

Erie Uses Novel Method Eliminating Grade Crossings

The Work was Done in Cramped Quarters

Concrete trestle as a retaining wall permitted full utilization of cramped right of way and enabled work to be carried out without obstruction

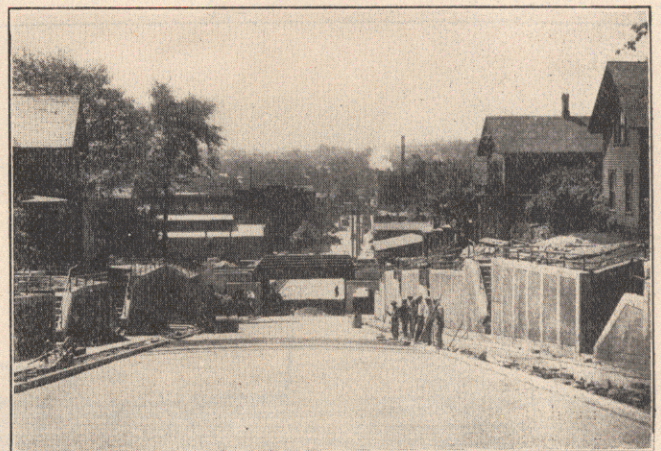
OVERCOMING the difficulties presented by a cramped right of way, adverse street gradients and heavy highway and railroad traffic, the Erie has recently completed a grade crossing elimination project at Jamestown, N. Y., in which three important street crossings were eliminated by depressing the streets and raising the main line tracks through the center of the city over a distance of approximately a mile. The Erie's main line through Jamestown is situated along the lower slope of a deep valley and crosses at right angles several of the main streets of the city which descend on steep gradients to the tracks. The hazard to street traffic had become so acute in recent years, particularly during the winter when ice covered the pavements, that approach to the crossings was dangerous and almost impossible under complete control. In spite of precautions taken and the maintenance of crossing gates and watchmen at the main crossings, the hazard existed and accidents occurred from time to time.

Work Begun in 1913

As far back as 1913 the urgent need for eliminating the main crossings at Jamestown became apparent and in that year work was begun on a project which contemplated the elimination of the grade crossings at West Second street, Main street and Institute street, by raising the tracks and depressing the streets. With a complete program of procedure outlined, work was begun on the construction of retaining walls which, together with other types of bank-retaining structures, had to be carried throughout practically the entire length of the track elevation owing to the narrowness of the right of way through the city, the close proximity of office and industrial buildings to the tracks and the passing of the Chadakoin river parallel with and immediately south of the tracks for a considerable distance west of the Main street crossing. Another governing feature, necessitating some sort of structure to retain the embankment of the main tracks, was the existence of an important industry track along the south side of the

right of way, stubbed at Main street and connecting with the main line just east of Institute street. As the location and elevation of this track had been established to serve industries abutting the railroad property and as this track was used daily, it was evident that it had to be kept in constant service and could not be altered in the general track elevation work.

Beginning work on the west end of the project where



High Retaining Walls Were Necessary on Both Sides of the Street North of the Foote Avenue Bridge

there was ample right of way, a solid gravity-type retaining wall was constructed along the south limits of the railroad property west of Main street, to retain the high embankment necessitated by the track elevation along the course of the Chadakoin river and in order to make possible the full use of the right of way at this point for a small yard. At this time certain sections of retaining walls were also completed along the north side of the right of way east of Main street, where it was necessary to keep the fill on the railroad property and away from industrial buildings which in many cases were only a

short distance from the tracks. With these walls completed, aggregating a total length of about 2,000 ft. and averaging between 25 ft. and 30 ft. in height, and with the elimination of the grade crossing at West Second street by depressing the street and constructing a seven-track solid deck through plate girder bridge, work on the project was suspended during the war.

Beginning again in August, 1923, work was started on the completion of the project. With progress well under way, a change in the plans for the work at the east end was made by the city, which proved to the advantage of both the city and the railroad. This change involved the elimination of the grade crossing at Foote avenue and the permanent closing of the crossings at Institute street and Center street, these streets, however, to be provided with subways for pedestrians. While this meant an extension of the track elevation work some distance further east, the advantages of the plan were readily apparent to the railroad as it provided for the closing of two streets which undoubtedly would have to be separated in a future extension of the work if the first plan had been followed.

Proceeding on this basis, an effective piece of grade crossing elimination work has been carried out, providing three through thoroughfares and two pedestrian subways under the tracks, and permanently closing two streets which formerly crossed the tracks with much hazard to traffic. With this work completed there are now only two grade crossings of the Erie's main line tracks in the City of Jamestown, Buffalo street and Fairmont avenue, both of which can be eliminated at some time in the future without altering the present work.

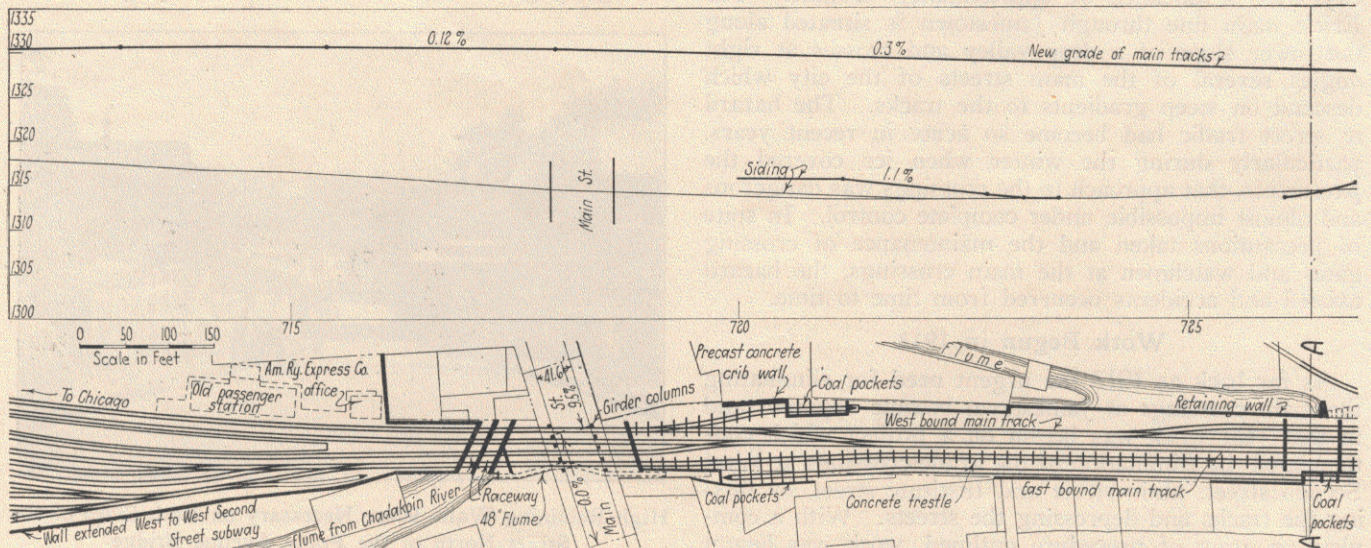
**Concrete Trestle With Aprons
Serves as Retaining Wall**

With the tracks to be raised a maximum of 16 ft. in the vicinity of Main street through a right of way 75 ft.

service and at grade, would have necessitated the complete shoring up of the track while the wall was under construction; and second, because to have raised one track at a time between the retaining walls on opposite sides of the narrow right of way to allow traffic to proceed over the new bridge to be constructed at Main street, would have required a fill so wide at the base that it would have cut off traffic on practically all of the right of way. The only alternative to this, if retaining walls were constructed was to construct a substantial temporary trestle east of Main street to carry one line of main traffic while the remaining area between the retaining walls was being filled. This would have been both difficult and expensive. Confronted with this problem, a solution was found in the construction of a reinforced concrete trestle where the fill was the highest, which served as a construction trestle and as a means of keeping one of the two tracks in main line service during the track elevation work, and after the completion of the work, as a permanent roadbed and retaining wall.

The plan followed was to move the main line tracks east of Main street, close to the north side of the right of way, and then to build a solid concrete retaining wall along the south edge of the right of way from a point where such construction became necessary at the east end of the track elevation, westward for a distance of about 350 ft. to a maximum height of 11 ft. 6 in. From this point westward, where a solid gravity type wall and an earth fill would have cramped the right of way during construction and interfered with train operation, a reinforced concrete trestle was constructed for a distance of about 1,100 ft. to the east abutment of the Main street bridge. The continuity of this trestle is interrupted only by a 60-ft. plate girder bridge carrying the tracks over a 15-ft. concrete arch located about 400 ft. west of Institute street.

The concrete trestle was constructed on 76 rectangular



Map and Profile of the West End of the Track Elevation District

wide, which could not be extended because of existing structures, and with the necessity of keeping the main line open and permitting street traffic to cross the tracks at all times, the plan of building solid retaining walls along both sides of the right of way and then raising the tracks under traffic was impractical; first, because to have constructed a gravity-type retaining wall along the south side of the right of way between the main tracks and the industrial track which had to be kept in

piers, 15 ft. wide and 2 ft. thick, spaced for the most part 14 ft. center to center. These piers are of uniform section and were cast in place by digging out the foundation area, placing steel forms and rod reinforcement, and then pouring the concrete direct from a mixer installed on a standard gage railroad car. This car was operated on a construction track laid just south of the eastbound main, and was moved from pier to pier by a locomotive crane which was used also to place and remove the steel

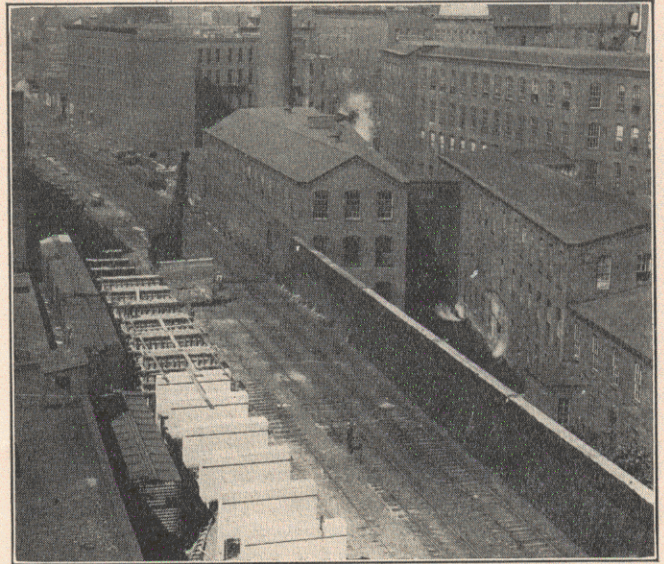
forms and to transfer the concrete materials to a hopper placed above the mixer on the car.

The reinforced concrete slabs of the trestle were pre-cast in the yard space west of Main street and were equipped with four U-rods embedded in the concrete in order to provide easy handling by a locomotive crane. As work on the trestle progressed, these slabs were moved to the site and set in place by the crane. All of the slabs are 23½ in. thick and in order to facilitate handling were constructed in widths of 6½ ft. and 8½ ft. to make up the full 15-ft. width of the trestle. When the trestle was completed, the piers below the ground level and the tops of the deck slabs were waterproofed by a heavy coating of pitch, and the joints between slabs were calked tight with an oakum and pitch filler.

While this work was going on, the south half of the girder bridge at Main street was being constructed and the southerly tracks west of Main street were being raised by a series of lifts to the bridge deck level. When this work was completed, the construction track lying between the trestle and the eastbound main was taken up and laid on the trestle and across the Main street bridge. This track was then ballasted with stone, cut into the existing tracks at each end, and put into service. During all of this work no interference was afforded traffic on either the eastbound or westbound mains, which were not obstructed at any time.

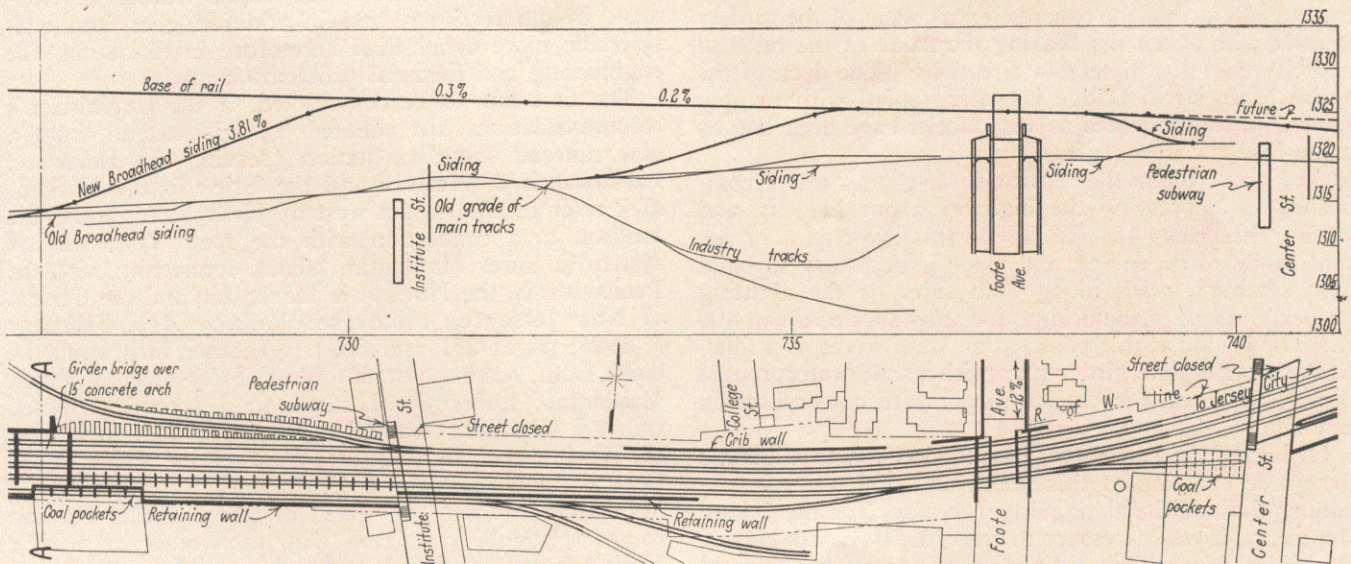
With the completion of the track on the trestle, the eastbound main was taken out of service and the filling of the space previously occupied by the construction track and the eastbound main was then readily accomplished by running trains of air dump cars out on the trestle and dumping direct to make the new fill. As the fill increased, the south slope was permitted to extend under the trestle and was retained at the outside edge by means of light precast reinforced concrete curtain walls which were placed between adjacent piers. These walls

Main street bridge was then constructed, as were also such additional retaining walls and industrial facilities as were necessary along the north right of way line. All of the fill retainers on this side of the right of way are gravity type retaining walls with the exception of a short stretch of concrete trestle and precast concrete crib-



Constructing the Trestle Piers Without Interfering with Operation on the Mains or the Busy Industry Track

bing wall, constructed just east of Main street in connection with a short industrial coal pocket track. Upon the completion of these structures and the Main street bridge, the embankment was extended across the right of way for two additional tracks by dumping from the inner raised track and then the next track put in service



Map and Profile of the East End of the Track Elevation District

are about 6 in. thick and varying with the height of the fill, range from 3 ft. 9 in. to 7 ft. high. With the fill completed for another track adjacent to the trestle, track was laid, connected up with the raised tracks west of Main street and the existing tracks west of Foote avenue, and then put in service. With two tracks then in service at the new elevation, the westbound main was taken out of service and removed.

Without interference to traffic the north half of the

at the new elevation. All of this grading was accomplished by work train and 12-yd. air dump cars. The total quantity of material used in the fill amounted to approximately 100,000 cu. yd., all of which was secured at a borrow pit about 1¼ miles west of the work.

The completed elevation of the tracks required a maximum fill of about 16 ft. which imposes about 1,200 ft. of 0.83 per cent grade and 2,100 ft. of 0.2 per cent and 0.3 per cent grade on the east half of the work. West of

Main street, however, the new track elevation provides a long descending grade of 0.11 per cent, overcoming at this end an original ascending grade about as severe as that encountered in the new grade at the east end.

Bridges Give Little Trouble

The complete separation of grades at Jamestown involved the construction of only four bridges, one of which, that at West Second street, was completed during the work previous to 1917. The other three bridges include those at Main street and Foote avenue, and a 60-ft. four-track deck plate girder bridge which it was found advisable to construct over an existing 15-ft. concrete arch which crosses under the track about 400 ft. west of Institute street. At Main street, the tracks were raised 16 ft. and the street depressed 21 in. Here the bridge is a four-track solid floor through plate girder structure supported on columns at the curb lines. As stated previously, the south half of this bridge, including the abutments, was constructed first to permit raising of the tracks on the south side of the right of way and at the same time preclude interference from traffic on the north side. When this half of the bridge was completed and traffic diverted from the north side of the right of way, the other half was built and connected to the first half by means of construction joints. In addition to the girder sections spanning Main street there are two 20-ft. reinforced concrete spans on the east end of the bridge, and three 20-ft. and two 19-ft. spans of the same type on the west end. While the two 19-ft. spans bridge a raceway crossing under the tracks, it is of interest to note that the 20-ft. spans on each end were put in to bridge the sidewalks and also to provide store space along the relatively valuable frontage on Main street.

In order to enhance the appearance of the bridge, all of the steel columns and the two outside girders are encased in concrete, the former having a bush-hammered finished set off by a rubbed finished paneling effect, while the outside face of the concrete encasement of the girders is inset with green tile bearing the name of the railroad and city, and also timetable directions. The deck of the entire Main street bridge is waterproofed with two-ply fabric, on top of which asphalt blocks have been laid as a sub-base for the ballast.

At Foote avenue the separation of grades was accomplished by depressing the highway about 11½ ft. and raising the tracks 4½ ft. To do this involved a 12 per cent grade in the street, and made it necessary to build high retaining walls along both sides of the abutting property, north of the bridge, for a distance of about 400 ft. The bridge at this point, as at Main street, is a four-track through plate girder span with a solid waterproofed deck. However, the outside girders are not encased in concrete.

Owing to the somewhat delayed decision to eliminate the grade crossing at this point, and difficulties in obtaining the additional property necessary for the bridge abutments, it was necessary to construct the north half of the bridge first. This did not affect operation adversely in any way, however, as work on this bridge was not started until trains were operating over the trestle on the south side of the right of way. When the north half of the bridge was completed, the track from the trestle and the first track raised on the embankment were swung northward over it and the south half was then constructed without interference.

The abutments of this bridge, which are of the hollow box, reinforced concrete type, support the girders at the curb line and provide ample space beneath for sidewalks. The only difficulty encountered in any of the bridge work

occurred at this point where, on account of a soft, spongy foundation, it was necessary to drive piling under the greater part of the abutments.

The pedestrian subways at Institute and Center streets were constructed under the tracks along the west property line of the street in each case, and built one half at a time so as not to necessitate shoring and working under traffic. The subways are 8 ft. wide and are constructed of concrete. At each end, frame head-houses cover the stairways leading to the subway level.

The elevating of tracks through Jamestown will bring about the construction of a new passenger station for the city since it was necessary to raise the tracks about 14 ft. in front of the old station and allow the embankment to encroach on the station building. In order to provide facilities during the track elevation and until the location and plans for a new station are decided upon, a temporary frame station was built on the north side of the tracks about 1,700 ft. west of Main street.

The plans for the work at Jamestown were prepared and the actual construction was carried out under the general supervision of R. C. Falconer, until recently assistant to the president and chief engineer, and F. A. Howard, engineer of structures, while C. H. Splitstone, superintendent of construction, was in charge of the construction and track work, with T. C. Wulling, resident engineer, on the ground. The contractor handling the work since its resumption in 1923 was the Arthur McMullen Company, New York.

North Jersey Transit Plans

THE North Jersey Transit Commission has issued its annual report to the state legislature. The report repeats, without important modification, previous recommendations for rapid transit development in the territory, and in addition goes into considerable more detail than heretofore in discussing the engineering and financial problems involved.

The first line to be constructed, if the commission's recommendations are adhered to, will extend from a new railroad suburban station (serving the Delaware, Lackawanna & Western and the Erie) in the Hackensack river meadows just west of Jersey City, under the Hudson to a connection with the New York subway system in lower Manhattan Island, connecting with the Pennsylvania, the Hudson & Manhattan and the Central of New Jersey en route (see *Railway Age*, February 7, 1925, pages 351 and 368). Another line would be built from some point in West Fifty-seventh street, Manhattan, under the Hudson to a second proposed railroad suburban terminal at New Durham, just west of Weehawken, serving the West Shore (New York Central) and two of the Erie's lines. Eventually the Manhattan termini of each of these under-Hudson routes would be connected with each other by a New York subway—to be constructed, possibly in co-operation with the Westchester County, N. Y., Transit Commission.

Similarly the Jersey termini at New Durham and on the Hackensack meadows would be connected, making a loop line. Rapid transit electric trains would be operated on these routes to give steam railroad passengers service to and from the city proper. Eventually, if the railroads should electrify their suburban lines, their trains could be run directly through the tunnels to New York.

The commission reports progress in its negotiations