CNR
ST FRANCIS RIVER BRIDGE, SHERBROOKE, QUEBEC
1933

Canadian Railway and Marine World

February, 1938

Concrete Bridges of Unusual Design on Canadian National Railways.

During the last four years, many grade crossings have been eliminated on Canadian National Rys. Central Region, and the engineering department gave a great deal of study to the structures carrying the railway tracks over the roadways, with the object of effecting economy. This has resulted in the con- and, in the case of the bridge carrying the Newmarket Subdivision line over St. Clair Ave. West, Toronto, utilization of the rigid frame type of construction.

Sherbrooke Bridge.—One of the most notable bridges of the series is at Sherbrooke, Que., mile 196.26, Sherbrooke Subdivision, St. Lawrence Division, The design incorporates a center pier on a footing 4 ft. wide; the subway contains a 5 ft. sidewalk and an 18 ft. roadway on one side of the center pier, and a 17¼ ft. roadway on the other side. The vertical clearance within the structure is 14 ft. The two deck slabs, each 53 ft. 2⅝ in. long over all, and continu-

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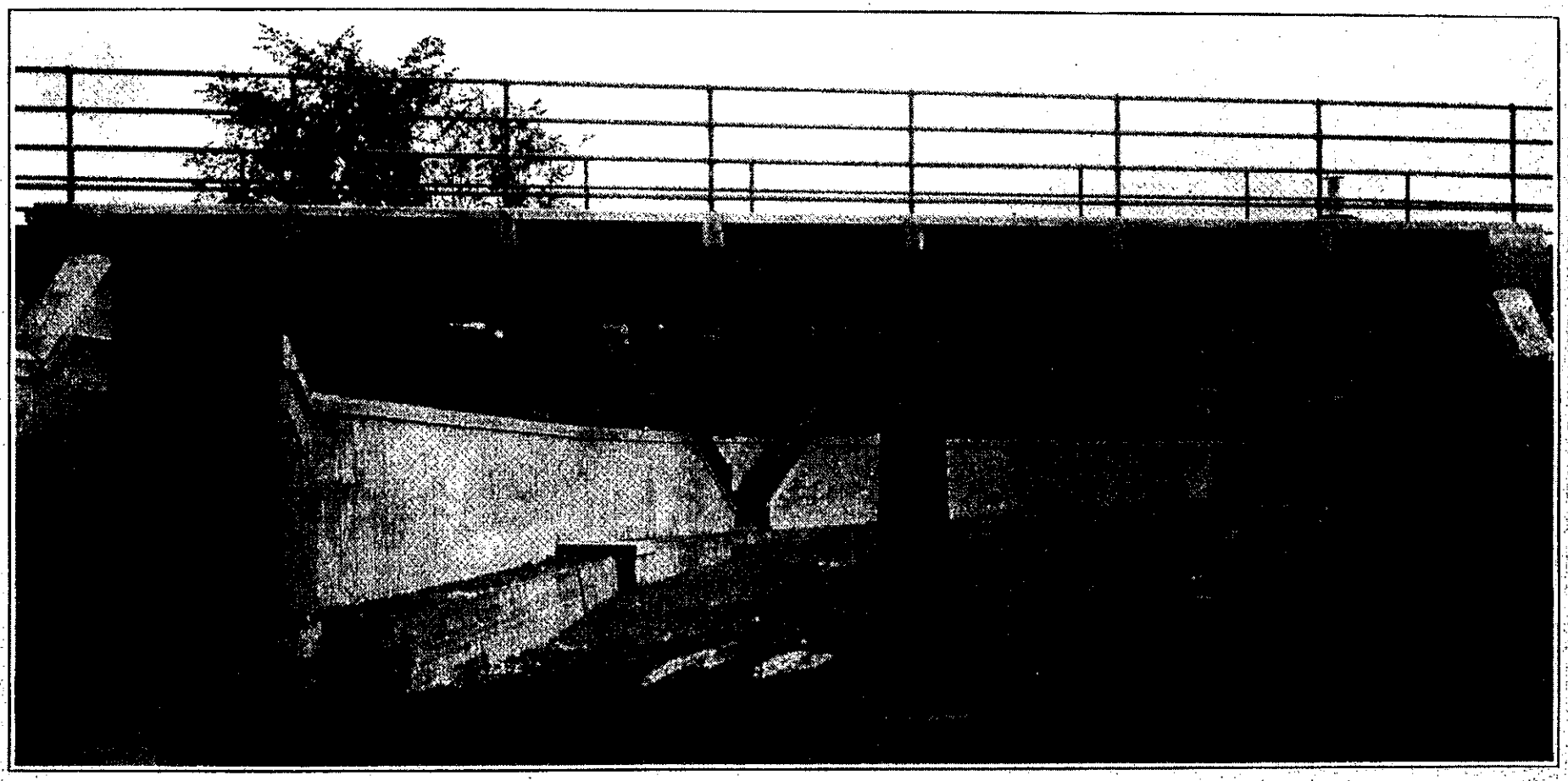

Bridge carrying Canadian National Rys. track over St. Francois Street, Sherbrooks, Que.
Note shallow slab used in deck. The retaining wall, integral with abutment at the left, protects the roadway from inundation by the Magog River, during high water.

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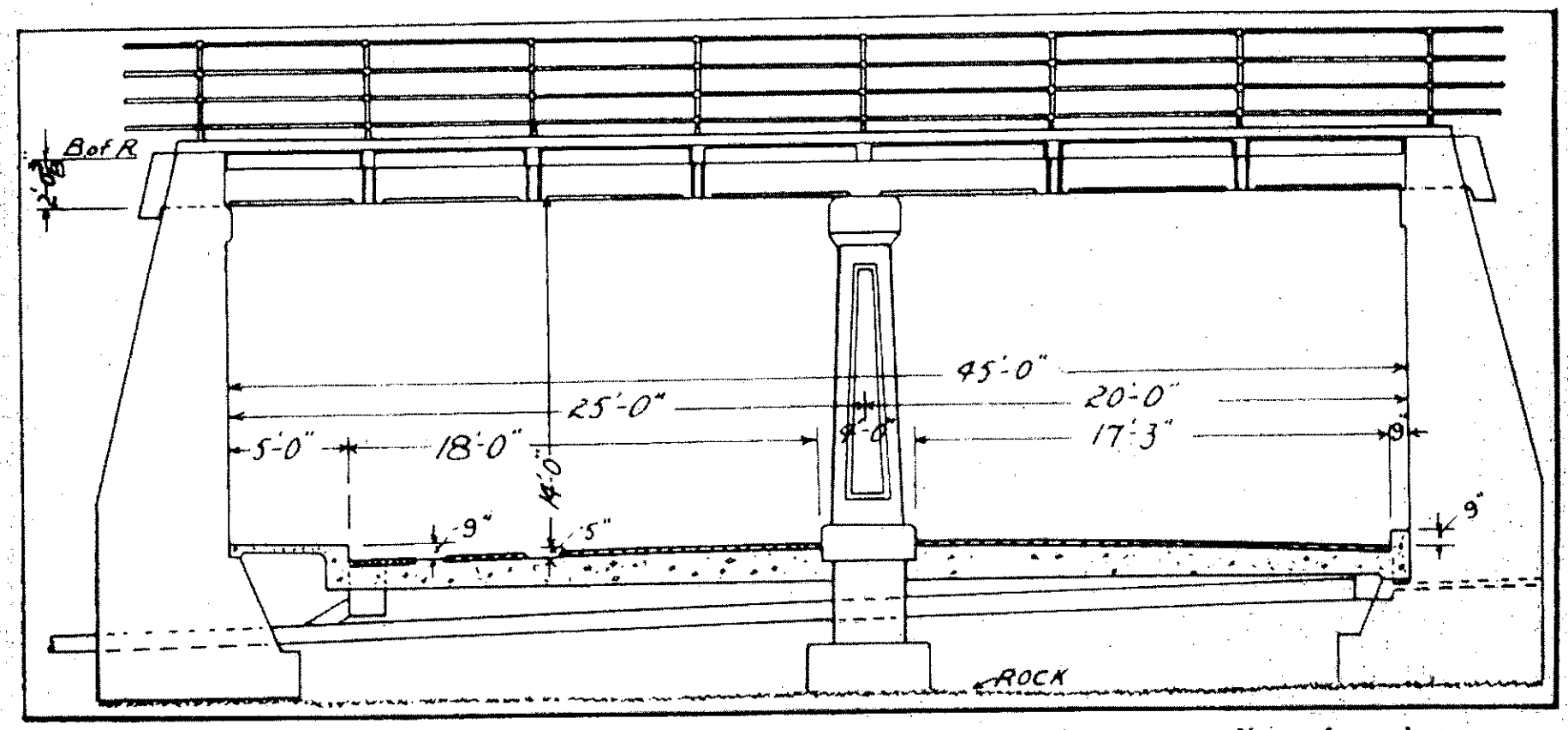
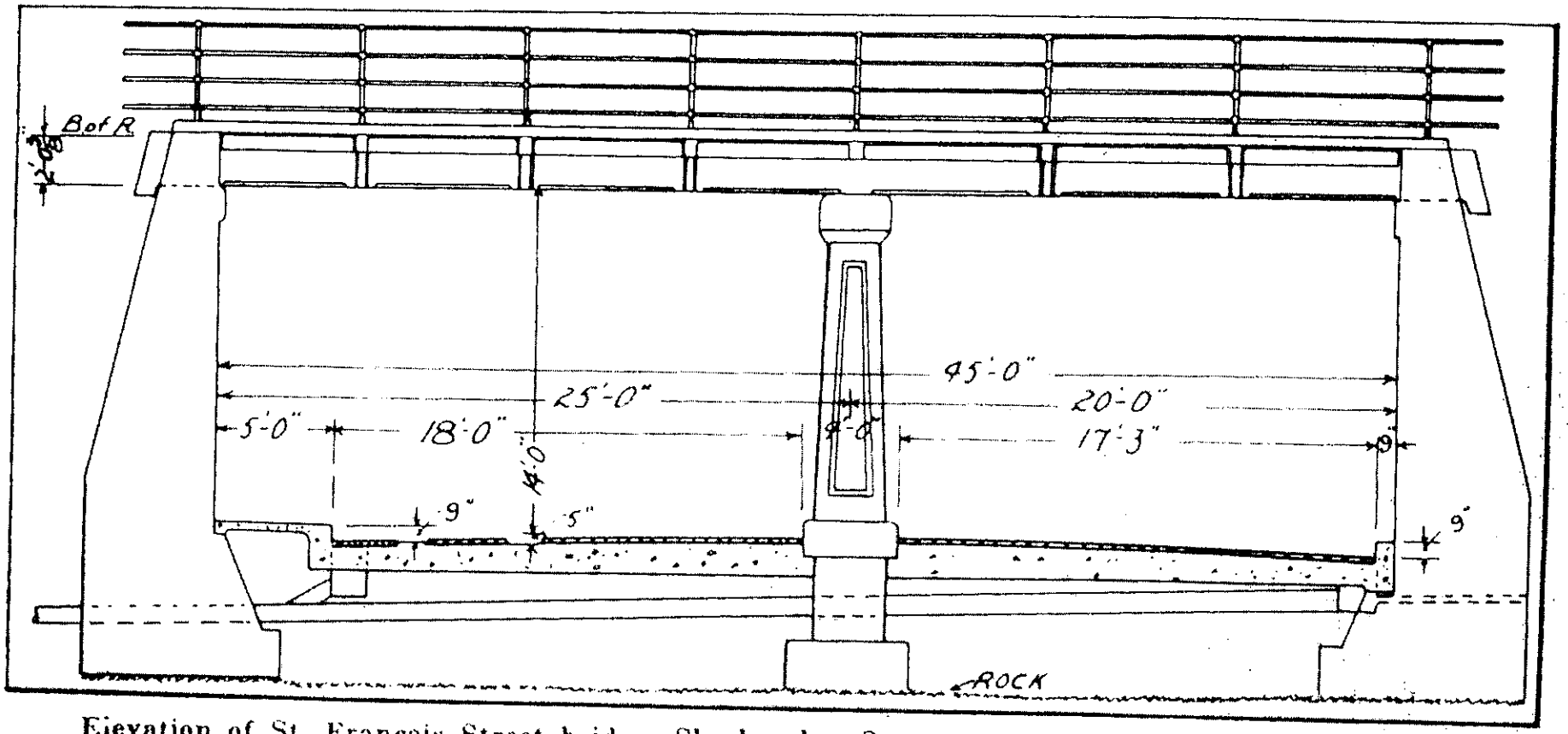


Elevation of St. Francois Street bridge, Sherbrooke, Que., normal to center line of roadway.



Elevation of St. Francois Street bridge, Sherbrooke, Que., normal to center line of roadway.

Waiting Room and Entrance to Train Concourse.

ast end of the station building is xpress warehouse and on the west the baggage warehouse, both at orm level. Reference to the block will indicate that the northwest r of the site is occupied by an exist- building, the former London Shoe premises, which were acquired by Canadian National and have been delled to house divisional offices.

e station grounds are laid out and caped in a spacious and pleasing er. A wide semi-circular driveway s the entire facade and is flanked ther side with stone wing walls, bery and grassed areas, and in the al area opposite the main entrance is a wide expanse of grass relieved flowering shrubs. Teaming yards n the baggage and express ware- s, and at the east end of the located in the basement. The elevation of the lunch room floor is 5½ ft. below the business lobby floor and 2 ft. 3 in. above concourse floor. It is thus centrally located in the layout, as patronage is equally divided between train passengers and nearby business people. Kitchen facilities adjoin the lunch room, with a service entrance direct to the platform above.

The underground passenger concourse is 117 ft. long and 35 ft. wide, with a ceiling height of 19 ft. 2 in. There are no columns and practically all the seating accommodation for waiting passengers is in this room, as experience has taught that the people waiting to board trains prefer to wait as near to the tracks as possible. The subway to the London and Port Stanley Ry. station is 9 ft. wide and 10[illegible] ft. long.

A mezzanine floor occupies the rear portion of the superstructure over the men's and women's anterooms and toilets, and houses record rooms, far room and minor offices.

The basement occupies only a portion of the substructure, and contains boiler room, electrical equipment, switchboard pipe ducts, etc., the balance being unexcavated.

This, generally, is the layout which has been developed after much study and it appears to be eminently suitable to the type and volume of business transacted at London.

Structurally, there are certain features worthy of more than passing notice. The underground concourse, for instance, is a fixed frame arched reinforced concrete structure, poured in four sections with expansion joints between each section. The side walls average 3 ft. 6 in. thick and the arch is 2 ft. 6 in. thick at the crown. All concrete used on this unit was vibrated. The subway to the London and Port Stanley Ry. is of similar construction to the concourse.

The substructure of the station, to approximately grade level, is of reinforced concrete, and above grade level is a steel frame with reinforced concrete floors and roof slabs. The exterior walls are of brick and stone, with inner linings of terra cotta. Roofs are felt, pitch and gravel type, laid on insulating material.

In point of architectural design, both exterior and interior follow modern restrained classic lines, and the station makes a decided addition to London's many fine public buildings. The large straight entrance archway is flanked by two pylons, each terminating in a finely sculptured figure symbolizing on one side "Commerce" and on the other "Engineering". This carving in technique follows the modern trend and appears to grow out of the stonework.

The exterior stone trim is Canadian limestone, and the brick, of a contrasting dark brown color, is also Canadian-made. Wood sash has been used throughout, with the exception of the large window in the entrance archway, which is of metal, with metal grilles. The main entrance doors are of white metal. The

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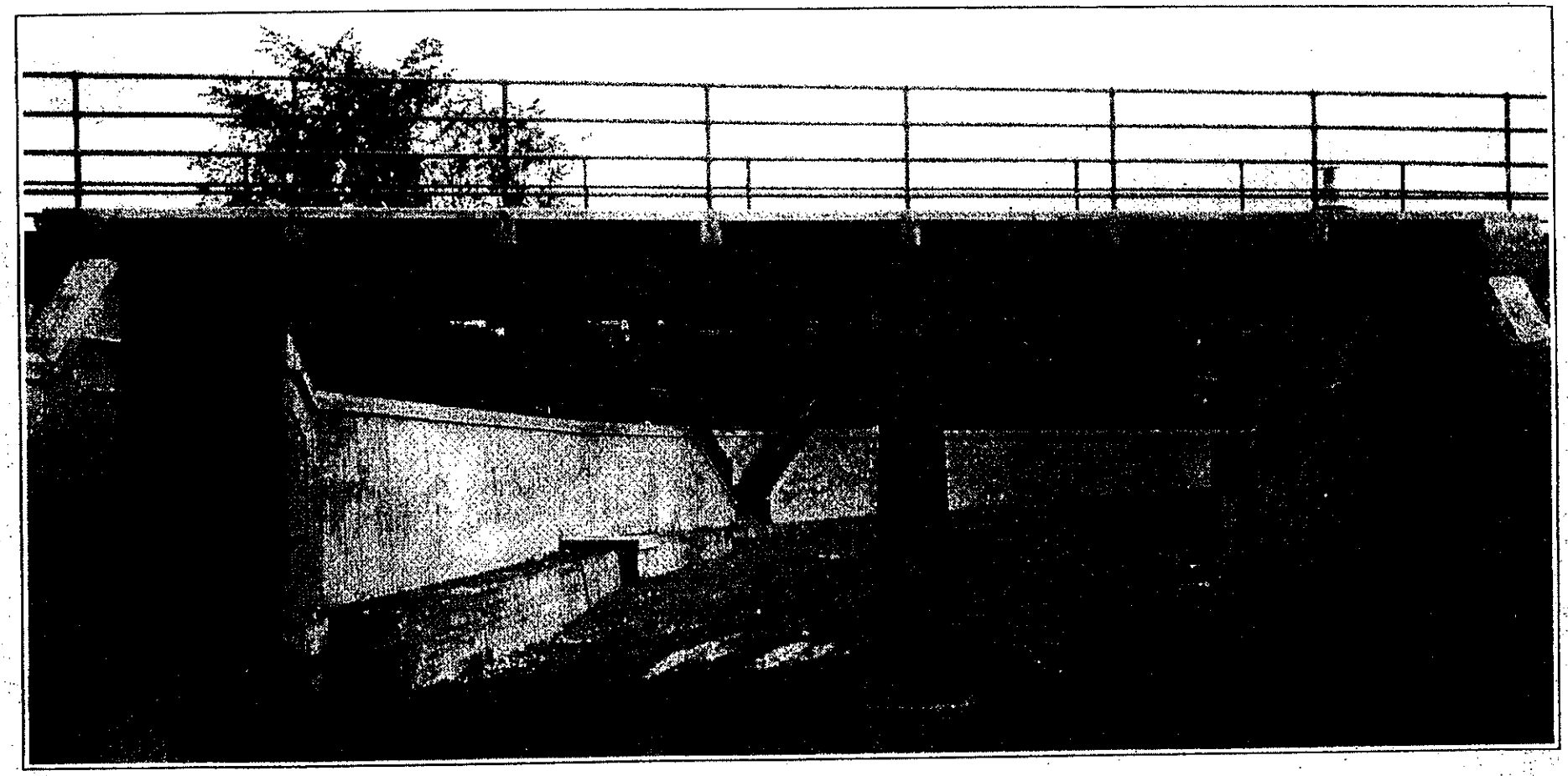

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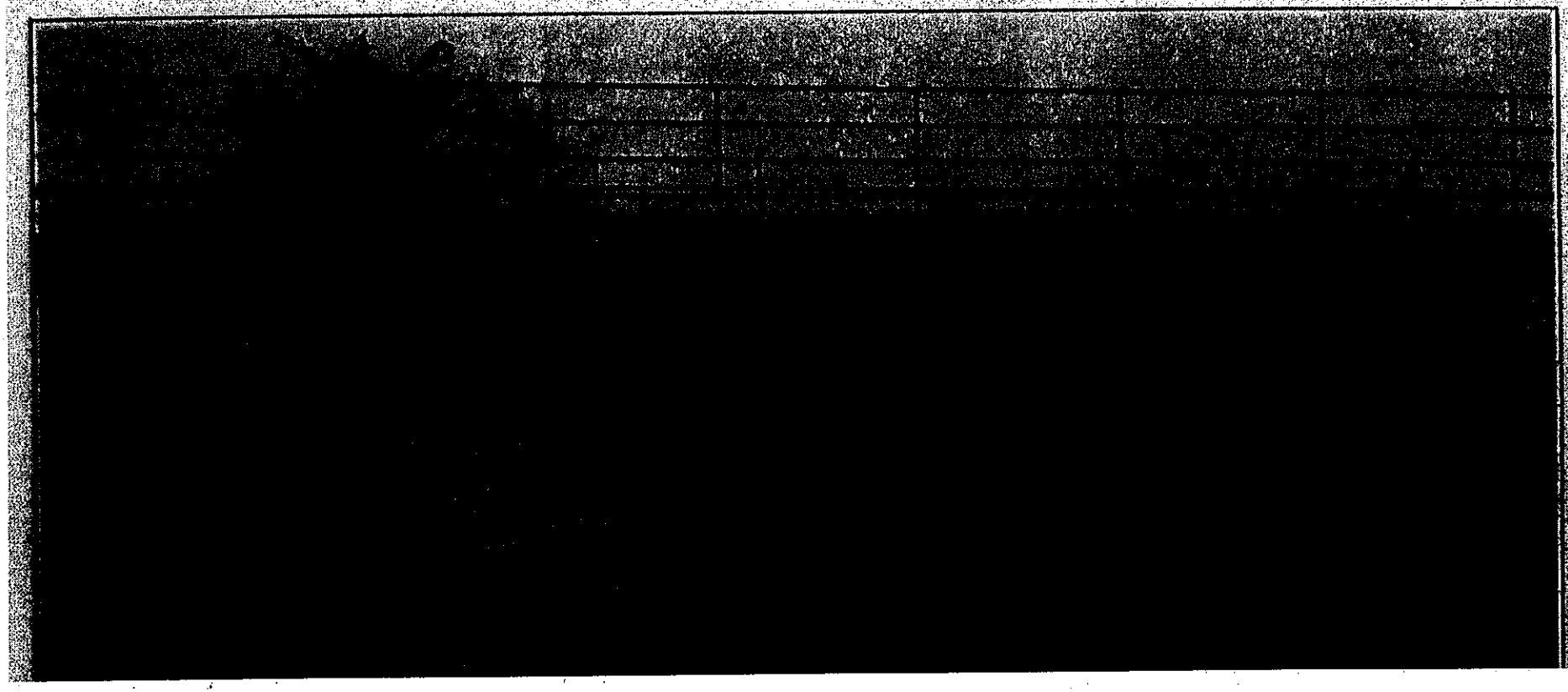
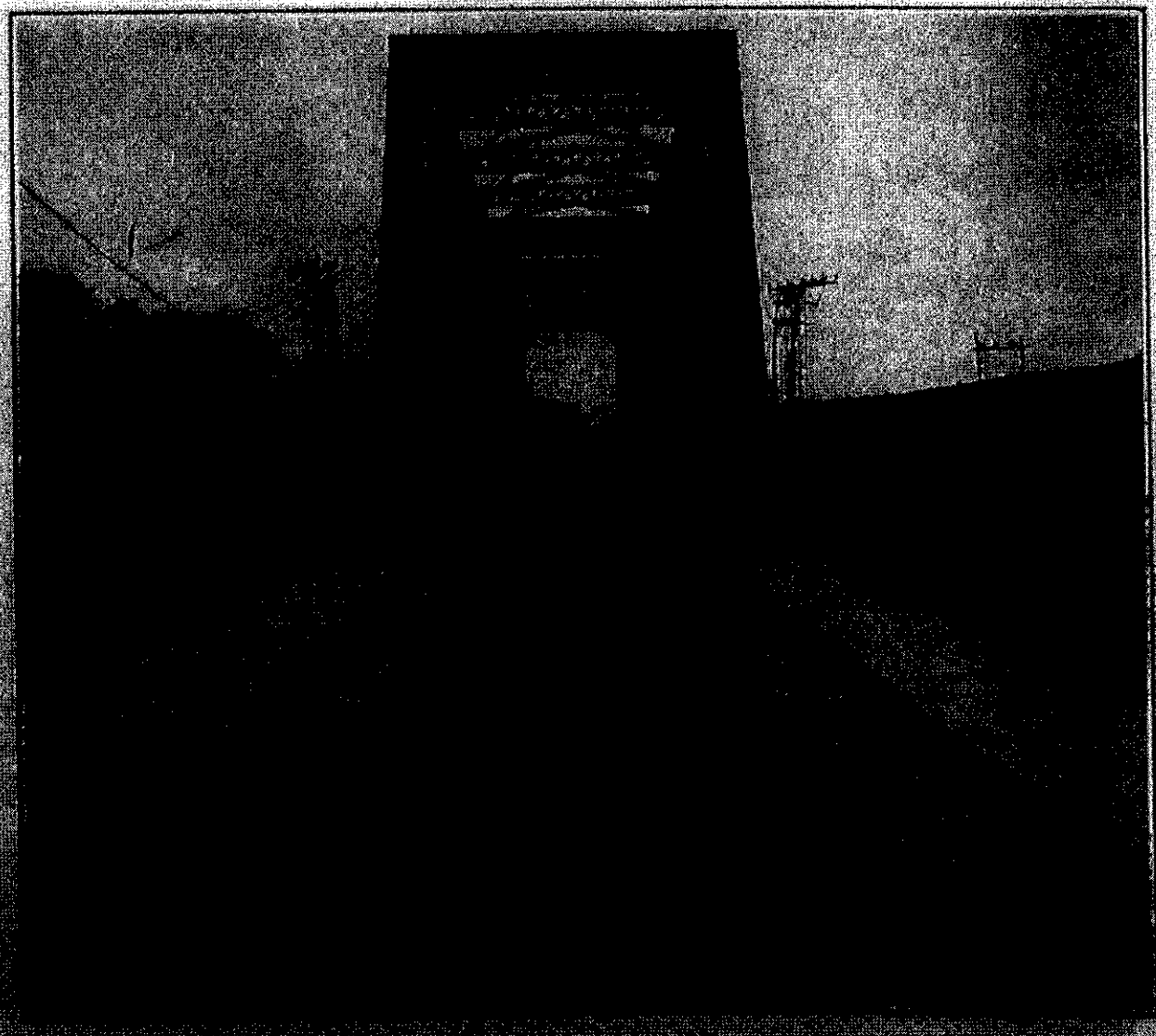


crete slab construction, supported on concrete brackets cast integral with the deck slab, the sidewalk slabs being 4 in. thick and reinforced, and also being connected with the supporting brackets by steel dowels grouted into position. The reinforcement in the deck slab consists of 1¼ in. square deformed bars. At each outside edge of the walks is a fence of pipe construction. The bridge is designed to provide for natural drainage. At its site St. Francois Street parallels and adjoins the Magog River, which the railway crosses on a steel bridge. To protect the street and roadway from high water in the river, the city built a retaining wall along the river side of the street, which ties in with one of the subway abutments. The concrete used in the subway structure was mixed to Canadian National specifications, which required ultimate compressive strength of 3,000 lb. per sq. in. after 28 days. Two lb. of Celite per bag of cement were used to secure uniform assembly and free flow of the concrete around the reinforcing bars.

Newmarket Subdivision Bridge, To-[illegible] The bridge carrying the New-[illegible] Subdivision double track line over [illegible] Avenue, Toronto, is [illegible] type. Unlike the Sher-[illegible] bridge, the Newmarket Sub-[illegible] is a deck structure [illegible] reinforced [illegible] 17 [illegible]

that on the Sherbrooke bridge, the Newmarket Subdivision bridge having track

appearance, surprisingly low cost of construction, the total having been only



$37,000, and saving in headroom made by utilization of the shallow slab. Another feature is that such a bridge can be built in relatively short time; the whole superstructure, in this case, was concreted in 72 hours, and if the material used had been early strength concrete the bridge could have been placed in operation only two weeks after the concreting. Another feature is that such a bridge will require absolutely no maintenance. If such a bridge is for more than one track, it could be built under traffic, by building only enough at a time to carry one track, and shifting traffic to the completed portion as construction progressed. This procedure was not followed in building the Newmarket Subdivision bridge, as it was found more desirable to maintain traffic at street level during the building period, and to build the bridge without the construction interfering with traffic or vice versa.

Other bridges built on the Central Region in this series include one forming the Richmond Street subway in London, Ont., one carrying Simcoe Street, Oshawa, Ont., under the tracks, and one over La Canardiere Road, Limoilou, Que. The London bridge is very wide, carrying 13 C.N.R. tracks, two London and Port Stanley Ry. tracks and a 24 ft. roadway. The distance from face to face of abutments is 66 ft., and a center pier was utilized, the clear space at each side of the center pier being 31½ ft. The deck width, including the roadway deck, is 268 ft. For this bridge the track slabs were cast in place. The track construction is the same as on the Newmarket Subdivision bridge. The track

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With such shallow slabs as those used in the bridges described, the quality of concrete was, of course, of prime importance, and specifications called for 2,500 lb. concrete in piers and abutments, and 3,000 lb. material in the deck slabs. Tests made during construction showed that the required strength of concrete was developed fully. The specifications called for minimum ultimate strength of 80,000 lb. per sq. in. in the steel used in reinforcing the concrete, tests showing this requirement to have been well exceeded.

The bridges described, all for Cooper's E-60 loading, were designed in the Canadian National Rys., Central Region, Engineering Department, of which T. T. Irving is Chief Engineer, and C. P. Disney Bridge Engineer, under direction of W. A. Kingsland, General Manager, R. A. Baldwin, Engineer of Construction, having been in charge of construction.

New Year's Messages from

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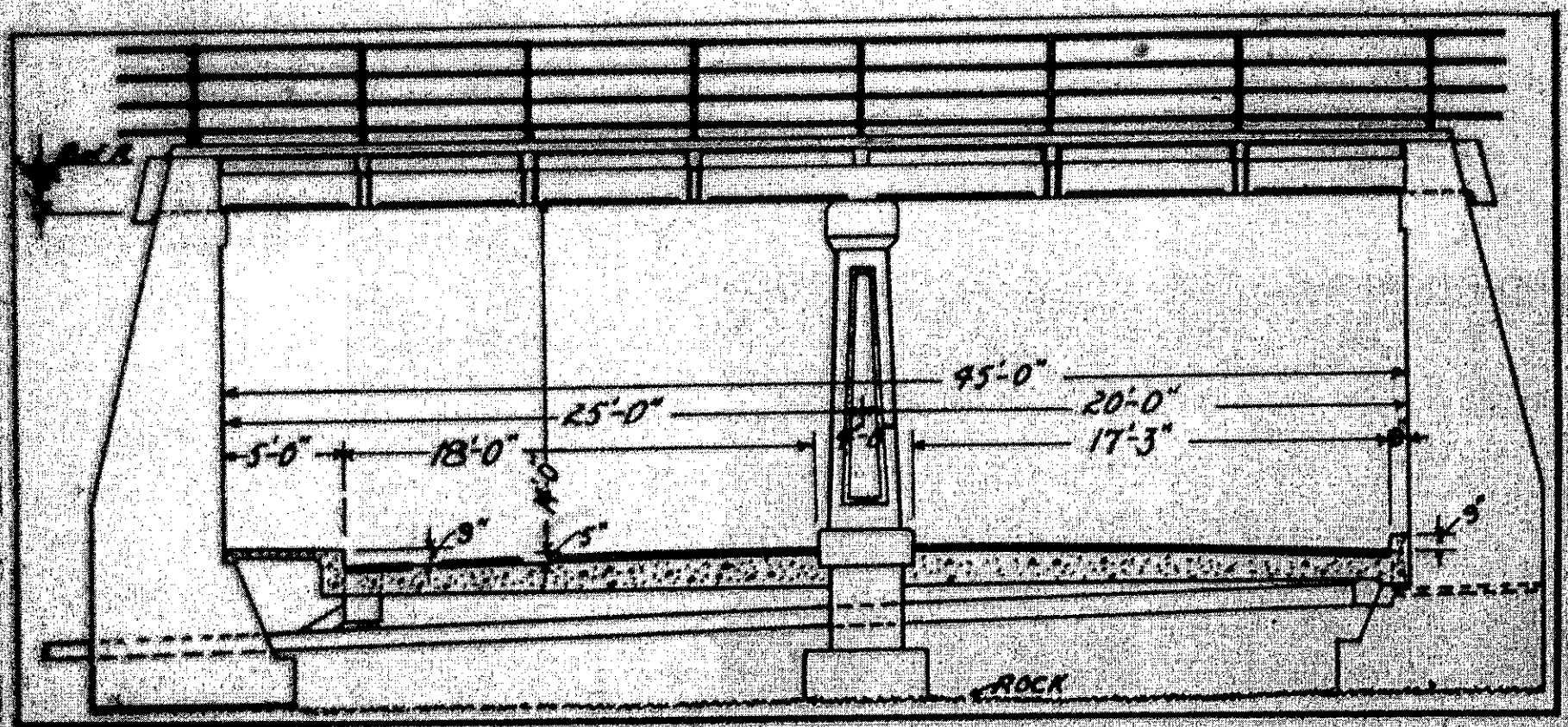
added personal sacrifices. While not minimizing the seriousness of the general situation, we may still retain our courage and our confidence in ourselves and in Canada. Problems which are particularly our own, because they relate to Canadian conditions, are receiving serious attention by our public men and leaders in finance, industry and agriculture, and the world's best minds are grappling with the complicated economic and international problems which presently exist. The result of those efforts must, even if slowly, indicate itself during the coming months. I am satisfied that our officers and employes will not only meet these unusual conditions with their accustomed courage and ability, but will make their own not inconsiderable contribution to the solution of our problems. We have the certain assurance that even a moderate improvement in the general situation will reflect itself immediately throughout the company's varied activities. I wish you all the best of health with which to meet the personal and official problems of 1933."

S. J. Hungerford, Acting President, Canadian National Rys., issued a message, Dec. 31, 1932, as follows:—"It is a

into the car, and in unloading it is forced out by air into storage tanks. In loading, the tanks are not completely filled, about 10 in. spaces being left at the top of the beer to allow for expansion of gas through temperature increase. The blow-off valve is set at 14 lb. On completion of filling the tanks, the beer pressure is reduced to 5 lb., and very seldom increases to 12 lb. in transit. The tanks are seamless, and therefore easily kept clean, and each tank is equipped with a manhole, to allow a man to enter it and wash and cleanse it. About the only repairs the car has required while being operated by the Carling Breweries have been the occasional renewing of a manhole gasket. There is space on the car, between the two tanks, for about 200 cases of bottled beer. The beer shipped in the tanks is equivalent to about 5,700 dozen pints or 3,000 dozen quarts, and as the rate on tankage beer is the same as that on beer in bottles and kegs, the use of the tank car effects a saving in the freight charge. No loss has been experienced due to beer being spoiled while being carried in the tanks.

Toronto Railway Club Activities.

were recessed to receive timber strips



Elevation of St. Francois Street bridge, Sherbrooke, Que., normal to center line of roadway.

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Elevation of St. Francois Street bridge, Sherbrooke, Que., normal to center line of roadway.

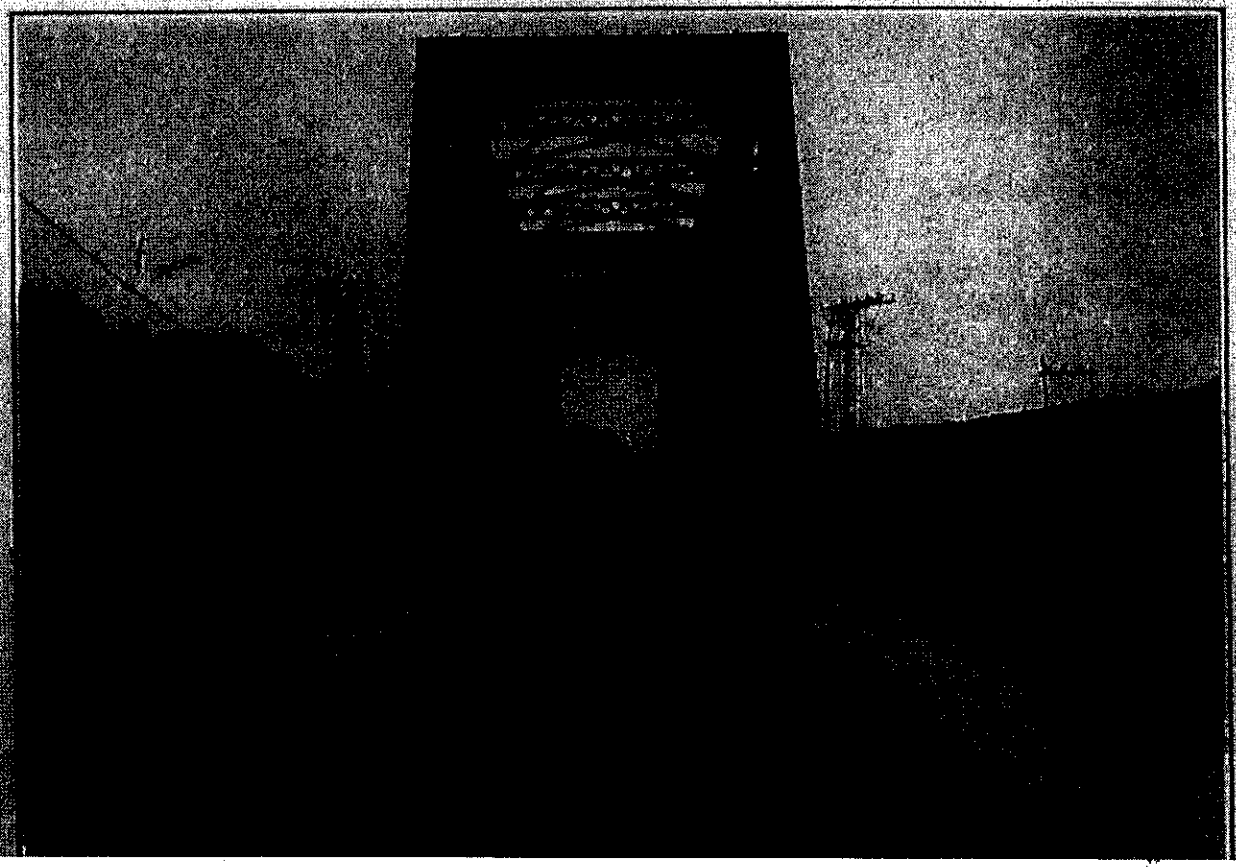
the same width as the base of rail. Steel sockets, threaded inside, were set in the concrete at 2 ft. centers; the rails are held in place by clips engaging the top side of the rail base, these in turn being held in place by bolts passing through them into the threaded steel sockets embedded previously in the concrete. At each side of the deck of the bridge is a trainmen's walk, 2½ ft. wide, of concrete slab construction, supported on concrete brackets cast integral with the deck slab, the sidewalk slabs being 4 in. thick and reinforced, and also being connected with the supporting brackets by steel dowels grouted into position. The reinforcement in the deck slab consists of 1¼ in. square deformed bars. At each outside edge of the walks is a fence of pipe construction. The bridge is designed to provide for natural drainage. At its site St. Francois Street parallels and adjoins the Magog River, which the railway crosses on a steel bridge. To protect the street and roadway from high water in the river, the city built a retaining wall along the river side of the street, which ties in with one of the subway abutments. The concrete used in the subway structure was mixed to Canadian National specifications, which required ultimate compressive strength of 3,000 lb. per sq. in. after 28 days. Two lb. of Celite per bag of cement were used to secure uniform workability and free flow of the concrete around the reinforcing bars.

[illegible] Bridge, To[illegible] [illegible] the Niag[illegible] [illegible] Toronto, [illegible] [illegible] the Stre[illegible]

depth of slab is only 3 ft. 9¼ in. There is no fixed connection between slab and center pier. The bridge being a 2-track one, the slab is 27½ ft. wide. As in the Sherbrooke bridge, the bridge is equipped with walks at each side of the deck, of reinforced concrete slab supported on brackets which are cast integral with the deck slab.

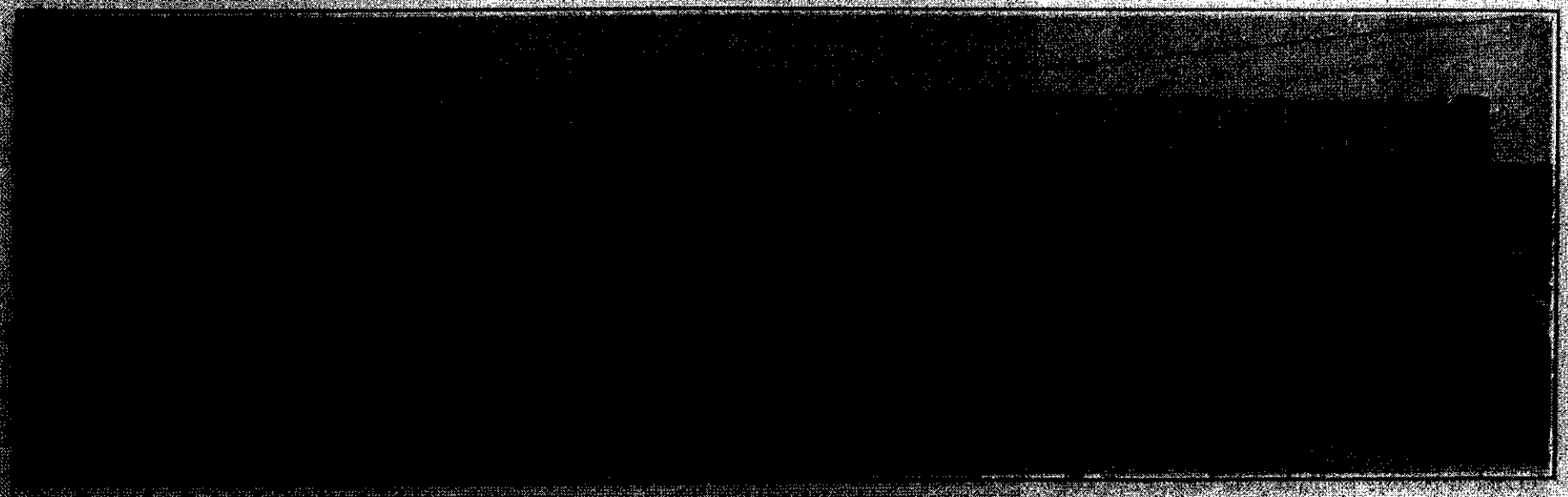
The track arrangement differs from that on the Sherbrooke bridge, the Newmarket Subdivision bridge having track bolts, and the steel sockets are given additional anchorage within the concrete by steel pins passing horizontally through them near their lower ends. There are four threaded steel sockets at each rail seat, but only two are utilized, two being left as spares, cast iron plugs being used to seal the latter. Each concrete tie weighs somewhat over 1,000 lb. and contains 0.229 cu. yd. of concrete and 100 lb. of reinforcing steel.

Features to which attention may be called in such a bridge as that on St. Clair Ave. West, Toronto, include good appearance, surprisingly low cost of construction, the total having been only



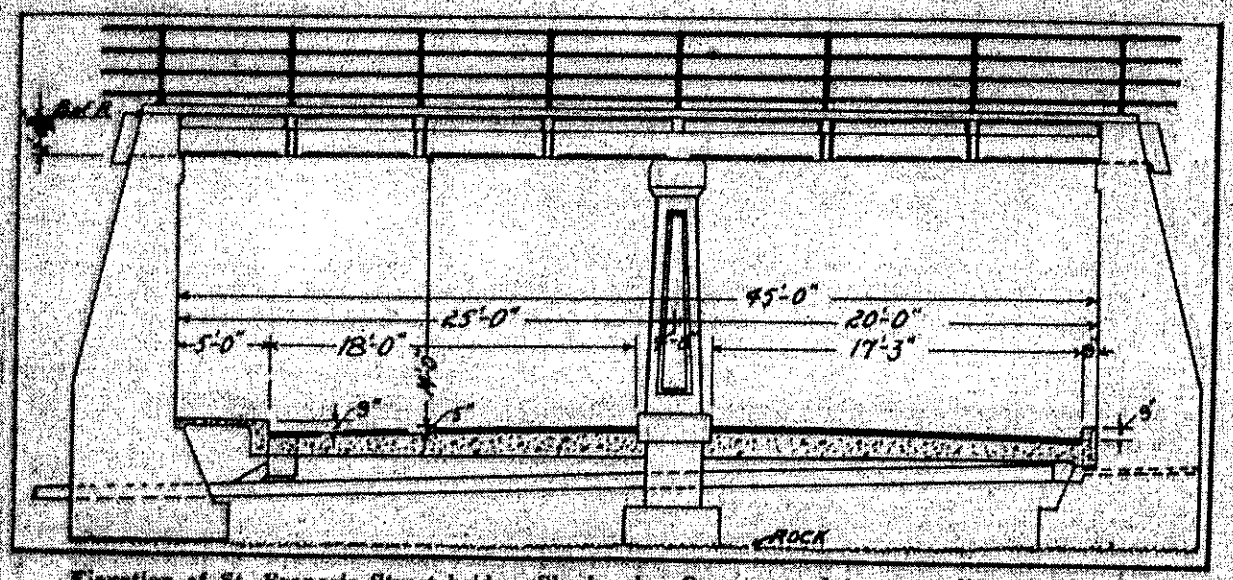
Bridge carrying Canadian National Rys. track over St. Francois Street, Sherbrooke, Que.
Note shallow slab used in deck. The retaining wall, integral with abutment at the left, protects the roadway from inundation by the Magog River, during high water.

struction of several reinforced concrete bridges of unusual design, incorporating features which, only a few years ago, would have been considered impossible of attainment. Most outstanding of these are the use of unusually long spans with relatively shallow slabs, the employment of reinforced concrete ties without ballast on the deck slab, in place of the usual ballasted deck structure, carrying the railway over St. Francois Street. As in the other bridges of the series, the features incorporated in the design resulted in securing a minimum distance between the underside of the slab and base of rail, the total distance on this bridge being only 2 ft. 0⅝ in., this being a remarkably shallow slab when it is considered that the distance from face to face of abutments is 45 ft. ous from abutment to abutment over the center pier, with the join coincident with the center line of the track, were precast near the bridge site, the work having been done by Goldie Construction Co.; the slabs were placed in position with the use of cranes, by railway forces. On the bridge seats ¼ in. sheet lead was placed to provide a uniform bearing by taking up inequalities. To provide for



Bridge carrying Canadian National Rys. [illegible] track over St. Clair Ave. West, Toronto.

a perfect join between the two slabs along the center line, a strip of sheet lead was precast into each slab, and, on completion of placing the slabs, the lead was folded over and welded, making a tight joint, in addition to which mastic filler was placed between the slab faces along the joint line. No ties were used in the track structure, but the deck slabs were recessed to receive hardwood strips



Elevation of St. Francois Street bridge, Sherbrooke, Que., normal to center line of roadway.

the same width as the base of rail. Steel sockets, threaded inside, were set in the concrete at 2 ft. centers; the rails are held in place by clips engaging the top

paratively shallow slab. Excessive stresses at the junctions of slab and abutments are taken care of by introduction of fillets, the curvature of which adds considerably to the appearance of the structure. Although the distance from face to face of the abutments is 100 ft., with clear span of 49 ft. at each side of the center pier, the slab being continuous over the center pier, the total

depth of slab is only 8 ft. 9¼ in. There is no fixed connection between slab and center pier. The bridge being a 2-track one, the slab is 27½ ft. wide. As in the Sherbrooke bridge, the bridge is equipped

consisting of concrete ties laid directly on the concrete slab, no ballast being used. The ties are 10½ ft. long, the concrete used in their manufacture, like that in the bridge itself, being of 3,000 lb. per sq. in. ultimate strength. As there is a 2½° curve in the track where it crosses St. Clair Ave., rail superelevation had to be provided, which was secured by making the ties tapered, the thickness being 7⅞ in. at one end and 6¼ in. at the other, width being 1 ft. throughout. Each tie is reinforced with five longitudinal square bars, ¾ in. thick, and seven ¼ in. stirrups, the minimum distance between the face of tie and longitudinal bar being 1⅜ in. The upper faces of the ties are grooved to receive hardwood strips, the same width as base of rail; the strips were made tapered to provide the required cant in the rails, one side being about ¼ in. thicker than the other. The method of securing the rails to the ties is similar to that on the Sherbrooke bridge, but in this case the internally threaded steel sockets are embedded in the ties. The bolts holding the rail clips are ¾ in. diam. and 4 in. long. Spring washers are used with the bolts, and the steel sockets are given additional anchorage within the concrete by steel pins passing horizontally through them near their lower ends. There are four threaded steel sockets at each rail seat, but only two are utilized, two being left as spares, cast iron plugs being used to seal the latter. Each concrete tie weighs somewhat over 1,000

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