about 4 miles per hour. A float thrown out in front of the span showed the speed of the current to be between 4 and 5 miles per hour and the span followed this float very closely until the seventh range was passed. At the seventh range the speed of the span was checked and the span brought practically to a standstill for a moment in order to show that the tugs had perfect control of the

Fig. 7.—Showing Span in Place After North Mooring Arm Had Been Connected and Just Before Scows Floated Away.

floating structure. It took approximately 3 minutes to stop the span. The span was then about three-quarters of a mile from the main bridge site and from then on was allowed to move slowly forward at a speed of about two miles per hour, and as it approached the space between the two cantilever arms it was lined up parallel to the main bridge by ranges on the shore and normal to the bridge by centering targets suspended by wires at the middle of the opening between the cantilever arms.

At 6.50 a.m. the span arrived at the bridge site and the mooring lines were connected up to the cast steel snubbing posts located at each of the four corners of the suspended span. These 1¼-in. steel mooring ropes, eight in number, four at each end of the span, were calculated to take a pull of 75,000 lbs. each and passed through sheaves at the lower corners of the mooring trusses and from there up to a nine-part ¾-in. wire rope tackle which led back to the drums of the derrick hoists situated on the bridge floor at the ends of the cantilever arms. The span was pulled directly under its final position in the bridge by means of these 1¼-in. ropes and the derrick hoists. The hanger lifting chains which were to raise the span were then lowered and connected through the slotted holes at the lower ends to the pins at the top of the short hanger links connecting to the supporting girders under the end corners of the span. This connection was made at 7.40 a.m., when the current was practically at zero; that is, the tide had turned and the current was about to change from a westward to an easterly flow.

The mooring frames were made up of two steel trusses braced together, the bracing being designed to take a transverse pull from each end of the suspended span of 300,000 lbs. They were pin-connected to the cantilever arm floorbeams so that by means of the nine-part ⅞-in. wire rope tackle leading from the lower corners of the trusses to the connection to the floor between panel points CF5 and CF6 of the cantilever arm and from there to the main hoists situated on the bridge floor, they could be raised so as not to obstruct the channel unnecessarily.

The hanger chains at each corner of the span were made up of four slabs to each chain, each slab being built up of two 30-in. by 1⅛-in. carbon steel plates. The slabs were manufactured and shipped in lengths of about 30 ft. centre to centre of end connecting pins. They were controlled after being suspended from the jacking girders located at the elevation of the bottom chords of the cantilever arms, by means of a two-part tackle connecting to the cantilever arm trusses at panel point CL2.

Details of Lifting Apparatus.—The hoisting apparatus at each corner of the span is illustrated in Fig. 2. A pair of supporting girders 6 ft. 11½ ins. deep and 25 ft. 0 in. long and braced together by bearing and pin-connecting diaphragms and cover plates, were placed under each corner of the span. The plate-lifting chains were pin-connected to these girders and also riveted to the same girders and passed up through a set of upper and lower jacking girders to which they were alternately pin-connected as the jacks between the upper and lower jacking girders were operated. These jacking girders were each made up of two plate girders 9 ft. 0 in. deep and 22 ft. 6 ins. long, connected together by cross bearing diaphragms and cover plates. The upper jacking girders were the movable girders and slid up and down in the stiff built guides which were riveted into the lower jacking girders, passed up through the upper jacking girders and connected to the stiff hangers which led on up to the upper supporting girders. These upper supporting girders were placed on top of the CUO joints of the cantilever arms, and were of similar construction to the lower supporting girders. The load of the span

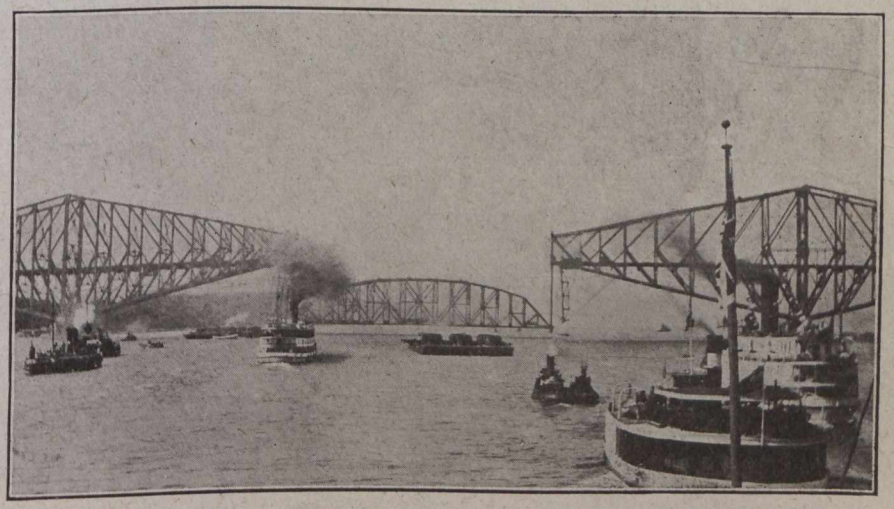

Fig. 8.—Taken Just After the Barges had Left and the Load is Being Carried by Cantilever Arms. Note One of the Specially Built Barges Floating Down Stream.

was transferred to the upper and lower supporting girders, by means of cast steel rocker bearings, designed so as to allow the span to sway in any direction under the influence of external forces from current and wind which might have acted while the span was being hoisted.