Interprovincial Bridge

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The General Superintendent advises us that in the spring the Co. will commence work on the approach to the new Interprovincial bridge. The line, which will be double track, will be constructed on the strip of land between Major's Hill Park and the canal and every precaution will be taken to prevent the disfiguration of the park. The Co. expects to run trains into the central station as soon as the Interprovincial bridge is built and will not wait for the construction of the union station.
About 75 men are now employed on the Interprovincial bridge and but one more pier remains to be put up. The stone work will easily be completed in the summer and the iron work will be put up. There will be a double railway track, a roadway for the electric cars, one for general traffic and a walk for pedestrians.

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Work is proceeding satisfactorily on the piers. The masonry will be gone on with as soon as the water lowers, and it is expected the superstructure can be put on next fall, by the time the extension of the Pontiac Pacific Junction Ry. is completed to Hull. A contract has been let for the superstructure.

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Work has been nearly completed on the piers of the bridge.

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Workmen are now engaged on pier No. 2. Another gang has been placed at work on the approaches on the Ontario side and the work is progressing at a good rate. It is expected that before the end of the year the greater part of the work will be completed. About 70 men are employed (June pg. 175).
The Ottawa City Engineer, J. Galt, has taken strong exception to the bridge plans. He says the way the ground plan of the bridge has been designed is exceedingly objectionable, particularly as regards the approaches on the Ottawa side. It contemplates a steam railway track in the centre, on either side of this, and separated only by a wooden balustrade, there being wedged in between trusses, two 4 ft. spaces for pedestrians. Outside of these footpaths again, and overhanging the river beyond the stone piers, are on either hand, spaces 1st for electric cars, and then for vehicular traffic. Under the proposed arrangement, pedestrians, tram cars and vehicles on the down river side of the bridge will turn into the street leading up past the Printing Bureau almost on a level with Sussex Street, but all three on the up river side of the bridge will be conveyed on an incline down to a point where they can be carried, by means of a subway beneath the railway track in the centre, coming up again so as to join the remainder of the traffic in the vicinity of the Bureau. The City Engineer claims that there are two highly objectionable features to this proposed plan - 1st, the wedging in of the footpaths between the railway track in the centre and the trusses on either hand; and 2nd, that half of the traffic in the Ottawa side of the Ottawa River must perforce go down grade to a low level in order to pass through the subway and then up again to reach the level of Sussex Street. In order to remedy these defects he suggests that the centre of the bridge between the trusses, 24 ft. shall be given over to steam cars; that the up river side shall be devoted to trams going both ways, there being no objection to their going down grade through the subway and up again and that the down river side shall contain next to the truss, a 14 ft. space for vehicles and on the outside, overlooking the river, a 5 ft. walk for pedestrians.
The bridge people admit that the original plan is not at all satisfactory, but they maintain it is the best way of disposing of all of the traffic. The city contributes a bonus of $100,000 on the understanding that free accommodation be provided for foot passengers and vehicular traffic.
After the falling of the Ottawa and New York Ry. bridge at Cornwall, the Government, fearing that it was caused by defective concrete in the piers, decided to make a thorough examination of the piers of the Interprovincial Bridge. Diamond drill borings have been made and it is said the result is satisfactory.

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Work has commenced to give the Pontiac Pacific Junction Ry. and the Ottawa & Gatineau Ry. connection between the Ottawa end of the Interprovincial Bridge and the Ottawa Central station. A double track will be built, to accommodate which, a section of the wall flanking Major's Hill park, at the southern end, about 12 ft. in depth, will have to be cut away. For 90 ft. in the direction of the river the roadbed will be made solid by filling in; the line for the rest of the distance to the bridge will run on a trestle. Dufferin Bridge already has enough open space through which the trains may run, but it will be necessary to construct an arch beneath Sappers Bridge. This will be done of stone and iron.

01-Nov-1899 Page 326

On Oct 26 we were officially informed as follows:- "All the water piers of the bridge are now completed, with the exception of one course and the coping still to be laid on the deep water pier. Work on the Ottawa approach is now being rushed and the Hull approach will be started in a few days. The foundations of the piers are composed of concrete deposited in bottomless caissons which were sunk to bed-rock, the concrete being deposited in the usual way in buckets holding about one yard and being tripped when they reached bottom. The best Portland cement was used and the greatest care exercised in mixing, depositing etc. The concrete for four of the water piers was mixed by hand and for the other 2 piers by concrete mixer, an excellent machine which gave very satisfactory results. The concrete was so deposited to within a few feet of low water mark, after which the caisson was pumped out, the concrete levelled off and masonry constructed in the usual manner. The superstructure is exceedingly heavy and massive and is probably one of the largest bridges of its design in Canada. The cantilever span is 556 ft. long. Considerable trouble was experienced with sawdust which was around one of the piers to a depth of 25 ft. The design would have been simplified had it not been for the amount of sawdust under the cantilever span, the depth of which was found by using a diamond bit, to be about 60 ft. No. 2 pier is also very deep being about 70 feet to the top of concrete and about 25 ft. masonry over this. Owing to the depth of this pier it was considered advisable to satisfy everybody concerned of the stability of the structure, to make diamond drill borings through the pier to bed-rock underneath. This test was in every way satisfactory, core being produced all the way down. As far as can be learned this is the first test of the kind on record in the history of concrete in which a core was procured from any depth of bore." G.C. Dunn is acting Chief Engineer for the Bridge Co.

G.H. Duggan C.E. from whose design the superstructure is being constructed has supplied the following information:- "The bridge has a total length of 2,050 ft., consisting of a cantilever span of 556 ft., which, together with its anchor arms, has a length of 850 ft., one 247 ft. span, one 140 ft. span, 750 ft. of trestle approach on the Hull side and 60 ft. of trestle approach on the Ottawa side. The trusses of the cantilever and other river spans are spaced 24 ft. apart centre to centre giving room for a single track railway and 2 wide sidewalks. Outside the trusses on each side brackets are extended 19 ft. to provide for the electric railways and waggon traffic. This bridge has been designed for very heavy traffic - a load of two 125 ton locomotives followed by a train of 3,000 lbs. per lineal foot having been taken for the railway track and trains of four electric cars of 30,000 lbs. each on the electric railway tracks, the whole being taken at the railway unit stresses specified by the Department of Railways and Canals.

It is not expected that the superstructure will be erected before next spring. The Ottawa City Board of Works has not sustained the City Engineer's objections to the approaches to the bridge on the Ottawa side. (Oct pg. 294).

01-Dec-1899 Page 353

The entrance of the railway to the Ottawa central depot from the Interprovincial Bridge will entail a considerable amount of hard and expensive work, notwithstanding that the distance is less than a mile. Almost the entire way there is much rock work. Along the line by the Major's Hill Park considerable stone work will be necessary and it is hoped to have most of the foundation completed by the time the frost stops this work. It is proposed to continue work all winter and in order to facilitate operation rails have been temporarily laid from Dufferin Bridge along the side of the park. The construction should easily be completed by spring, as heavy steam drills and a good sized staff of men are now employed and will be through the winter. (Oct. pg. 327)

01-Dec-1899 Page 352

It is now said the erection of the superstructure will be commenced this month. A track has been laid from the CPR north shore line to the Hull end of the bridge, so that the material for the superstructure may be taken in over it. (Nov., pg. 326).

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On the south approach between Nepean Point and Sappers Bridge, work is being continued through the winter and it is expected to have all the substructure completed early in the spring. On Jan. 19 we were advised that the centre portion of one truss on the superstructure was in place on the Hull side and another one was being erected. (Dec, 1899, pg. 352.)

01-Apr-1900 Page 113

On April 4 we were informed as follows: "The centre portions of the spans between piers 4 and 5 and between piers 5 and 6, are in place and the cantilever arm between piers 2 and 3 is being erected but owing to he expected break up of the ice, very little more will be done before it goes out. The approach on the Ontario side is being pushed and in a very short time the north approach on the Quebec side will be commenced and rushed to completion. (Feb., pg. 41.)

01-Jun-1900 Page 175

On May 28 we were officially informed as follows: Work is progressing very satisfactorily. The iron work is practically completed on two truss spans on the Quebec side of the river, also the south anchor arm of the cantilever with the exception of the waggon road bracketing at side of same, some of the riveting and diagonal bracing. Owing to high water, they were obliged to block this span on the piers, but are now letting it down and expect to get it in place in a couple of days. (This has since been done). There has also been several hundred feet of trestle laid on the Hull side. We are pushing the south approach to completion, including work on a very heavy dry masonry retaining wall and an undercrossing on the road for vehicular traffic. We are also engaged in cutting through the abutment of Sapper's Bridge, a rather interesting piece of work, as it was built in 1837 when Co. By first reached Ottawa. The total thickness of the abutment is 24 ft., the outside walls in some places being only 2 ft. thick, apparently laid in water line, which is now about the consistency of sand. The filling between the walls is composed of earth and some small broken stone. The stone is in fairly good condition with the exception of about 2 ins. on the outside, which the weather has had a chance to work at. (April, pg. 113).

Reports of the progress of the work on this bridge, now nearing completion, are given regularly in our Railway development department and description on the structure will be of interest. It will connect Ottawa with Hull and will have a total length of 2,286.75 feet between abutments. It is being built entirely of mild steel and consists of pin connected truss spans over the river and a long plate girder approach viaduct at the north end, besides 2 short girder spans over the steep rocky bank between the end pier and the abutment at the south or Ottawa end.

The most prominent feature of the superstructure is the cantilever portion, which is 1,053.75 ft. long between anchorages, with a clear span of 545 ft. between centre piers. The anchor arms are each 247 ft. long, the channel arms each 123.5 ft. and the suspended centre span 308.75 ft. The sub panels are in uniform units of 30 ft 10½ ins. The greatest depth of truss is 90 ft. centres, and the depth of the centre span is 45 ft. The trusses are in vertical planes 24 ft. apart throughout the whole structure, the outlines of which are shown in the general elevation. The roadway platform is 65 ft. 2 ins. wide and is designed for a single track to accommodate the Ottawa and Gatineau and the Pontiac Pacific Junction Railways, 2 electric car tracks, 2 carriageways, and 2 sidewalks. On the north approach the roadway is at a grade of 0.238% and is a deck platform except at the 60 ft. and 67 ft. street crossings, which are through plate girder spans. All the main spans are through truss spans with a horizontal roadway platform, 7 ft. 2 ins. above the centres of the horizontal bottom chords and 34 ft. 9 ins. above the tops of the channel piers. The piers are built of masonry down to a point below low water where they rest on concrete footing carried to bed rock. Piers 4 and 5 were built through ice 30 ins. thick, in shallow water, on rock bottom so level that the cribs were sunk with their lower course of timbers hewed to fit the smooth surface, as shown in the elevation of the south anchor pier. The north anchor pier is taller and has a different type of crib, which was sunk through sawdust deposit. The stone masonry of all the channel piers corresponds to that in pier 4. Pier 1 was built without any crib, the masonry being laid at low water directly on the blasted rock bottom. Piers 2 and 3 were built in much deeper water and their concrete footings were constructed inside of very tall cribs which were sunk by dredging through 20 or 30 ft. of sawdust, waterlogged timber and other material difficult to remove. In some places between the piers this deposit was 60 ft. thick, but the piers were located so as to penetrate it in its thinnest places. The crib for pier 4 was essentially like that for pier 2 which is shown in plan and cross section. Its walls were solid courses of green 12 x 12 in. hemlock timber slightly battered upstream and on the long sides and braced by 4 cross beams tied into both sides at every fourth course. These side pieces were dovetailed between adjacent wall courses and projected about 3 ft. beyond them on each side to receive the planking of pockets which were filled with stone ballast to sink the crib. The 8 lower courses were each successively offset 4 ins. so as to extend the base of the crib to 29 x 40 ft. exclusive of the cutwater.

The lower part of the crib was built on shore. After it was launched, vertical 3 x 12 in. planks were spiked on outside, projecting below the bottom course to conform to the profile of the bottom previously obtained by soundings. The crib was floated with the lower four courses submerged when the vertical sheathing was spiked on, covering the sides to the 6th course. In order to work at the sheathing, a raft was built inside the crib and the edge of the latter was pried up from it with long levers so as to cant the crib over far enough to allow the spiking to be done above the surface of the water. Cribs 2 and 3 were located by the intersection of the bridge axis with transit lines from a fixed point on one shore to different points on the opposite shore.

For sinking the cribs 2 special scows were provided 80 ft. long, 20 ft. wide 5½ ft. deep and curved at each end. The bottom and deck of each scow was made of 2 in. caulked transverse planks extending across its full width and spiked to the top and bottom chords by 4 longitudinal intermediate trusses. The sides were made of heavy planed timber, butt jointed and bolted to inside vertical posts with cover splices and the joints of the top and bottom courses. The longitudinal trusses were intersected by 3 solid transverse portions or bulkheads, which divided the scow into 4 watertight compartments and contributed to its stiffness. The scows were placed parallel to each other and connected by 2 queen-post combination trusses about 10 ft. deep and 50 ft. long, which were bolted firmly across their decks so as to leave a rectangular 30 x 60 ft. well between them and the scows, in which the crib was suspended by four 2 in. screw rods, by which its descent was regulated. The scows were anchored in a 3 mile current, to the adjacent piers, when these were available, and by Chinese anchors, and the cribs were also anchored by up and downstream diverging lines, which were also attached to Chinese anchors.

As the cribs were lowered, their ballast pockets were filled with broken stone, shoveled in from the decks of the scows, and their sides were built up with additional timber courses until they were landed on the bottom. Slabs as much as 30 ft, long were found bedded in the sawdust and it was excavated slowly and with difficulty by a 1½ yard clam-shell dredge bucket which removed about 150 yds. a day. The material was so stiff that the sides of the excavation stood vertical and the portions raised to the surface were tough coherent masses. Planks were laid across the tops of the cribs and they were loaded with rails and other temporary weights piles on to sink them. At pier 2 the water was 40 ft. deep and the sawdust was 30 ft. deep and at pier 3 the sawdust was about 20 ft. deep.

The bottoms of the excavations inside the piers were cleaned by divers, who leveled off the irregularities and guided diamond drills, with which holes 12 ins. deep were made. These were charged with dynamite and the worst irregularities of the rock bottom blasted off. A maximum depth of 72 ft. below low water level was thus reached. The crib was filled with 1:1:3½ Portland cement concrete made with 2½ in. broken stone. The concrete was made in a horizontal mixing machine and deposited by a 1½ yard bucket with double flap doors on the bottom, which opened downward and allowed the concrete to remain on the bottom when the bucket was hoisted. Over 100 bucketfuls were deposited in water 70 ft. deep in one day of 10 hours. At first the concrete mixer was set on the deck of the scow but after about 1,000 yards had been deposited, filling the crib to a depth of about 25 ft., the work on it was stopped on account of fear caused by the collapse of the concrete pier of the Cornwall bridge. It was not resumed until April 1899 when the mixing machine was set up on shore and the concrete mixed with heated sand and water and taken in sleighs across the ice to the crib.

The contractors were also directed to warm the interior of the crib which was filled with water circulating freely from the river. They accordingly established a 10 h.p. boiler on the deck of the scow and discharged live steam from it into the water. The crib was filled with concrete up to 18 ins. of low water mark; a tight coffer dam was then built on top of it, pumped out and the stone masonry laid in it. After the concreting was completed, the Government required a test boring to be made through it to bed rock with a diamond drill. A 3 in. bit was drilled down to within a few feet of the bottom, the hole cased and a 2 in. hole drilled the remainder of the distance. A core was recovered from the whole depth of the hole, which was in every way satisfactory, showing that the concrete was well set though still green. One diamond-drill hole was bored nearly to the bottom of the concrete and a second one was bored entirely through it and into the bed rock. The core was recovered in short pieces less than 12 ins. long and did not, of course, measure up equivalent to the length of the hole, but did give data of the condition of the mass at all depths. About 4 months were required for the drilling of both holes. To test the efficiency of the method of depositing the concrete, a bucket full of it was lowered to the bottom of the crib, then drawn up to the surface, again lowered a little, dumped in

a submerged box and allowed to set there. When it was examined it was strong and sound, with no evidence of washing or deterioration by the movement through the water.
The principal cross-sections of the cantilever spans are given in diagrams off transverse vertical planes lettered to correspond with the references on the general elevation. The sway bracing consists in general of heavy upper cross struts and multiple intersection diagonal angles, with a light bottom cross strut or with no lower cross strut at all. Where the roadway is elevated the most above the lower chord, there is transverse diagonal bracing below the floor beams. At the anchor ends of the cantilevers, the end lower chord pins are attached at the middle of the floor beam with short diagonal braces. The under side of this strut has a projection which slides in a longitudinal seat in a casting bolted to the pier masonry, so as to allow for temperature movements of the truss and to hold it securely against any lateral displacement. The main lateral system is that in the plane of the floorbeam lower flanges, where each panel between the planes of the trusses is braced by struts made up of 4 angles riveted together back to back and riveted to connection plates on the bottoms of the floor beams. Besides these the alternate panels included between the projecting ends of the floor beams outside the trusses and the stringers are X-braced with single angles. There is X-bracing of pairs of angles in every panel of the top chords except in the second panel each side of the main posts of the trusses. The diagonals are complemented by the top struts of the sway-bracing systems and by a continuous centre longitudinal strut running through every panel.
In order to simplify the supports and save room on top of the masonry, the ends of the adjacent bottom chords of the cantilever and the 247 ft. river span are to be supported by single pedestals common to both spans on top of pier 4. The essential features and general arrangement are shown in an elevation made from the accepted study of the pedestal. A 4 x 6 ft. grillage of 10 in. longitudinal I beams with top and bottom plates, sets on the masonry and receives 2 nests of rollers. Between these there is a space left for the steel loops which engage the end pin of the cantilever span above and pass down through the pier well to connect with the anchorage platform built into the masonry. Above the rollers is a second set of grillage made of two sets of 8 in. transverse I beams with very heavy top and bottom plates, which support a tall pedestal with two pins. The lower one receives the anchor bars and the cantilever truss members; the upper one is about 2 ft. above it in the same vertical plane, and receives the members of the short truss and the pedestals of the pier floorbeam. At the south end of the cantilever span the pedestal on pier one receives only the anchor-arm truss and is anchored by 6 in. vertical eye bars. The grillage is composed of eight 15 in. longitudinal I beams 4½ ft. long, and the pedestal is seated on the rollers without the interposition of an upper grillage.
The bridge is being built under the supervision of G.C. Dunn, acting Chief Engineer of the Ottawa & Gatineau and of the Pontiac Pacific Junction Rys.

01-Aug-1900 Page 239

Work is proceeding on the superstructure and it is hoped to have the bridge completed in October or November. (Jly., pg. 195).
The Dominion Parliament last session voted $100,000 in additions to $112,000 previously granted, towards the construction of this bridge, on condition that it provide suitable facilities, to the satisfaction of the Minister of Railways, for vehicular and foot traffic the same as upon a public highway.

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Picture of the Interprovincial Bridge recently completed over the Ottawa River, between Ottawa and Hull.

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Extending from Nepean Point across the Ottawa River to Hull. The main bridge is 1,437 ft. long having a cantilever span of 556 ft., two arm spans of 247 ft. one truss of 247 ft. The cantilever span is the longest in the Dominion and only a few others exist which are longer. These spans rest on piers built on bed rock and composed of concrete placed within bottomless caissons to within 2 ft. of low water level, and from that point up of first class masonry. Pier no. 2 (the second from Nepean Point) is 100 ft. high, 70 ft. of concrete and 30 ft. of masonry making one of the highest concrete pillars built in this manner in America, and as far as is known the only one in the world that has been successfully tested by a diamond drill from the top to the bottom, producing satisfactory core. A heavy deposit of sawdust had to be removed to place the foundation at each of the piers, in some cases reaching a depth of over 20 ft. By test borings sawdust and slabs were found to be under the main span to a depth of 60 ft. with 20 ft. of water over this. The north approach in the Province of Quebec is upwards of half a mile long, being composed of heavy steel and timber trestle, the former resting on concrete superstructures, and crossing over seven streets in Hull by heavy steel bridges resting on concrete abutments. The south approach from the end of the bridge to Central station, Ottawa, is over half a mile in length, and is for the most part cut out of solid rock, and has an outside retaining wall for the entire length built of heavy masonry, in some places being 50 ft. high. In this length are included two structures built of heavy steel for three tracks of railways, one bridge carrying the railway over the waggon road which leads from the bridge to the city and the other being a steel trestle 300 ft. long and in places upwards of 60 ft. high carrying the railway over a government road. The main bridge is 65 ft. wide having one steam track in the centre and foot passenger, electric tracks and roadway for vehicles etc. at each side, the waggon road portion having the approaches to each side laid out in such a manner that vehicles and pedestrians do not have to cross the steam railway tracks. Work was commenced on the bridge in Feb. 1898, the first locomotive crossed in December 1900 and the first passenger train on April 22, 1901. H.J. Beemer was contractor for the entire work. A very satisfactory test of the bridge was carried out April 19, by loading it with four locomotives and ten cars loaded with steel and stone, giving a total weight of between 450 and 500 tons, the deflection on the cantilever span being about 2 inches both in dead and running load. G.C. Dunn, Chief Engineer of the Ontario (sic), Northern and Western Ry. was also Chief Engineer for the bridge, it was built by those companies jointly. Steel poles and brackets are being erected on the approaches and structures and wire is being strung for electric cars. (June, pg. 171.)

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It is reported that at the solicitation of the Mayor of Ottawa President Beemer has decided to name the bridge "Alexandra" and will invite the Duke of Cornwall and York to formally designate it. (Aug., pg. 229.)

01-May-1924 Page 224

The question of the reflooring of the highway section of the Interprovincial Bridge between Ottawa and hull is being considered. The CPR is stated to have threatened to close the bridge to general traffic until the planking is put in order. The Ottawa City Council, at a recent meeting did not favour taking any action until the Hull City Council agrees to pay for its share of the work.

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Protection for pedestrians on Interprovincial bridge

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Protection for pedestrians

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Protection of pedestrians

01-Jul-35 Page 315

The Board of Railway Commissioners passed order 52016 June 10 extending until July 15 the time within which the CPR is to provide protection for pedestrians in the bridge over the Ottawa River.