had been a great deal of agitation for the elimination of the crossings at Delavan and Kensington avenues. Because of the physical conditions it was desirable that they be undertaken as one job. Both the commission and the two railroads believed it more desirable to take care of the crossings south of Delavan first, because of their relative importance. Furthermore the elimination of one involved the necessity of completing several at the same time. An added reason on the part of the railroads was that the work would be progressively done, and the tracks fully elevated to the point where further work must be done jointly.

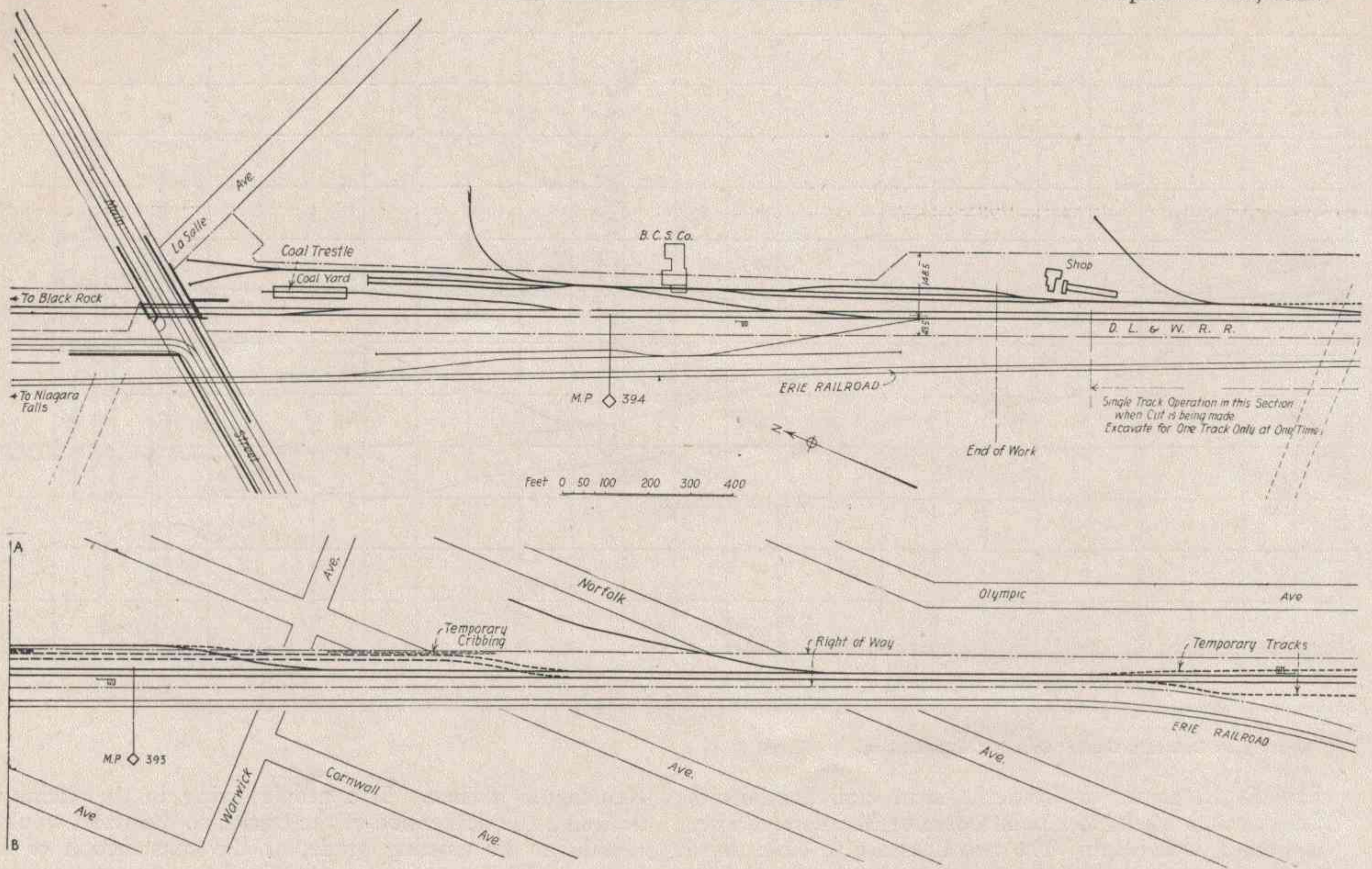
VARIOUS PLANS PROPOSED

There was no difference of opinion between the commission and the representatives of the railroads as to the plans for the Delavan avenue work. At Kensington avenue, however, there existed a decided difference. From Delavan avenue the grade of the tracks rose sharply toward the north to a summit about 1,500 ft. beyond

Kensington avenue. The people living in the vicinity desired a full depression of the tracks, so the street would remain at the existing grade, or the construction of a subway. The commission recognized the impracticability of both propositions, but desired the roads to depress more than they were willing to do for two reasons. As previously mentioned Main street, the next open street north of Kensington, is crossed overhead. If a full depression was required it would be necessary to introduce heavier grades than were desirable. Furthermore rock lays almost at the surface and the cost of the work would have been excessive. On the other hand some depression was desirable in order to reduce the existing grade and eliminate as much of the summit as practicable.



Details of Cast Iron Blast Plate Kensington-Delavan Elimination.



Location Plan, Bailey Avenue to Main Street, Buffalo, N. Y. Showing Kensington

In case a subway was decided on there could be no grade reduction, and the only benefit obtained by the roads for their heavy expenditure would be the relief from the grade crossing. The total cost of the subway scheme would have been approximately equal to the cost

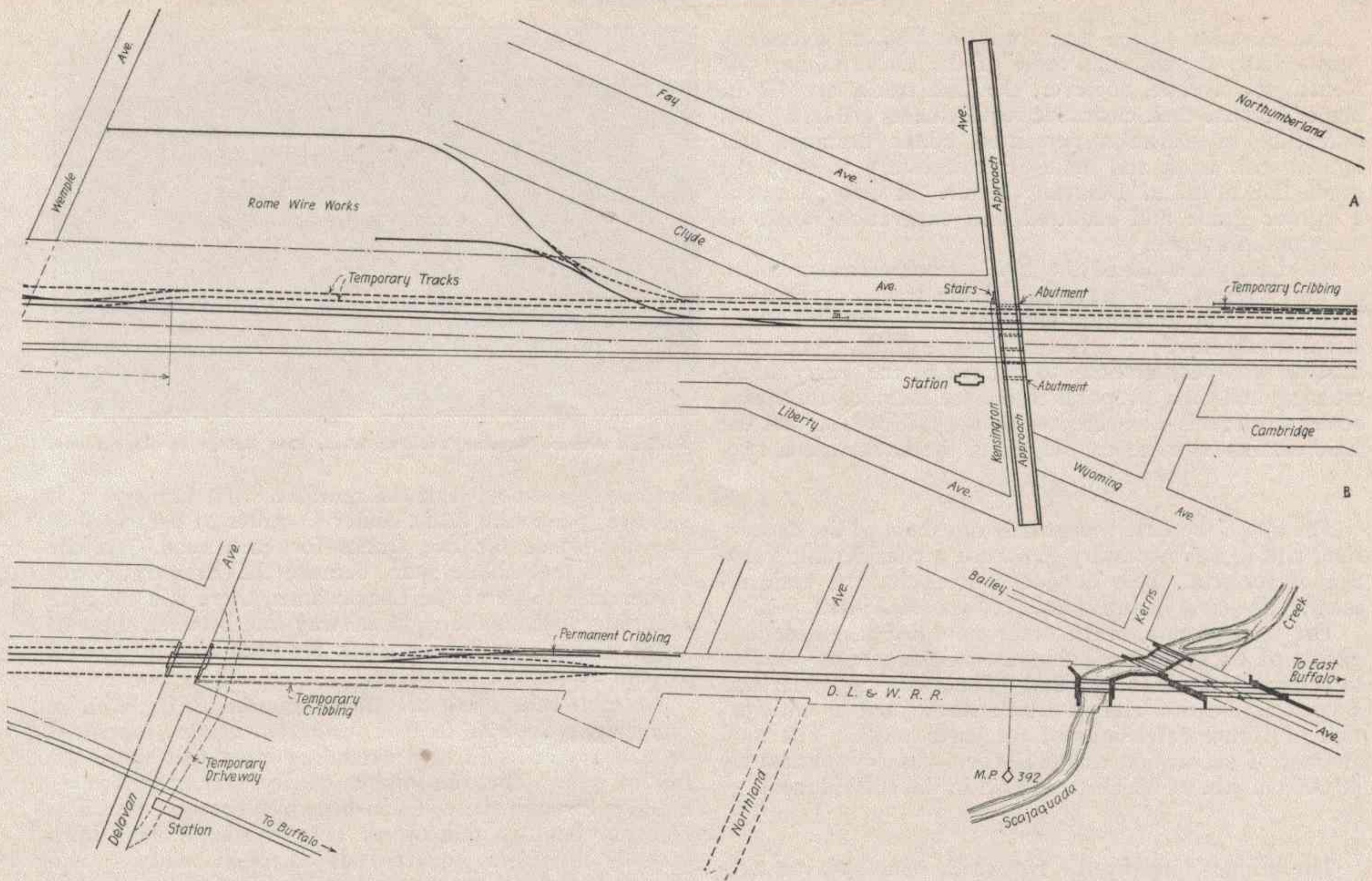
of a viaduct, though the cost to the roads would have been somewhat less due to the system of dividing the expense.

THE OVERHEAD STRUCTURE

The general scheme and the question of grades having



Kensington Avenue Viaduct Showing Columns and Collision Base for Bents.



ton-Delavan Grade Crossing Elimination and Arrangement of Temporary Tracks.

been decided on and agreed to, there rose a difference as to the design of the overhead structure. It was the wish of the commission to keep the elevation of the roadway over the tracks to a minimum, and to do this it designed a very shallow floor system. The structure proposed was a through truss giving a clear width of roadway of 42 ft. with seven foot sidewalks on either side. This made a very uneconomical design, and as the roads were compelled to participate in the initial cost to the extent of 65 per cent, and probably would be compelled to bear the maintenance cost, they objected and a deadlock resulted. This situation obtained for some time when it was suggested that a reinforced concrete bridge of the flat slab type be substituted for the steel structure. This the commission readily agreed to, and in a short time all details were worked out to the satisfaction of the interested parties.

METHOD OF FINANCING

When these matters had been settled another difficulty arose. The Erie was not in position to finance its share of the cost of the project and, therefore, could not go ahead with the work. After considerable negotiation the commission agreed on behalf of the city to finance that part of the cost allocated to the Erie. This was done by a bond issue by the city which the Erie is to pay off in 20 equal annual installments, keeping up the interest payments as well.

ALLOCATION OF COSTS

The contract covering the crossings stipulates that the division of the work and cost thereof shall be as follows:

All work done on the right of way exterior to street lines, except bridge abutments, shall be done by the railroads and they shall bear the entire cost. All abutments

and piers and the bridges carrying the tracks over the street shall be constructed by the railroad. The cost of this work is to be divided 65 per cent to the railroads and 35 per cent to the city. All other work within street lines, is to be done by the city and the expense pro-rated as above. The same arrangement applies to such retaining walls as may be constructed along subway approaches although located outside the lines of the street. The same division of cost is applied to the purchase of such lands as are necessary on account of street changes. Property damage arising from the street changes is divided 55 per cent to the railroads and 45 per cent to the city. Property damage not arising from street changes is borne in full by the railroad. For overhead street structures the city does all the work and divides the cost as in the case of a subway.

GRADES

As previously explained the Walden-Bailey track elevation of the Lackawanna was completed in 1916. The northerly end of this work was at Scajaquada Creek, just north of Bailey avenue. From this point a temporary grade was run to the southerly line of Delavan avenue. The grade line for some distance south of Scajaquada Creek is level. The new grade from Scajaquada Creek to Delavan avenue is approximately 0.04 per cent descending. From Delavan avenue to a point 2500 north there is descending grade of 0.02 per cent. From this point to Kensington avenue the grade ascends at the rate of 0.1 per cent. The reason for this is that the elevation at Kensington avenue is fixed and, while it was necessary to secure drainage in the cut, it was not desired to introduce a decided sag between the two streets. From Kensington avenue to the northerly limit of the work the grade is 0.4 per cent ascending.

The elevation of the Erie tracks at Delavan avenue is substantially the same as those of the Lackawanna. At Kensington avenue, however, the Erie tracks are 4.2 ft. higher because their clearance requirements are less. This difference in elevation permitted better drainage and lighter rock work and made it unnecessary to drop the grade line north of Delavan avenue. It also permitted a lighter grade and required less excavation north of Kensington avenue.

As already mentioned the Erie's track elevation ended at Ferry street. To have raised the tracks at Delavan avenue without joining up with the work south of Ferry street would have left a bad sag in the grade. The commission was very anxious to get rid of the Ferry street crossing and their proposal to finance included the Ferry street work; this was accepted by the railroad, so that the Erie eliminated three crossings and the Lackawanna two.

QUANTITIES

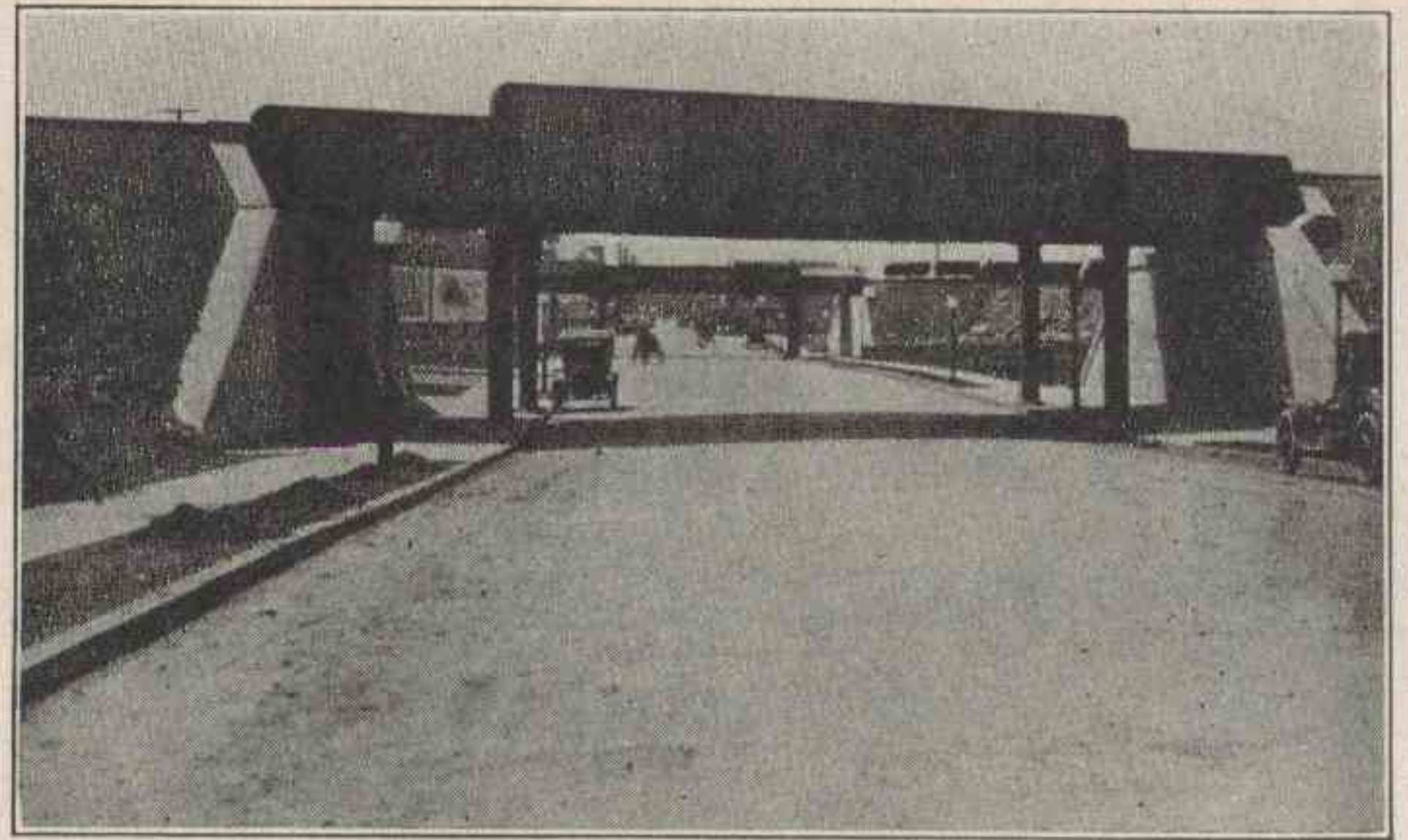
The fill on the Erie was greatly in excess of the excavation, and it was necessary to secure a considerable yardage of material from outside sources for the embankment. The total quantity involved was 99,754 cu. yds.

The Lackawanna on the other hand had a considerable excess of excavation. This was used as far as possible to construct the embankment. The excess material was wasted at the east end of Black Rock yard in anticipation of future extensions of the yard tracks. The total amount of excavation was 60,700 cu. yds., approximately 48,000 cu. yds. of which were used in the embankment.

BRIDGES

The bridges built by the two roads over Delavan avenue are of the usual through plate girder type, supported on steel columns at the curb, and with reinforced concrete floor slabs.

At Kensington avenue the viaduct over the tracks, built

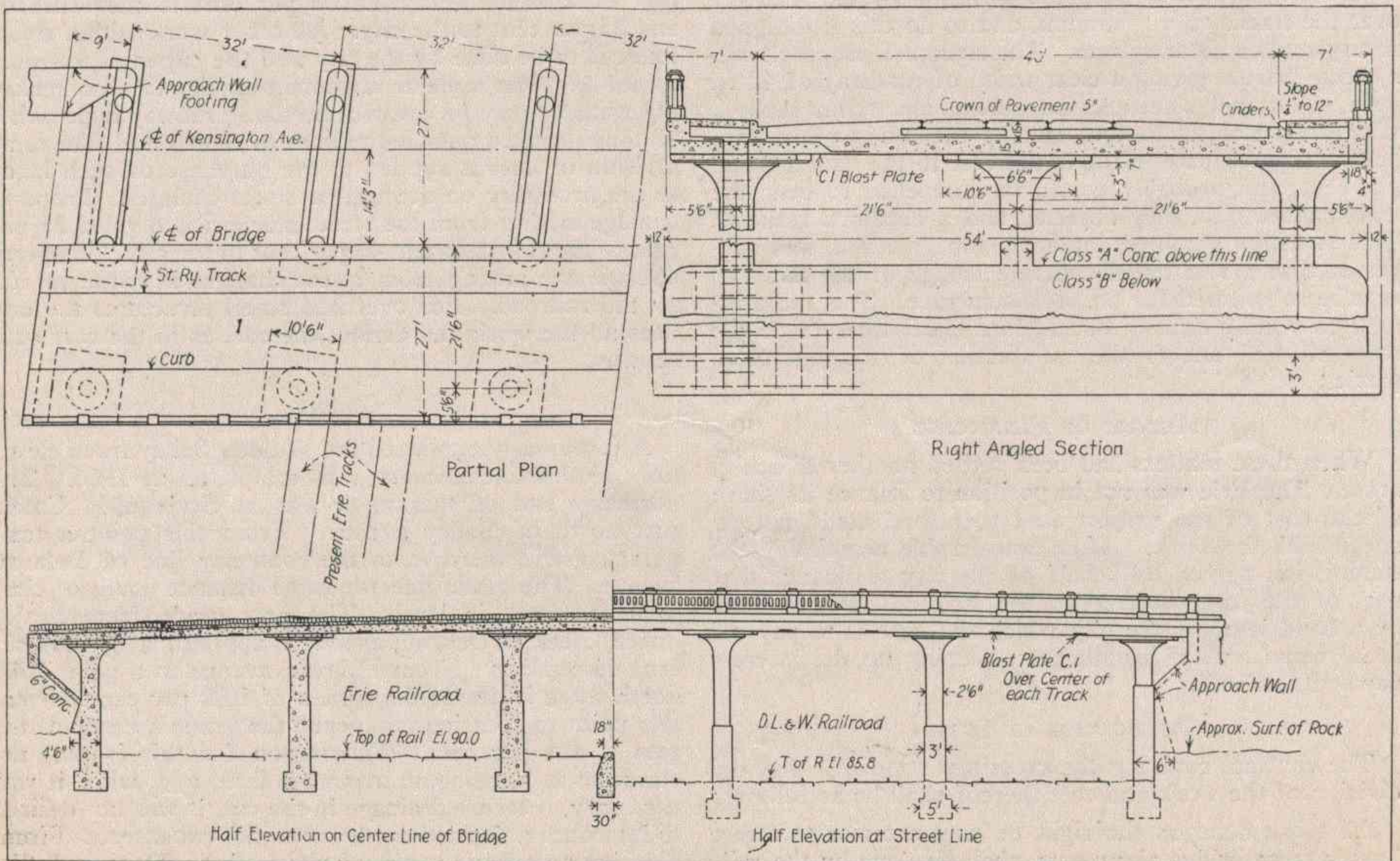


Delavan Avenue Subway Looking West, Erie Bridge in Background.

by the commission, is of the reinforced flat slab type. It has five spans each 32 ft. center to center of bents. This provides space for five tracks for each road. At the center of the middle span, because the Erie tracks are higher than those of the Lackawanna, there is a concrete retaining wall on the right of way line between the two roads. This permits one track for each road to be laid at their respective elevations.

At each bent there are three columns 2 ft. 6 in. in diameter, spaced 21 ft. 6 in. center to center, supported on a heavy collision base extending eight feet above the top of rail. The reinforcing of the columns however extends through the collision bent into the footing. The collision bent is reinforced, both vertically and horizontally, by 1/2-in. square rods on 24-in. centers. Although the structure rests on rock, a footing five feet in width is used.

The flat slab is 15 in. thick and is designed with four way reinforcing as shown in the drawing. At the ends



Details Kensington Avenue Viaduct, Buffalo, N. Y.

of the bridge the floor slab overhangs and an apron depends from it. A six-inch concrete slab joins this apron and the top of the outside collision bent. This construction avoids the necessity for an abutment. The total width of the bridge is 54 ft.; the roadway is 40 ft. in width, with sidewalks seven feet wide on either side. The pavement is Medina sandstone so largely used for paving purposes in and about Buffalo. A double track street railway is laid over the structure and approaches. Blast plates are provided over each track. These are of cast iron $\frac{5}{8}$ in. thick, ribbed both longitudinally and transversely, and are anchored in the slab in the manner shown.

The design of the balustrade, which extends over the bridge and approaches, is shown in the drawing. The method of constructing was somewhat unusual. The base was cast in place. The center panel and the rail surmounting it were each cast separately, and after curing were assembled on the base. Forms were then set up and the posts constructed in place. Special posts were designed and located 80 feet apart on each side to support the trolley poles.

STREET CHANGES

The southerly line of the viaduct and approaches is coincident with the southerly line of the street. The approaches are earth fills between retaining walls and are on a grade of 4.0 per cent. On the west of the tracks Wyoming avenue comes into Kensington avenue from the south at about the center of the approach. Sufficient property was purchased to provide a 30 ft. drive with sidewalks to connect the two streets west of the foot of the approach. The intersection of Liberty and Kensington avenues was also widened.

On the east of the tracks a new street was laid out on the north to provide access to Fay and Clyde avenues.

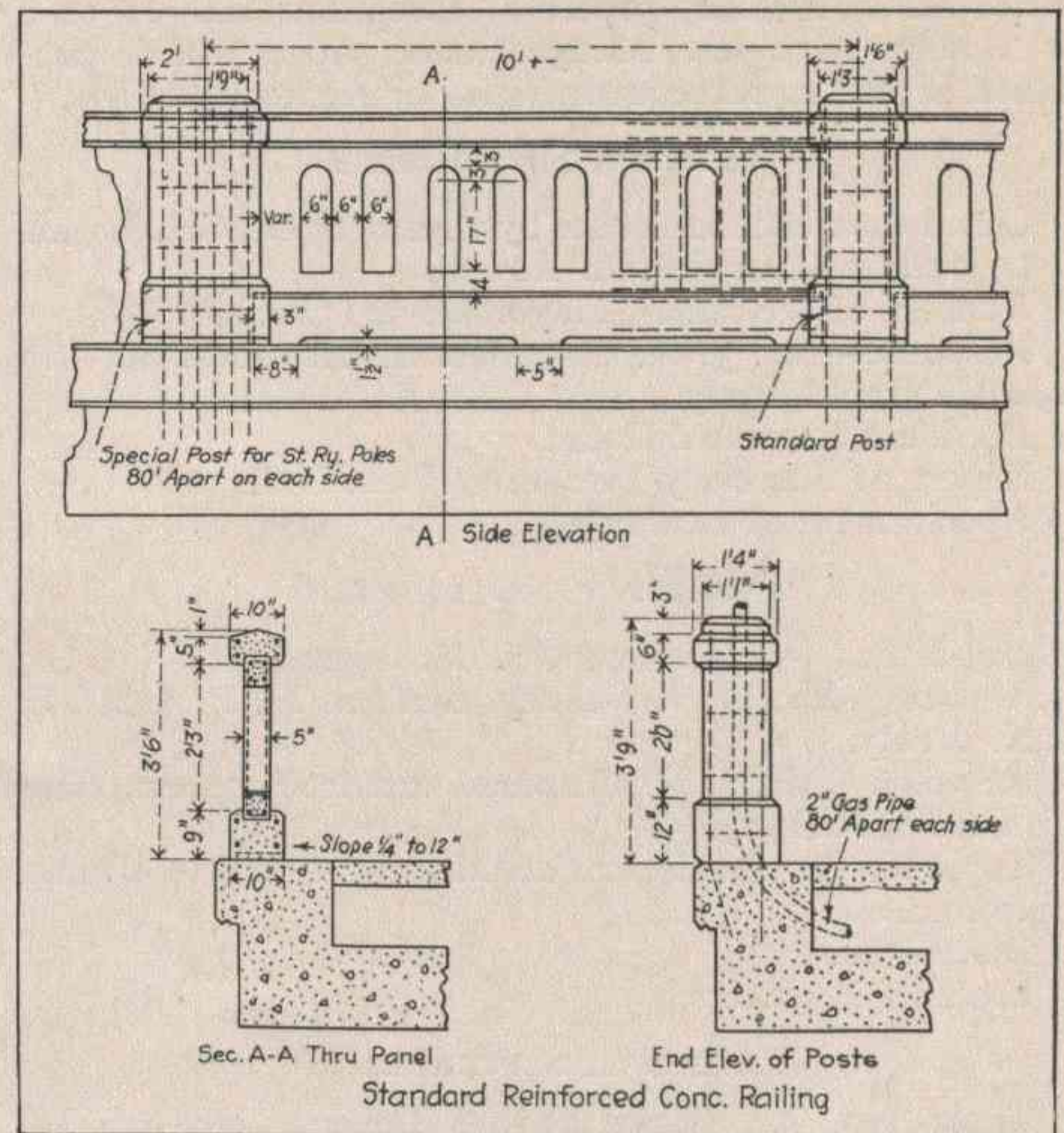
TEMPORARY TRACKS

On the Lackawanna the tracks were diverted for both the cut and fill. Along the cut the two main tracks were shifted to a temporary grade at the east side of the right of way. There were three industries requiring temporary connections, but as the temporary grade was substantially the same as the original grade no complications were introduced.

For the fill the conditions were not quite so favorable. There was not room for both tracks on one side and it was decided to spread them, locating one temporary track on each side of the fill. It was necessary, because of the character of the work at Kensington avenue, to close this street to vehicles and street cars. Foot traffic however was provided for. There are no through streets between Kensington and Delavan avenues, and on the south Ferry street is the first east and west through street. Further there are no convenient cross streets. These conditions made it imperative that all traffic be provided for at Delavan. A temporary plank road, substantially at the old street grade, was opened across both roads just far enough south of the street so as not to interfere with the construction of the bridge abutments.

This road had to be maintained until the street work was completed, making it difficult to complete the fill and lay the tracks across the bridge. For this reason every effort was made to complete one half of the width of the street in order to hasten the removal of the tracks to the high level.

The temporary tracks prevented the construction of the wing walls at the time the abutments were built. The procedure was to construct the abutments and install cribbing to hold the fill. After the traffic was transferred to the high level the temporary tracks were removed and the wings built.



Details of Balustrade and Special Posts for Supporting Trolley.

The fill for the temporary tracks at Delavan avenue was obtained from the cut at Kensington avenue. The land south of Delavan avenue and to the west of the track is rather low and, to avoid encroaching on the adjacent property, cribbing was erected on the right of way line for a distance of about 500 feet south of the street. Cribbing was also required for short stretches at other points.

The work was started in the spring of 1923 and completed early this year. H. F. Curtis was the contractor for the Lackawanna. The Miller Construction Co. of Lock Haven, Pa., did the work for the Erie. The contractor for the city was the John Johnson Construction Co., of Buffalo.

The work was done under the general direction of George J. Ray, chief engineer, for the Lackawanna, R. C. Falconer, assistant to president and chief engineer, for the Erie, and Edward B. Guthrie, chief engineer, for the Grade Crossing Commission of Buffalo. F. L. Wheaton, division engineer, and Fred B. White, assistant engineer, as field engineer were in charge of the Lackawanna work. R. L. Turner, engineer grade crossings, had charge for the Erie. E. A. Deal, bridge engineer, and F. A. Howard, engineer of structures, designed the Delavan avenue bridges for the Lackawanna and Erie respectively.

General Foremen Hold Annual Meeting

The International Railway General Foremen's Association convened at the Hotel Sherman, Chicago, on Tuesday, September 9, for its eighteenth annual session. The meeting was adjourned, after a four days' program of unusual educational interest, on Friday, September 12.

The Association of Railway Supply Men, who exhibited a great variety of mechanical devices at the convention, had arranged an excellent program of entertainment for visiting members of the foremen's association and their families, which was heartily praised by individual members, and for which the supply men were tendered a vote of thanks by the foremen.

The complete program of the association, which is pub-