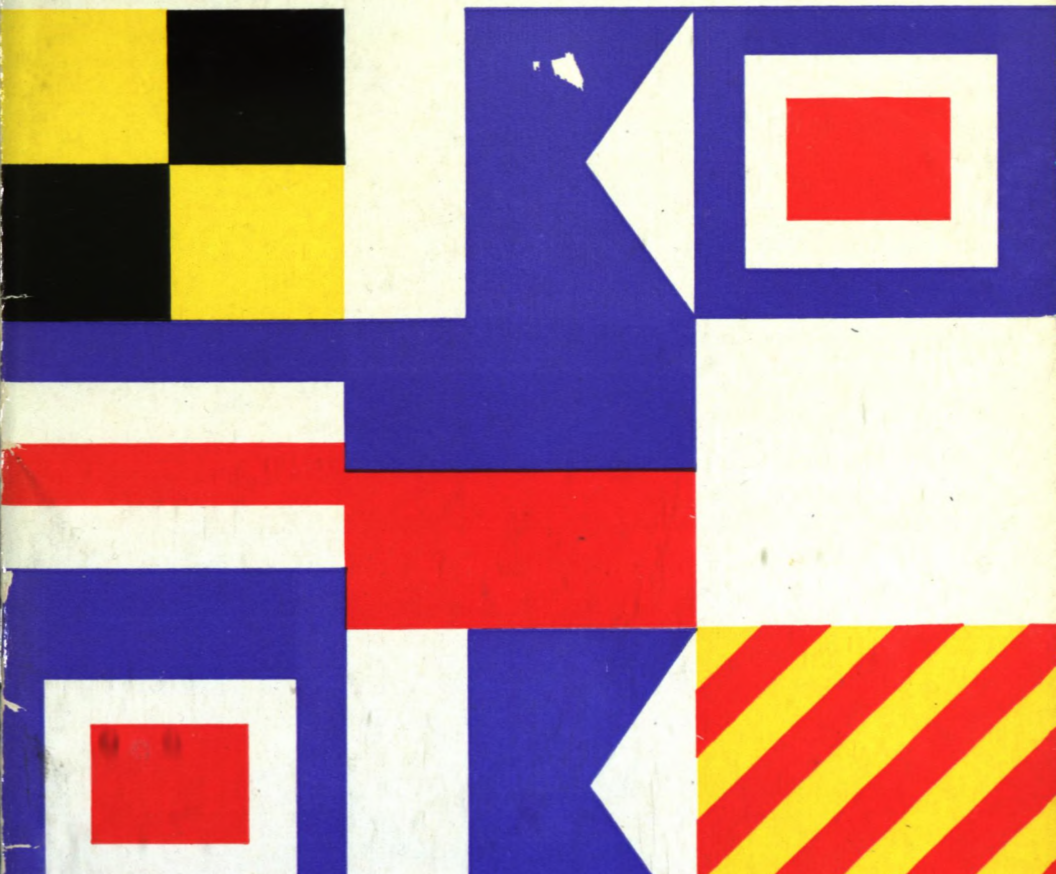
The St. Lawrence Seaway



The St. Lawrence Seaway

The St. Lawrence Seaway was formally opened at Montreal, June 26, 1959, by Her Majesty Queen Elizabeth II of Canada and President Dwight D. Eisenhower of the United States of America. This ceremony marked the completion of five years of intensive work on the 191-mile section between Montreal and Lake Ontario which has seen great locks and deep channels replace the older, much smaller ones which denied ocean-going vessels access to the heartland of North America.

Navigation through the new Seaway had been inaugurated at Montreal, April 25, when the Canadian Government ice breaker "d'Iberville" led a group of inland and ocean ships into St. Lambert Lock, the Seaway's easternmost gate. The Hon. George Hees, Minister of Transport, and a large group of Members of Parliament and Senators were aboard the Canadian vessel. Simultaneously, a flotilla of vessels entered the Iroquois Lock at the western end to begin the first east-bound passage through the newly completed channel.

Thus has been brought to reality the dream of a deep waterway from the Atlantic Ocean to the head of the Great Lakes, which has been of concern to Canadians since Jacques Cartier, in the early part of the 16th century, was blocked in his attempt to find a north-west passage to the Orient.

In one of the most ambitious construction ventures since the Panama Canal, Canada and the United States poured more than a billion dollars in all into the task of preparing the mighty river for deepwater navigation and of harnessing its power for the development of vast new supplies of hydro-electric energy. Thousands of men were engaged in one of the most incredible engineering and construction jobs ever attempted, and in some ways the hardest. Historic communities on both sides of the St. Lawrence had to be moved to new locations as the neighbouring nations worked in close partnership in the low-lands across which they had exchanged insult and salvo in earlier days.

The work on the Seaway was carried on in Canada by the St. Lawrence Seaway Authority, and in the United States by the St. Lawrence Seaway Development Corporation. The accompanying power project was carried out co-operatively by the Hydro-Electric Power Commission of Ontario and the Power Authority of the State of New York.

Vessels from the four corners of the world can now sail from the Atlantic Ocean unimpeded through the system of channels and locks to the Canadian Lakehead. Canadian grain from the prairies can be carried direct from the elevators at Port Arthur and Fort William, as no longer will trans-shipment be necessary. Iron ore from Sept-Iles, Quebec, can be transported inexpensively by water to the large ore-consuming areas in Central Canada and the United States, where approximately 80 per cent of North American steel is produced. The markets of Central Canada will be more accessible for the Atlantic Provinces. Thus benefits will accrue to all parts of Canada from this new waterway.

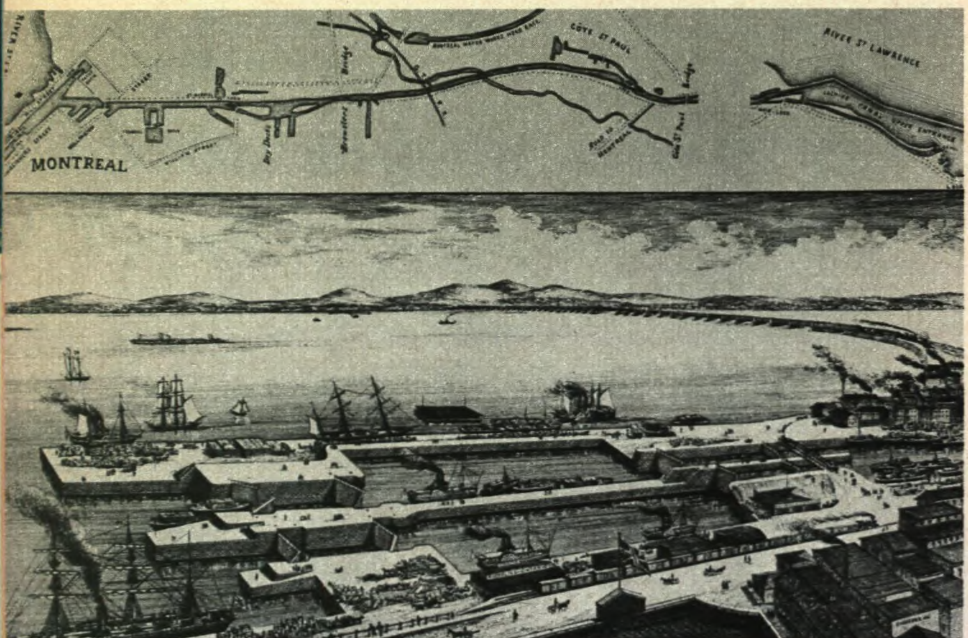
W. H. Bartlett's conception of the Long Sault Rapids, long a barrier to transportation

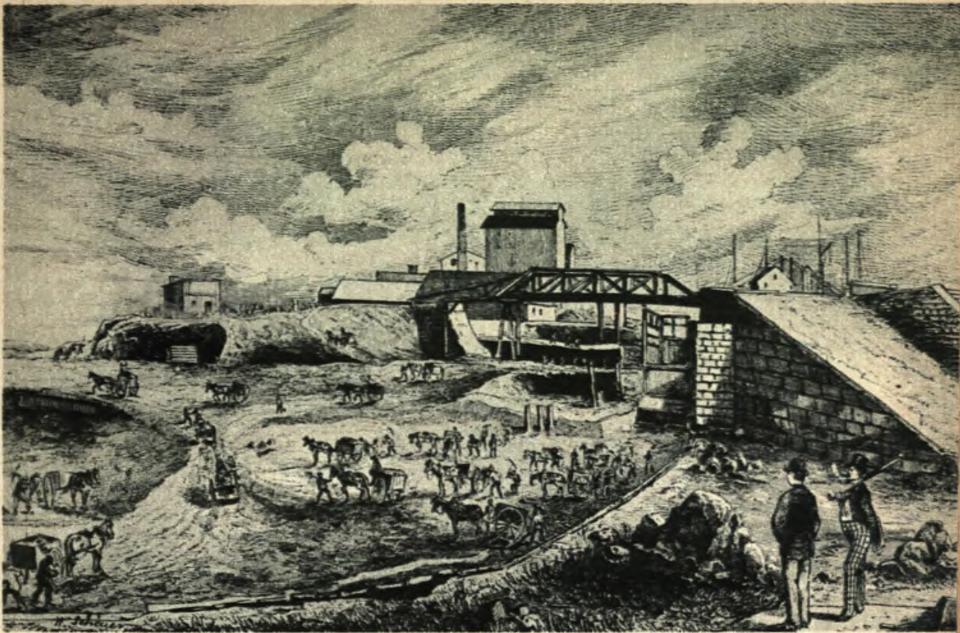
Prior to the opening of the new Seaway, lake vessels by-passed the Long Sault by using the Cornwall Canal

History

In the early part of the sixteenth century the French explorer, Jacques Cartier, was turned back by the rushing waters of the Lachine Rapids just west of what is now Montreal and was thereby forced to abandon his dream of finding the Northwest Passage to the Orient. At various times during the intervening three hundred-odd years, canals have been dug and locks built around the natural barriers to navigation in the St. Lawrence River and in the waters connecting the

The Lachine Canal was completed to a depth of five *feet in 1821 and deepened to* fourteen *feet between 1870 and 1883*





Early excavation operations on the old Lachine Canal connecting the Port of Montreal and Lake St. Louis

Great Lakes. This activity was spurred by the desire to make use of the economical water route which the waters of the Great Lakes Basin offered for the transportation of goods in and out of this important area of the continent. The first recorded improvement in the long history of navigation on the St. Lawrence waterway dates back to 1700, when a one-and-a-half foot canal was constructed at the Little River St. Pierre near Lachine. In 1780 and 1804, shortside canals of two and three feet in depth were constructed at the edge of the Lachine Rapids. Using them were, among other craft, the huge freight-carrying "canots de maître" of the fur-trading companies as they plied between their bases at Montreal and the remote posts of the West. It was only in 1821 that the first Lachine Canal proper was undertaken. From a five-foot depth this canal was deepened to nine feet between 1843 and 1848. A second and last enlargement, between 1870 and 1883, provided a fourteen-foot depth throughout. This Lachine Canal, eight and three-quarter miles long, had a total lift of fifty feet and gave access from the Port of Montreal to Lake St. Louis.

The Soulanges Section extended from deep water at the head of Lake St. Louis

Intrepid voyageurs braved the terrors of the mighty river in Canada's early days

to deep water at the foot of Lake St. Francis, another widening in the course of the St. Lawrence. Between 1779 and 1783, the Royal Engineers built four side canals with locks six feet wide, giving two-and-one-half foot depth to overcome the Cascades, Split Rock, Cedars, and Coteau Rapids, in ascending order. The Beauharnois Canal, on the southerly shore, built between 1842 and 1845, replaced these earlier canals and provided nine-foot navigation. It, in turn, was replaced by the new Soulanges Canal on the opposite side of the river. Begun in 1892 and completed in 1899, it was provided with five locks, a total lift of 84 feet, and provided fourteen-foot navigation.

The International Rapids Section, extending from St. Regis at the head of Lake St. Francis to Chimney Point, east of Prescott, with a total difference of water-levels of some ninety-two feet, had to be overcome by a series of canals. The first of these, proceeding up-river, was at Cornwall where a nine-foot canal was built between 1834 and 1842. In turn, this canal was enlarged to fourteen-foot depth between 1897 and 1901. Next in order was the Farran's Point Canal, first built between 1844 and 1847 and enlarged to fourteen-foot depth between 1897 and 1901. The Rapide Plat Canal at Morrisburg, constructed at the same time as the canal at Farran's Point, was enlarged to provide fourteen-foot draught between 1884 and 1904. The last in the series of canals in this section was the Galop Canal at Iroquois. Construction of this canal for nine-foot depth navigation commenced in 1844 and was completed in 1848. This canal was later enlarged to fourteen-foot depth and completed in 1908.

The obstacle to navigation between Lake Ontario and Lake Erie is presented by the Niagara River, its rapids, and

Niagara Falls. Between the lakes there is a difference in level of 326 feet. This is overcome by the Welland Ship Canal, which crosses the Niagara peninsula ten miles west of Niagara Falls. It is some twenty-seven miles in length. The first canal was built by a private company between 1824 and 1833 and had a depth of seven-and-a-half feet. This canal was later taken over by the Government of Upper Canada and deepened to 9-feet between 1842 and 1850. Its completion coincided with the completion of the St. Lawrence Canals in 1848 and permitted vessels 140 feet long, of twenty-six-foot beam and nine-foot draught to ascend for the first time from Montreal to Lake Erie. Construction of the third Welland Canal was begun about 1873 and completed for fourteen-foot navigation in 1887. It required no less than 26 locks to accomplish the three hundred and twenty-six-foot lift from Lake Ontario to Lake Erie. In 1913 work was begun on the Welland Ship Canal. Construction was suspended in the autumn of 1916 because of the First World War, but was resumed after the cessation of hostilities and completed in 1932. The lift from lake to lake remained the same, but accomplished with only eight locks as against 26 in the fourteen-foot canal. Several of these eight locks are 859 feet long and one is 1,380 feet in length. All are 60 feet wide with thirty-foot depth over the lock sills. The available depth was 25 feet, although about seventeen miles of the canal was 27 feet deep.

The St. Lawrence Canal at Coteau du Lac, built by the Royal Engineers in 1781

International Co-operation

Negotiations between Canada and the United States aimed at developing these twin resources of the St. Lawrence River and the Great Lakes for the benefit of both countries began towards the end of the last century, although, as has been shown, piecemeal development of navigation by Canada in the Great Lakes Basin started centuries ago. Power was first developed at Niagara at the turn of the century. In 1932, Canada and the United States signed the St. Lawrence Deep Waterway Treaty which was to provide for the joint development of the resources in the Great Lakes Basin in the interests of both navigation and power. In 1934, this Treaty was rejected by the United States Senate.

After further studies, stimulated by the power needs created by war production, Canada and the United States signed the Great Lakes—St. Lawrence Basin Agreement in 1941 with the same object in view. This Agreement, which like its predecessor was submitted to the United States Senate for approval, remained unratified by 1949.

The 1941 Agreement was intended, amongst other things, to permit the development, as a joint project, of the power resources available at Niagara Falls, where, over the Falls alone, 160 feet of drop is available for the production of power. Since there was little prospect by 1949 that the Agreement would be approved, a separate treaty was signed and ratified in 1950 setting forth the principles under which the water in the Niagara River could be turned into power by Canada and the United States.

At more or less the same time the Canadian Government let it be known that Canada was prepared to proceed with an "all-Canadian" Seaway as far west as Lake Erie, once the means had been found to have the power works constructed concurrently in the International Rapids Section of the St. Lawrence River. By December of 1951 the St. Lawrence Seaway Authority Act and the International Rapids Power Development Act were approved by the Canadian Parliament, the first authorizing the construction of navigation works on the Canadian side of the river from Montreal to Lake Ontario as well as in the Welland Ship Canal, the second authorizing the Hydro-Electric Power Commission of Ontario (HEPCO) to join a United States power generating entity in constructing the necessary power works in the International Rapids Section of the St. Lawrence River.

In 1952, in order to get the power project under way, the Canadian and United States Governments submitted joint applications for the approval of the International Joint Commission to the proposed power development, on the understanding that the Canadian Government would undertake to construct, more or less concurrently, and to operate all the works necessary to insure uninterrupted twenty-seven-foot navigation between Montreal and Lake Erie. Approval of this proposal was given by the International Joint Commission in an Order of Approval dated October 29, 1952.

In 1953, the U.S. Federal Power Commission granted a fifty-year license to the Power Authority of the State of New York (PASNY) for the development of the United States half of this power project. Because the Order granting this license to PASNY was contested in U.S. courts, it was not until June of 1954 that PASNY had clear authority to join HEPCO in making a start on these works.

In the meantime, however, the United States Congress had enacted the Wiley-Dondero Bill (P.L. 83-358) which authorized and directed the St. Lawrence Seaway Development Corporation to construct, on United States territory, all the twenty-seven-foot navigation facilities required to get shipping around the navigational barriers in the International Rapids Section. The situation thereby created required close consultation between the Canadian and the United States Governments in order to avoid a duplication of locks and canals. The number of compromises and accommodations were eventually worked out and embodied in a series of exchanges of Notes according to which the United States agreed to build a canal and two locks on United States territory to bypass the Barnhart-Cornwall generating dam at the foot of the Long Sault Rapids and, in addition, to do some essential dredging elsewhere, while Canada agreed to build a lock and canal around the Iroquois Control Dam some 30 miles upstream and, in addition, to complete to a common standard all the necessary navigation facilities in Canadian territory, i.e. between Montreal and Cornwall and in the Welland Ship Canal. The estimated cost to the United States of these works was of the order of $100 million while the estimated cost to Canada was to amount to about $200 million.

How it was done

Canada and the United States jointly began construction of the multi-million dollar St. Lawrence Seaway in 1954. Major projects were undertaken at Montreal and Beauharnois; south of Cornwall in the American section, and at Iroquois.

As the Seaway was built in conjunction with the international power project at Cornwall, a lock was needed at Iroquois to take ships past the control dam, and into the new lake which the power project created. The lock is situated north of the control dam which governs the flow of water from the Great Lakes. The Iroquois lock is three times as long, twice as deep, and nearly twice as wide as most of the half-dozen locks it replaces. In a day it will pass as many as 30 ships, each carrying up to 25,000 tons.

First, the ninety-foot canyon was dug, throughout the mile-long stretch. Nine million tons of limestone and glacial till were carted away before the concrete could flow. And flow it did, bucketful upon bucketful, until over 600,000 tons were poured.

To bypass the power installations at the other end of the pool, ships now

The Twin Locks at Beauharnois were carved through almost solid rock follow the American Canal system. At the Eisenhower lock they drop 40 feet into the three-and-a-half miles of overland canal. At the Grass River, or Snell Lock, a further drop of 46 feet completes the bypass of the international power installations at Cornwall and the ships enter Canadian waters again.

The American operations were entrusted to the United States Army's Corps of Engineers, traditionally responsible for America's inland waterways. The actual work was done by private firms under contract to the Army. For the hundreds of thousands of tourists who visited the project each year, the star of the show was "the Gentleman," the biggest dragline in the world, digging a channel. Weighing 650 tons, it swung at the touch of a lever. Its enormous bucket scooped 20 tons of earth at a single bite. The Gentleman's two thousand-mile journey from its home in the minefields of Kentucky lasted 68 days,

Excavating blasted rock in the Côte Ste. Catherine cut, site of the Seaway lock and twenty-seven-foot channel opposite Montreal

and it left a trail of dismantled bridges in its wake.

Excavations accounted for a good portion of the Seaway's cost . . . and for their ten-mile section of channel, the American contractors assembled the greatest single collection of machinery in the world.

Upstream from the canal, a group of islands, which extended into the ship channel, were sliced off, and trimmed to size. In some cases, whole new islands were created, others disappeared entirely. Nowhere along the Seaway has the geography of the river been so drastically altered by the hand of the engineer.

On June 3, 1956, the lock formerly designated as the Robinson Bay Lock was dedicated in the name of President Dwight D. Eisenhower. At that time, the lock was little more than two rows of concrete cubes at the bed-rock bottom of a canyon 150 feet deep. As the individual cubes took shape, the areas between them were filled with concrete, and new cubes were built above them like building blocks, until the walls reached more than a hundred feet in the air. Each swing of the bucket brought four cubic yards of concrete to the forms. As the bucket swung clear, puddlers moved in with vibrators, compressed air devices which settled the concrete by driving out air bubbles. Working three shifts a day, throughout the warmer months crews managed to pour as much as three thousand cubic yards of concrete in one day.

Underneath the Eisenhower Lock, a highway tunnel leads to beautiful new parklands and observation points commanding views of both the power project and the Seaway.

Some three miles down-stream, where the Snell Lock terminates the canal, dredging operations were carried out. Approximately two thirds of the Seaway passes through open river, and a wide channel, 27 feet deep, had to be cleared.

At Grass River, opposite Cornwall, a hydraulic dredge sucked up the river bottom and powerful pumps forced the sludge through a long tail pipe, over water and land, to spoilyards up to a mile away. When these spoilyards were dry, they were planted and landscaped to blend with the surroundings.

Again on the Canadian side, south of the old fourteen-foot Soulange Canal, the new route follows the Beauharnois Power Canal, which, with two locks added, became a sixteen-mile channel into Lake St. Louis below. Ships leave the power canal and enter the upper lock near the Railroad Bridge, and drop 42 feet into an overland canal.

Three-quarters of a mile further down, they enter the lower lock, near the power dam, and drop the final 42 feet into a dredge channel in Lake St. Louis. Work on the upper lock was greatly complicated by an abnormal amount of seepage. To control it ten massive pumps flushed out 25,000 gallons of water per second, as workmen prepared to install the lock-gates.

Below the Railroad Bridge, ships pass down the overland canal on their way to the lower dock; 4,500 feet long, this is the Seaway's shortest canal. The shortest, but by far the most difficult. Every inch of the canal turned into a battle. The reason: Potsdam sandstone. Underneath the shallow subsoil which covers the area lie layers of this hard abrasive stone. Every cubic yard had to be blasted free with high explosives and thousands of blast holes drilled deep into the rock. At the lower end of the channel there was a further complication: a tunnel had to be dug beneath the lower lock for the four-lane traffic of a main provincial highway.

As each of the seven locks may eventually be twinned to double the Seaway's capacity, the tunnel was dug to double

length. Only when the tunnel was covered, and opened to traffic, could the concrete be poured on the lower lock.

The estimated cost of the Beauharnois project, over fifty million dollars, makes this the most expensive mile of the entire St. Lawrence Seaway.

From Lake St. Louis, beneath two bridges, an overland canal takes ships, around Lachine Rapids, into Côte Ste. Catherine Lock. Protected from the currents of Lachine by cofferdams, powerful construction equipment pushed the ship channel deep into the dry land of Caughnawaga Indian Reserve and beyond for eight miles to the Côte Ste. Catherine Lock.

Honoré Mercier Bridge is one of the four structures linking the Island City of Montreal with the South Shore of the St. Lawrence River. New approaches took shape to sweep traffic a hundred and twenty feet above the ship canal. In the centre, over the channel, a falsework structure was prepared to support the main span during installation. Riggers manoeuvered the wooden beams and girders high above the channel floor. South of the channel, great concrete pylons were erected to receive their separate ramps to carry traffic along highways east and west.

The South Shore below Montreal was basking quietly, in sleepy historic villages like Côte Ste. Catherine, when the first Seaway blasts exploded in the summer of '54. For several years they watched as power shovels tore a channel between them and the river beyond. Items began to appear in the newspapers: A bridge to the Island. A new park. New highways and railway lines. And as the lock began to take shape at their doorstep, a two million dollar harbour was announced for the peaceful village of Côte Ste. Catherine.

High above the lock-floor, fenders were installed, to prevent ships from bumping the gates when moving into the lock. As the lock provides a 30-foot lift, the gates are heavy enough to hold back a 30-foot head of water.

From Côte Ste. Catherine Lock, ships pass seven miles down stream to St. Lambert Lock, where they drop a final 15 feet. The ships then sail under Victoria Bridge and through the last thousand yards of dyking, where they leave the Seaway and enter Montreal Harbour or follow the St. Lawrence down to the Ocean, a thousand miles away.

Rather than dredge the river below Côte Ste. Catherine Lock, contractors saved both money and time by building a dyke in the river along the channel edge, pumping out the water, and excavating the dried land with power shovels and trucks.

By filling in the area between the channel and the present shoreline, some three hundred acres of parkland were created between Jacques Cartier and Victoria Bridges. Upstream from Victoria Bridge lies the Seaway's seventh and final lock. A tall batching plant provided the 800,000 tons of fresh concrete required by this lock alone.

At the downstream end, the last span of the Victoria Bridge had to be replaced by a lift bridge to provide clearance for ships using the lock directly underneath. Working on one lane at a time, the engineers removed the old rigid sections, and replaced them with steel platforms that can be quickly raised and lowered by towers at either end. Highway traffic using the bridge is not interrupted when the lift section is raised: traffic lights divert traffic to a second lift bridge at the other end of the lock.

Spanning Montreal Harbour in two sections, Jacques Cartier Bridge is over two miles long. Built in 1929, it now carries seventeen million cars per year. To provide ship clearance where it crosses the Seaway, the bridge was raised a total of 80 feet. By slowly jacking the southern spans and adding layers of concrete to the existing piers, engineers raised the bridge 50 feet. The final 30 feet required for full clearance was gained by removing the old section with its network of steel struts beneath, and installing another span supported from above.

The new section was completely preassembled on tracks, and coupled alongside the span it would replace. Then a group of eighty engineers and technicians gathered to begin an operation as minutely planned as a wartime commando raid; to move the new through-span sideways, 78 feet into place. The seventy-eight foot slide was broken into a series of four-foot moves; the rails lay greased and ready. When the hydraulic jacks began, the old section was pulled sideways out of the way, and the new span coupled to it slowly moved into place.

At the operation's nerve centre, midway down the old span, control men prepared to record the movement of the individual ends, at half-inch intervals, on special measuring rods. The control engineer telephoned the start of the cycle to the jack operators at both ends of the spans. As the control levers advanced, electrically driven pumps forced oil to the giant jacks at pressures up to six thousand pounds per square inch.

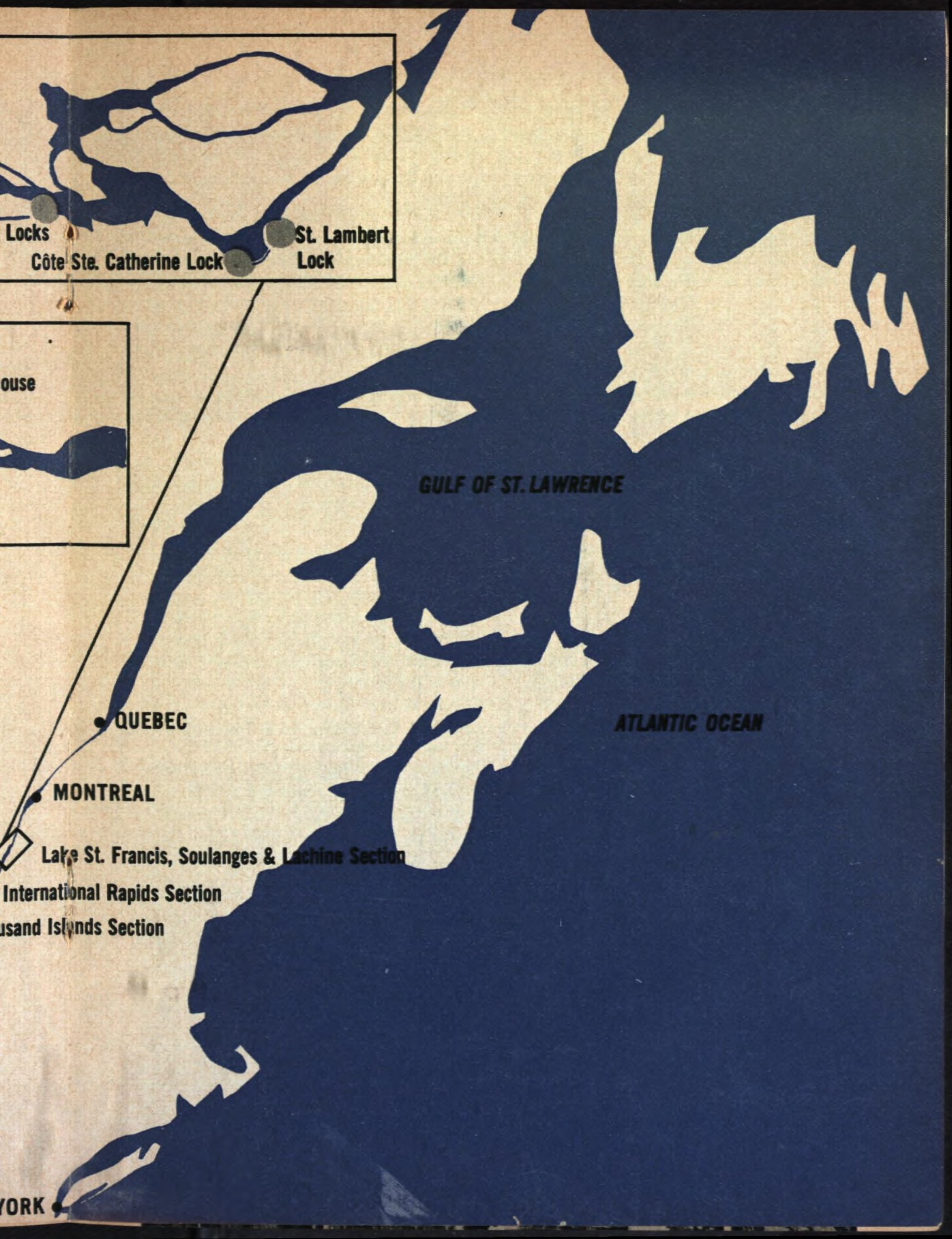
Slowly the two spans began to move.

As the spans completed their four-foot travel along the rails, the pressure was removed from the jacks, and technicians slipped wooden wedges under each carriage to prevent it rolling back. At the other end of the rails, workmen quickly removed the plate links from the chain, one set for each four-foot move, and slid them down disposal chutes to the sand piles below. Then the shortened chain was rejoined, and the cycle repeated, until the new section finally pulled into place.

The through-span was paved and readied for traffic beforehand, so no time would be lost in returning the bridge to use.

The following day work was resumed on the jacking operations that completed the seven million dollar uplift on old Jacques Cartier Bridge.

HUDSON BAY
Beauharnois Locks
Côte Ste. Ca
Long Sault Dam
Power House
Eisenhower Lock
Snell Lock
Iroquois Lock
Iroquois Dam
PORT ARTHUR
FORT WILLIAM
LAKE SUPERIOR
SAULT STE. MARIE
MONTRE
Lake St. Fr
International Ra
Thousand Islands Se
GEORGIAN BAY
KINGSTON
LAKE HURON
LAKE ONTARIO
TORONTO
HAMILTON
Welland Ship Canal
LAKE MICHIGAN
ERIE
WINDSOR
LAKE ERIE
DETROIT
CHICAGO
CLEVELAND
NEW YORK


Locks
Côte Ste. Catherine Lock
St. Lambert Lock
ouse
GULF OF ST. LAWRENCE
QUEBEC
ATLANTIC OCEAN
MONTREAL
Lake St. Francis, Soulanges & Lachine Section
International Rapids Section
usand Islands Section
YORK

The Power Project

The development of 2.2 million horsepower of electricity in the International Rapids section of the St. Lawrence was indeed a task of major proportions. The unique project, with installations set squarely across an international boundary, got underway in 1954.

Simultaneously, on the Canadian and United States shores facing Barnhardt Island, preparations began for building one of the world's greatest powerhouses. The major problem was to dry up a section of the river-bed: first, a causeway was built behind the Island to block the flow in the north arm of the River; then, in front of the site for the powerhouse —to seal off this part of the River completely—a cofferdam was built.

The hollow cells of the cofferdam formed a circular wall of sheet-steel pilings to be filled with earth. Huge template discs made a framework through which the pilings were driven into the river-bed.

Work continued through the winter as, section by section, pilings of the giant coffercells were threaded into position.

With the cofferdam completed, the water was drained from the enclosed part of the River. Work on the powerhouse now began. The heavy artillery of the construction arsenal was trained on the river-bed. Excavation to depths as great as ninety feet continued until, at last, the earth was ready for the foundations of the powerhouse.

An assembly-line of carpenters produced concrete-forms. Each of these was carefully numbered, so that it would be sure to find its place in the intricate pattern. Then came the mammoth concrete buckets, each carrying four cubic yards a load. Bucket by bucket, four million tons of concrete.

Compressed air vibrators released air bubbles and settled the concrete. The great spiral casings for the turbines took shape. Overhead, the steel superstructure of the powerhouse control building rose above the dam.

Erection work here was done by Mohawk Indians—famous for their skill at high steel construction.

The headworks of the powerhouse stretched across the skyline. Below, the sixteen power units on Canada's half of the dam were readied, one by one, to receive the generators, gigantic speedrings girdling each unit. And, early in 1958, the powerhouse was completed.

While work continued here, another job was under way behind the Island. A triangular cofferdam was built across one side of the River, and a channel cut around it to let the water flow past. With the water by-passing the cofferdam, the enclosed area was excavated for the south half of the Long Sault dam. Then, the cofferdam was removed and the channel closed. A new channel was cut higher up to divert the water from the Long Sault through the completed half of the dam.

On December 3, 1956, a gate was raised allowing the first flow of water through the completed Stage 1 structure of the Long Sault Dam. The south half of the Dam was at work.

To complete the dam it was necessary to dry up the Long Sault Rapids. A causeway upstream and a cofferdam downstream blocked off the Long Sault, so that the Rapids could be pumped dry. Half a million cubic yards of fill material were required to make an embankment that would hold back the River at the upstream end. Load upon load of earth and rock, from mid-stream and from the banks, cascaded down to choke off the Long Sault's angry torrent.

The ancient Rapids were not to be subdued without a struggle, however, nor without exacting losses. But in March 1957, the Long Sault was overcome, and its angry roar dwindled away to a quiet, submissive trickle. With the rapids stopped and the river-bed dry, the cement buckets again swung through the air, as work went ahead on the north half of the Long Sault Dam. When it was finished and joined to the already completed south half, the curved concrete structure of this control dam was over half a mile long.

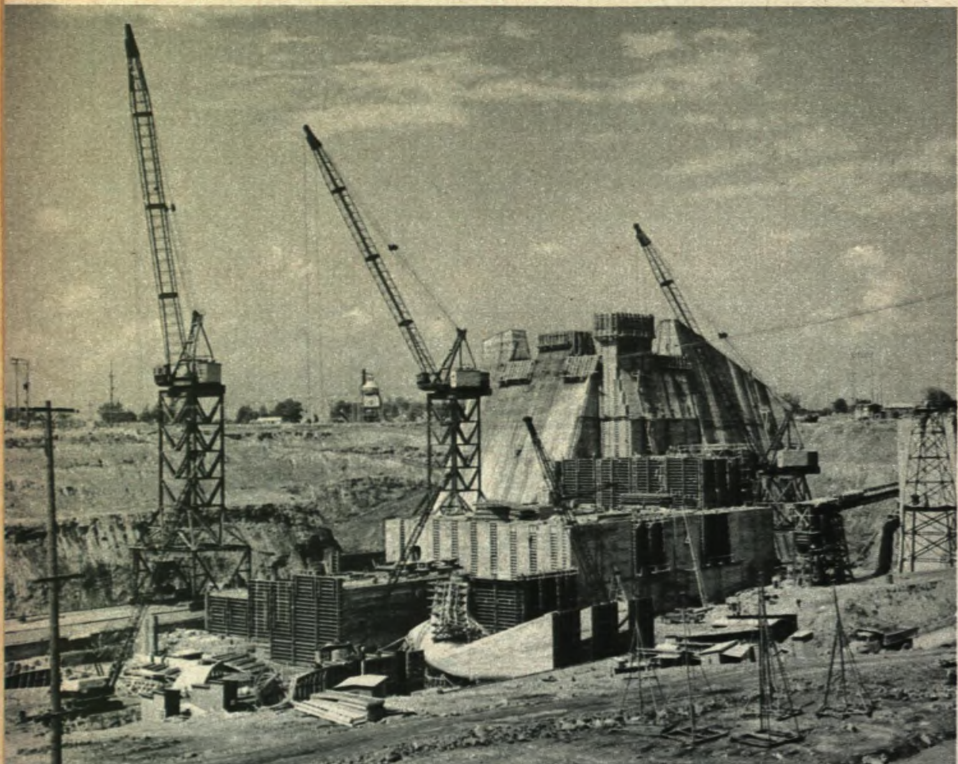
In spring, when the River is swollen, its sluicegates will open to allow excess water to bypass the powerhouse; in autumn, when the level drops, they will close to keep the water at the required height. Completion of the Long Sault Dam, then, was the project's second major task.

Twenty-six miles upstream, at Iroquois, work had already begun on the third major structure of the project. Like the Dam at Long Sault, the Iroquois Dam was being erected in two stages. First, a cofferdam was built out from the mainland on the south shore. The River would be widened here, so the Dam began some distance in from the bank. Then, the coffers were removed and the same process started over again on the north side.

As soon as the south half was completed it was put into service. Engineers raised the eighty-ton gates. Water flowed over the sluiceways from Lake Ontario into the international power pool. Causeways remained, protecting sections where construction was not complete. But, when all structures were readied, in July 1958, the last causeway was demolished.

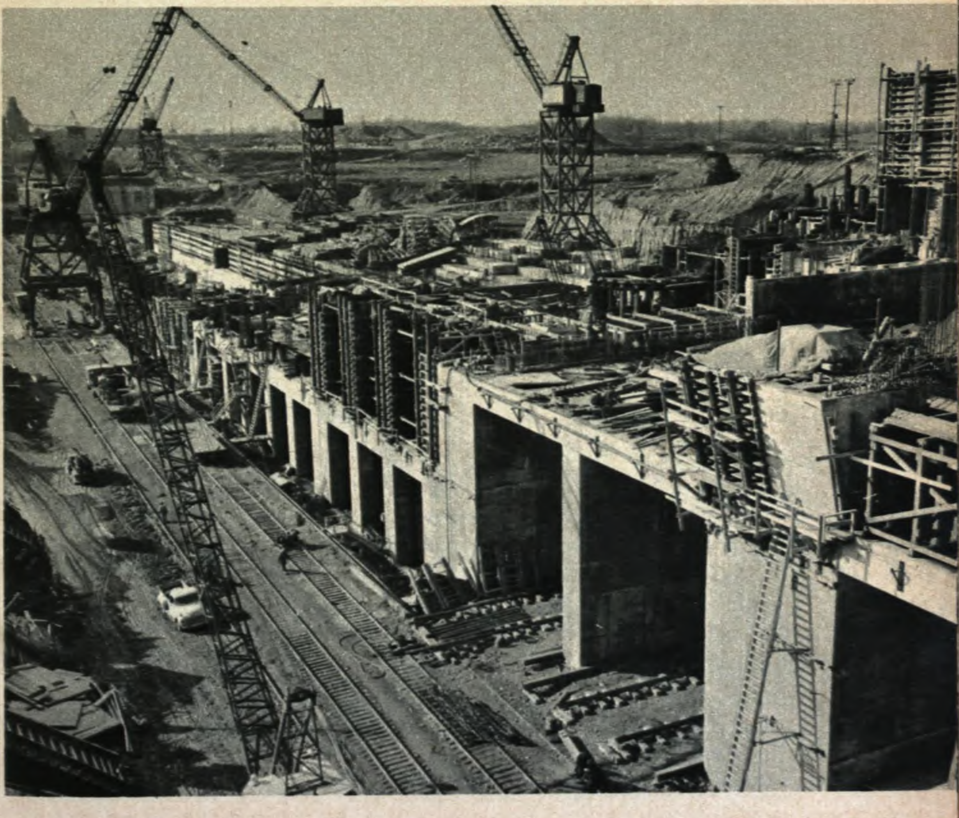
And the River plunged through up to the powerhouse, to create "Lake St. Lawrence," a 40-mile long reservoir of power.

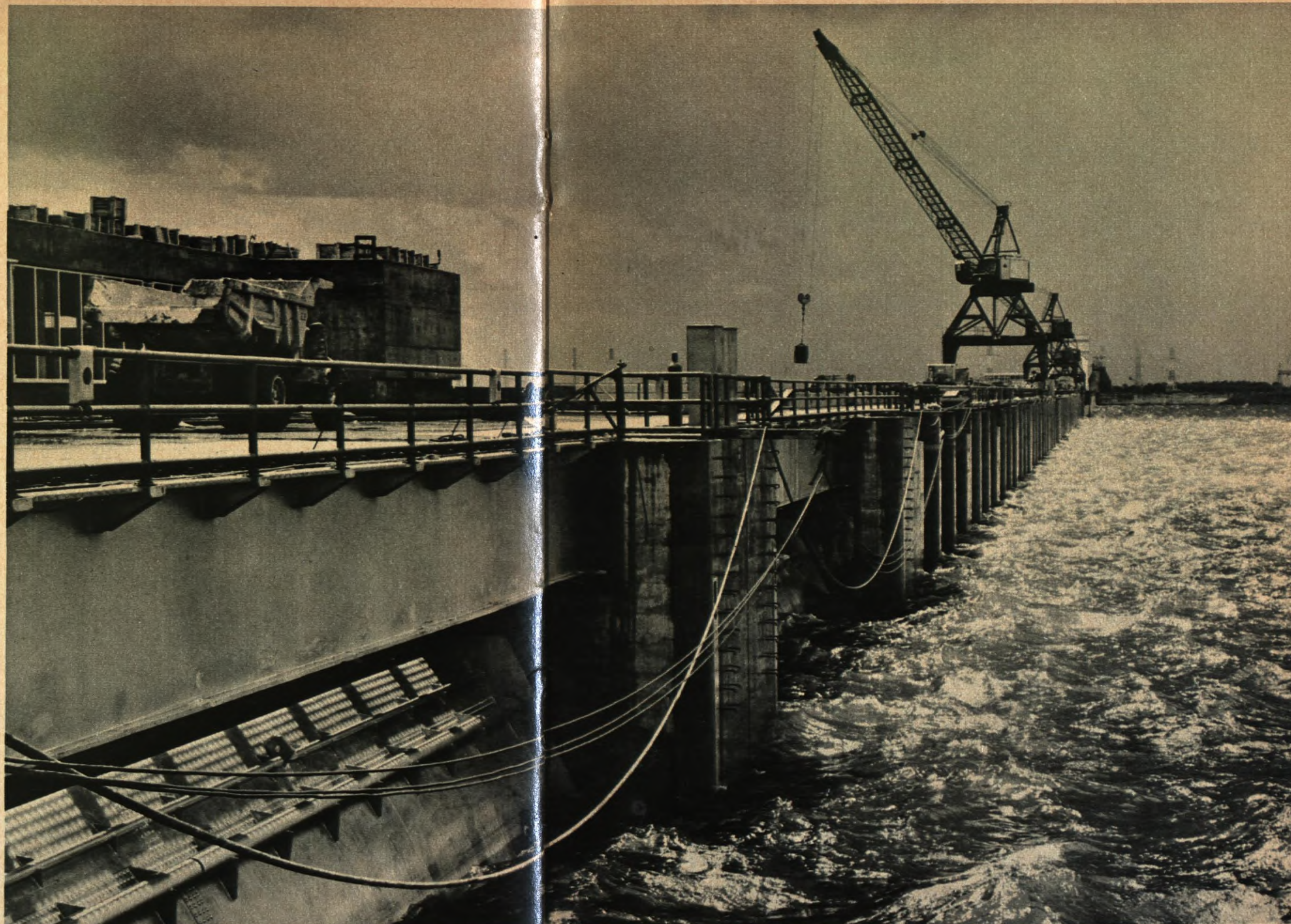
The development of 2.2 million horsepower of electricity in the International Rapids section of the St. Lawrence taxed the engineering skill of the two co-operating nations. Three major structures were erected, the Moses-Saunders Powerdam and the Long Sault Spillway Dam above Cornwall, and the Control Dam upstream at Iroquois. This shows an early phase of the work on the Canadian section of the Powerdam, which was started in 1954



Below: *Work progressing on the Canadian section of the Powerdam. A major problem in construction, that of drying up a section of the river-bed, involved the building of a causeway behind Barnhart Island to block the flow in the north arm of the River and the construction of a cofferdam in front of the site for the Powerhouse. Foundations for the Powerhouse were sunk 90 feet into the river-bed, and 4,000,000 tons of concrete were used*

Next page: *Erection work on the steel superstructures of the powerhouse control building was done by Mohawk Indians, famous for their skill at high steel construction. The 16 power units on Canada's half of the dam were readied, one by one, to receive the generators, gigantic speedrings girdling each unit. The Powerhouse was completed early in 1958*

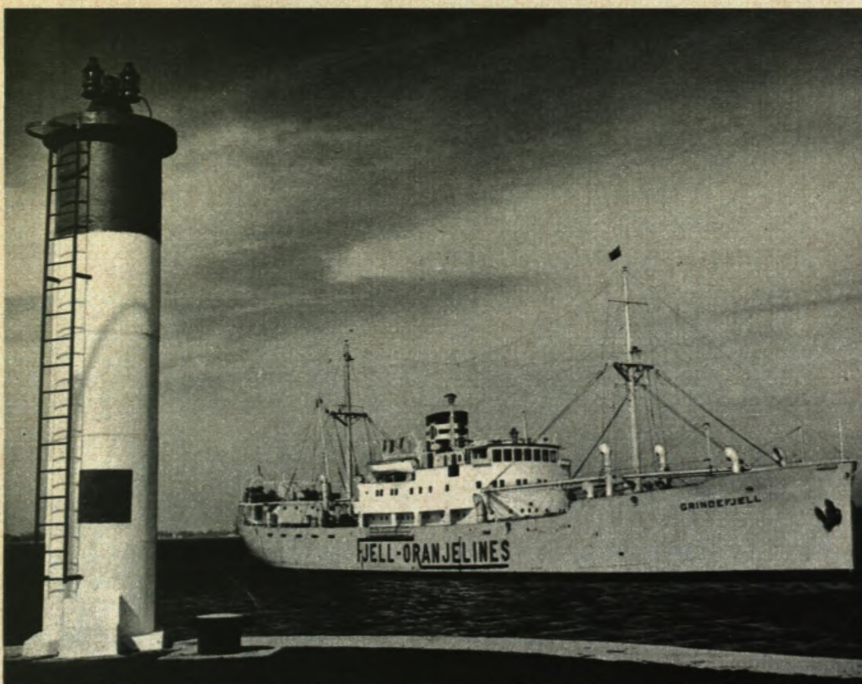




Left: *Côte Ste. Catherine Lock has a lift of 30 feet and requires 24,000,000 gallons of water to fill*

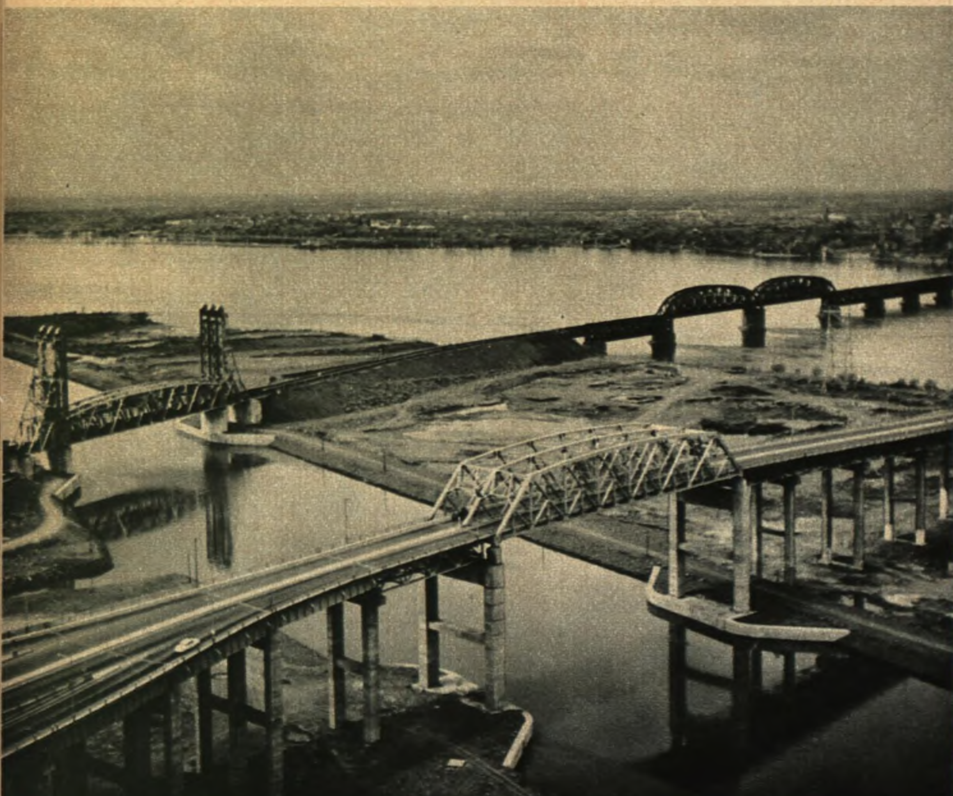
Below: *Ocean-going freighter approaching Iroquois lock, most westerly of the seven new Seaway locks*

Right: *St. Lambert Lock, at the eastern Seaway entrance, is 768 feet long and 80 feet in width*

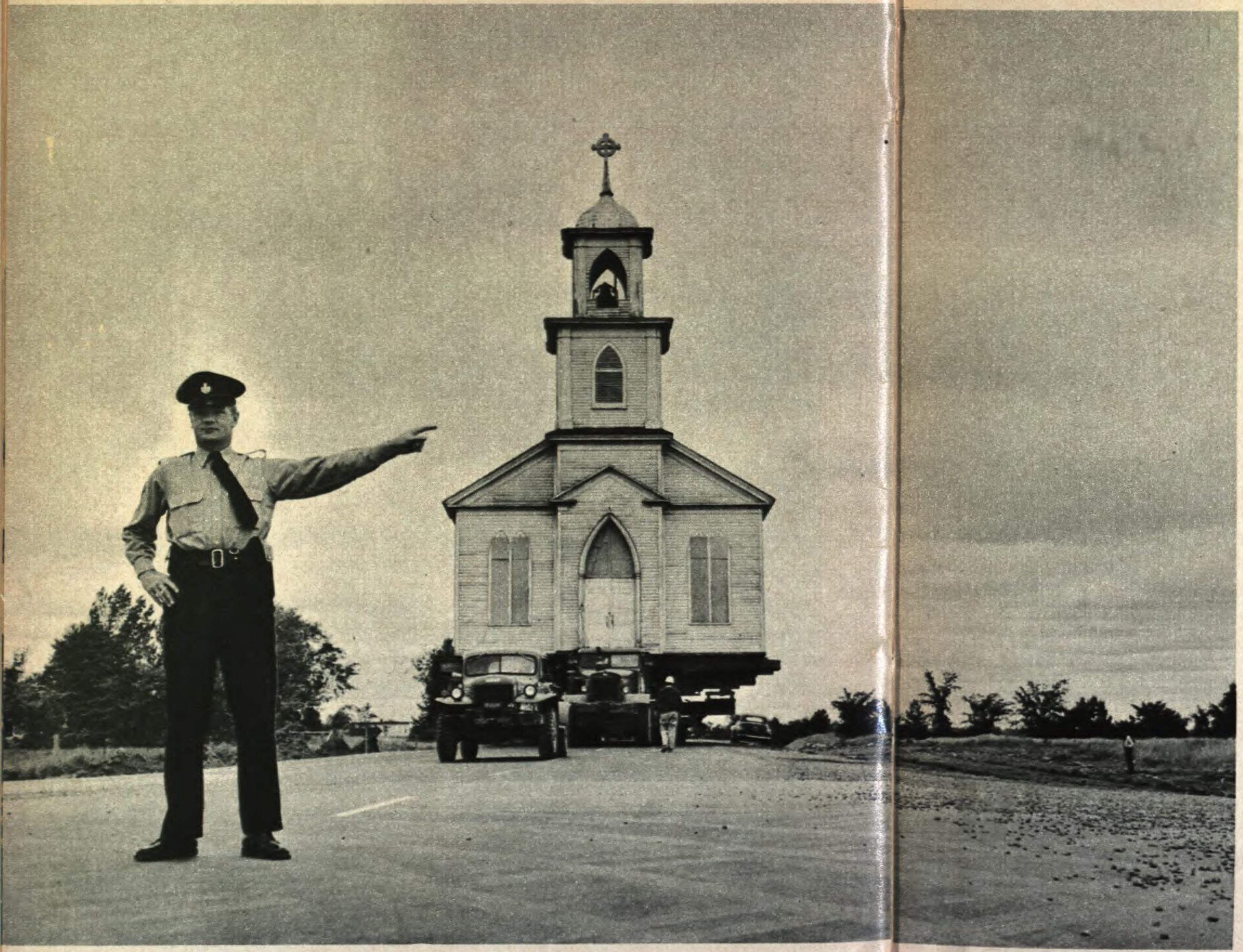


Below: *Two of the four bridges spanning the Seaway near Montreal are the Honoré Mercier Bridge in the foreground and the Canadian Pacific Railway Bridge in the background. Both provide a minimum of 120 feet clearance for shipping*

Right: *After leaving Montreal Harbour, vessels now make the ascent to Lake St. Louis through St. Lambert and Côte St. Catherine Locks and the new canal along the eastern shore, which passes the historical Indian village of Caughnawaga, part of which is seen in the picture*



A vast rehabilitation programme moved some 6,500 people and several Ontario communities to new locations



Vast Rehabilitation Scheme

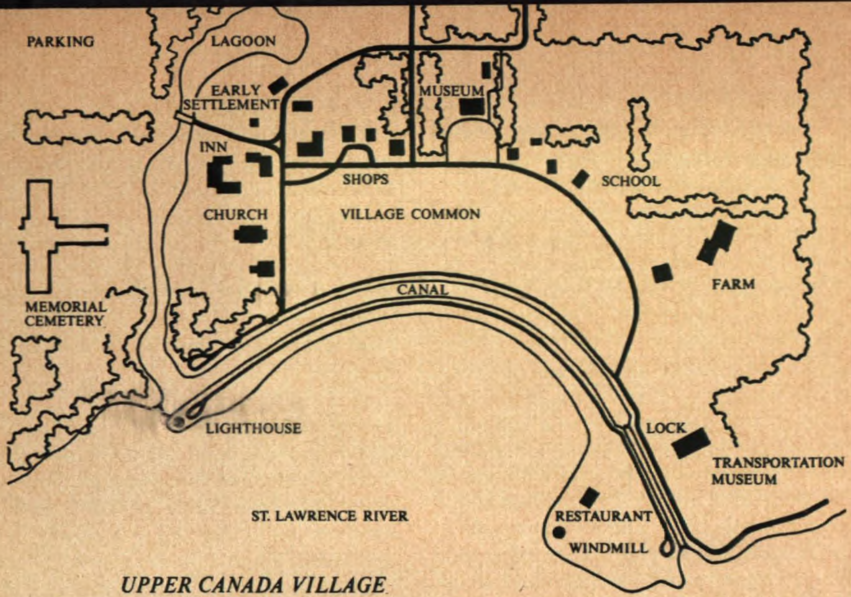
While work on the power project was being speeded, other important work had to be done in preparation for the creation of the new lake above the control dam. Whole communities had to be moved, No. 2 Highway relocated, and 40 miles of main Canadian National Railways track re-routed. While the technical problems were solved readily with the continued efforts and skill of construction workers and engineers, the more delicate problems of human relations also were overcome successfully in the extensive rehabilitation programme. This involved moving some 6,500 people along the north shore of the St. Lawrence between the Cornwall area and Iroquois. More than 550 dwellings were transported by giant moving machines, and new schools, churches, shopping centres and public buildings were erected. The village of Iroquois was completely flooded out, and moved north of its former location. About one-third of Morrisburg was flooded out and the business section relocated to the east of the remaining existing buildings. A new municipality, Ingleside, was located north-east of Farrans' Point to include the former communities of Aultsville, Farrans' Point, Dickinson Landing and Wales. A second entirely new community, Long Sault, was located northwest of Moulinette and included Moulinette and Mille Roches.

Concurrent with these developments was the creation of thousands of acres of parklands in the Seaway valley, including the Crysler Farm battlefield monument and a two-thousand-acre park for recreation, and, as well, Upper Canada Village, which is a distinctive and fitting

Above: *Morrisburg, seen from the north-east, with the newly established shopping centre in foreground*

Top right: *Historic Upper Canada Village re-creates life in the early days of the Ontario communities moved to new locations. (Plan courtesy of Projects Planning Associates, Ltd., Toronto)*

Right: *Crysler Hall, Williamsburg Township, before its removal to Upper Canada Village*



UPPER CANADA VILLAGE

memorial to the United Empire Loyalists.

Upper Canada Village is composed of a number of buildings which have historic connection with the pioneers. In these buildings there will be a museum collection of Canadiana. A sizeable collection of furniture, dishes, textiles, and tools has already been acquired and is on display in a museum building in Morrisburg. There will be huts, an early blacksmith shop, a farm house and barns of the early period. Here will be located an exhibit of early agricultural machinery and implements. There will be models of early forms of transportation, both on land and on the river, and replicas of a shallow draft canal and early type locks.

The monument is a national memorial to the victory won by British and Colonial troops at the Battle of Crysler's Farm. It will be relocated on a central point of the new shoreline and at an increased elevation which will make it visible for miles from both land and water.

A special building, located north of the monument, will contain a notable mural of the battle. This will be of large proportions and will depict a scene at the height of the battle and will show the action both on land and water. The building will display various weapons, uniforms, and other mementos of the battle.

Centred between the Battlefield monument and memorial and Upper Canada Village is located a pioneer memorial cemetery where are placed for future preservation the fragile tombstones still available in the numerous cemeteries which have been removed from the areas inundated on the completion of the St. Lawrence Power Project. The memorial takes the form of a walled landscaped area and enclosure. An endeavour was made to obtain tombstones representing every pioneer family identified with the early settlement of the district.

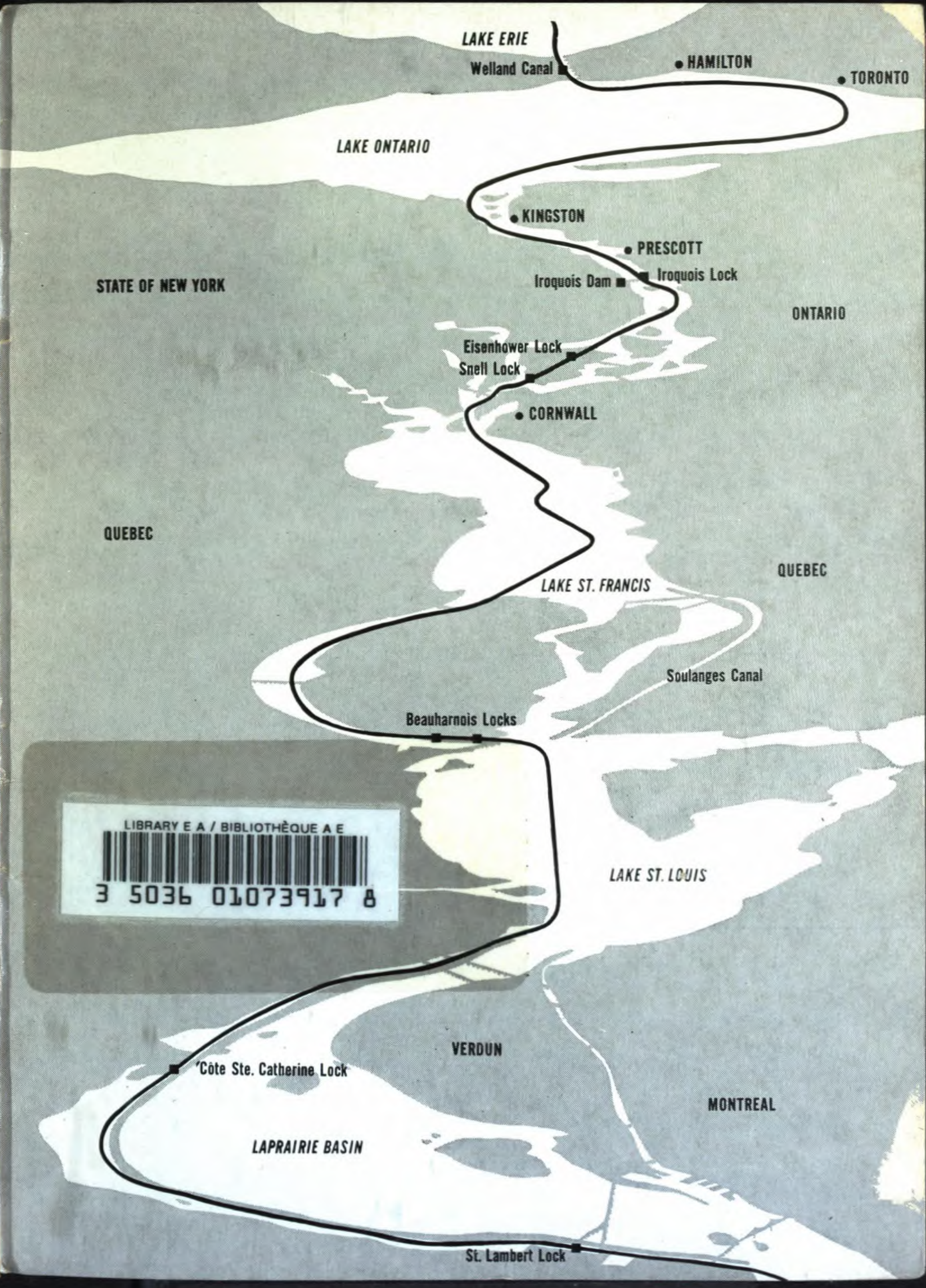
A series of parks is located along the waterfront and immediately south of relocated No. 2 Highway. In the best available locations there are facilities for dockage, swimming, picnicking and camping. A total of eighteen new islands was created, and a new Long Sault Parkway, commemorating the famous Long Sault Rapids, will connect a number of these islands with the mainland highway system.

The St. Lawrence Seaway stands as a tribute to the vision of Canadians who had for years seen its necessity, to the personnel engaged in its planning and construction, and to the spirit of cooperation and understanding which has long marked relations between the United States and Canada. Typical of those who worked hard for the realization of the Seaway was George Washington Stephens, a former president of the Montreal Harbour Commission and one of the earlier and most active protagonists of the idea. He wrote in 1930:

"*The St. Lawrence River is one of the world's great trade routes. It is destined to be, on an ever increasing scale, a carrier of world commerce between the North American continent and the rest of the world. It nurses in its bosom a vast amount of sleeping electrical energy, the development of which is likely to be a prominent factor in the industrial and economic development of both Canada and the United States.*"

George Washington Stephens did not live to see the opening of the Seaway. But the motto he chose for his book can serve as a tribute to the quality of all those who have shared in building Canada:

"*To those who see only with their eyes, the distant is always indistinct and little . . . but to the imagination, the far off is great and imposing.*"


LAKE ERIE
Welland Canal
HAMILTON
TORONTO
LAKE ONTARIO
KINGSTON
PRESCOTT
Iroquois Dam
Iroquois Lock
STATE OF NEW YORK
ONTARIO
Eisenhower Lock
Snell Lock
CORNWALL
QUEBEC
LAKE ST. FRANCIS
QUEBEC
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