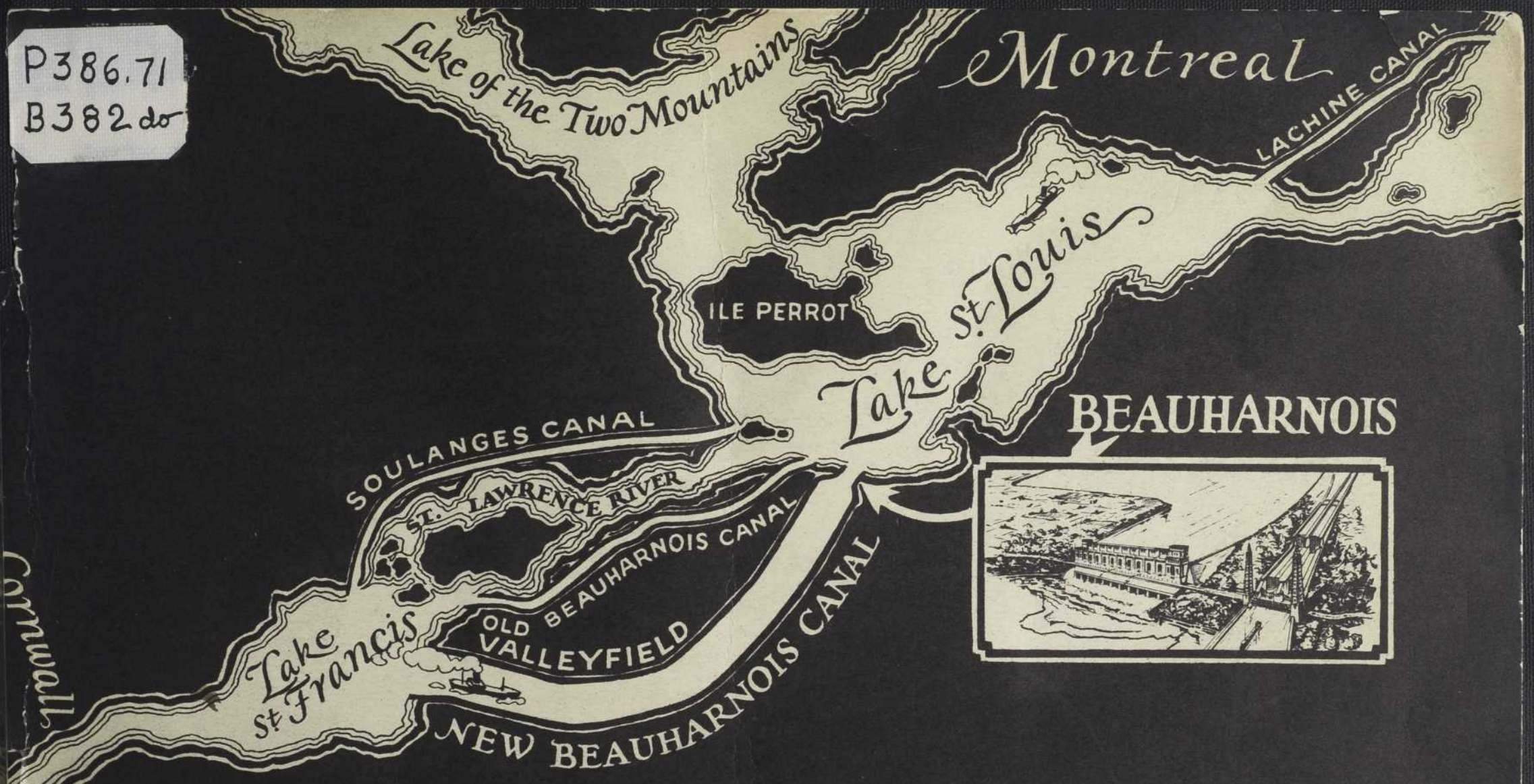

Down The Canal


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Down the Canal

A pictorial presentation of the Beauharnois Power and Navigation Development

Here is portrayed the fashion in which the construction work on the Beauharnois Power undertaking is being carried out. It is intended to provide the layman with a bird's-eye picture of the construction operations, and omits those minutiae which are of interest only from a technical standpoint. The pictures in the booklet take the reader from the entrance of the canal, near Valleyfield, down the route of the new watercourse to the power house construction at Beauharnois

◆

Published January 31, 1931
by
Beauharnois Power Corporation Limited
University Tower
Montreal

Its Location

The map shows the relationship of the new canal to the St. Lawrence, as a whole, to the surrounding district, and to other power producers on the river.

Taking water from the Old Beauharnois Canal is the Canadian Light and Power plant. Operating in the bed of the river is the Cedars Rapid Manufacturing and Power Company. The plant of the Provincial Light and Power Company takes water from the Soulanges Canal.

These four plants produce some 260,000 h.p. If the water used there were to be passed through the New Beauharnois Canal over the full head of 83 feet available at Beauharnois, it would produce some 700,000 h.p. The unallocated balance of the water in the river, if used at Beauharnois, would permit a further installation of 1,000,000 h.p. in the plant. Both the canal and the power house have been designed to permit such further low cost expansion.

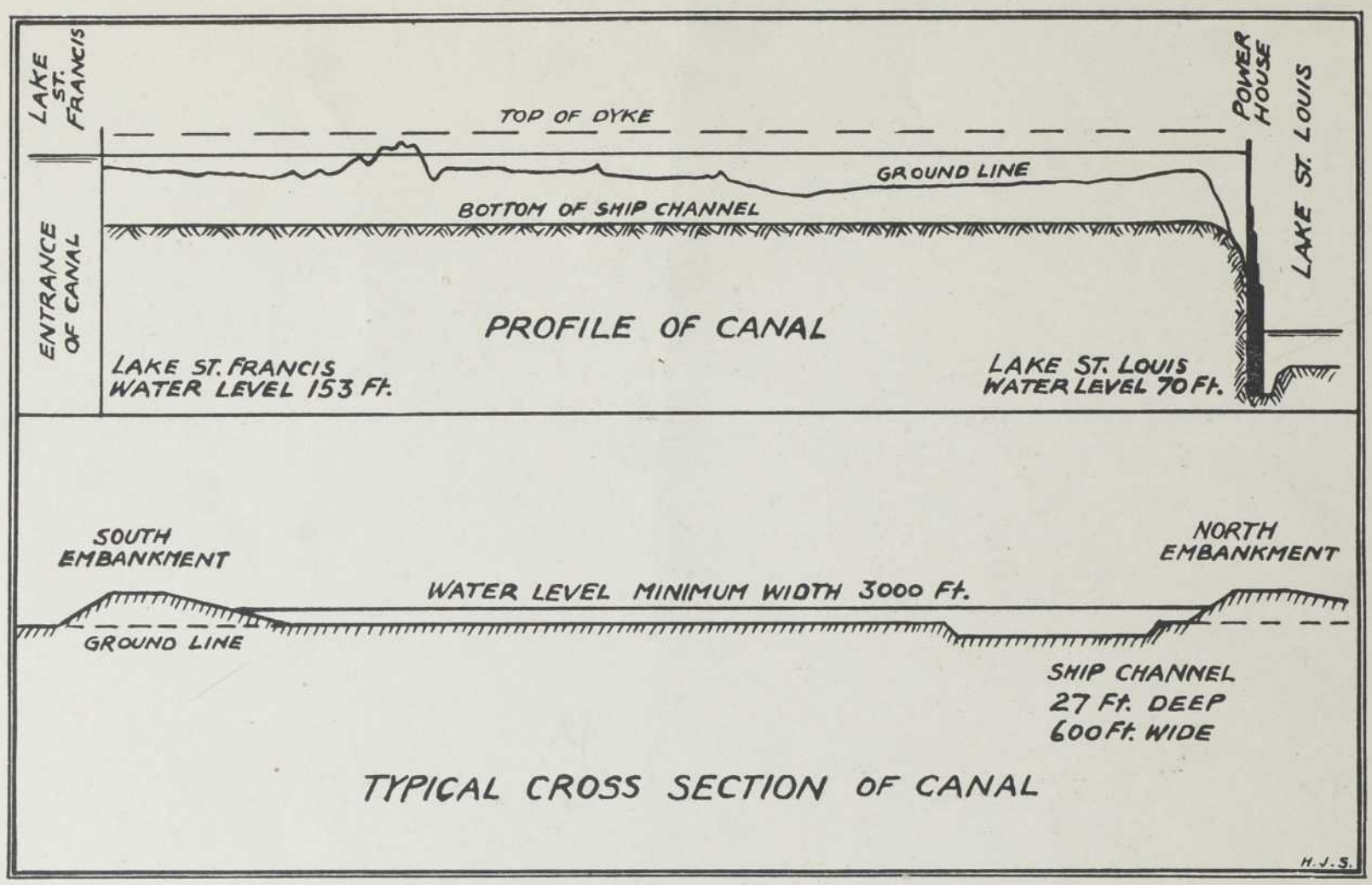
At Valleyfield, operating on the southern branch of the St. Lawrence, is the hydro plant of the Montreal Cotton Company. These water rights have been acquired by the Beauharnois Power Corporation and, when passed over the larger head at Beauharnois, will produce about eight times the power available from the present plant.

Photo by Compagnie Aerienne Franco-Canadienne

The Entrance

Here is the entrance of the new canal. In the background is Lake St. Francis. Two dykes over half a mile apart have been built. They will lead the water at the Lake St. Francis level to Beauharnois, where will be installed 500,000 h.p. The bed of the canal lies almost entirely below the level of Lake St. Francis. Dykes, erected many years ago when the level of the lake was raised, prevent the water flowing into the area shown in the photograph. Behind both the canal banks are the settling basins filled by the output of the electric hydraulic dredge.

The bed of the canal lies here about four feet below the level of Lake St. Francis. Towards the dyke at the right is seen the ship channel, 27 feet in depth. When the government builds the necessary two locks at Beauharnois, this channel in the bed of the canal will provide deep water navigation facilities in the entire wholly-Canadian section of the St. Lawrence, save for the stretch around the Lachine Rapids at Montreal. Thus the development also provides a $16,000,000 navigation canal without cost to the government.



Construction Details

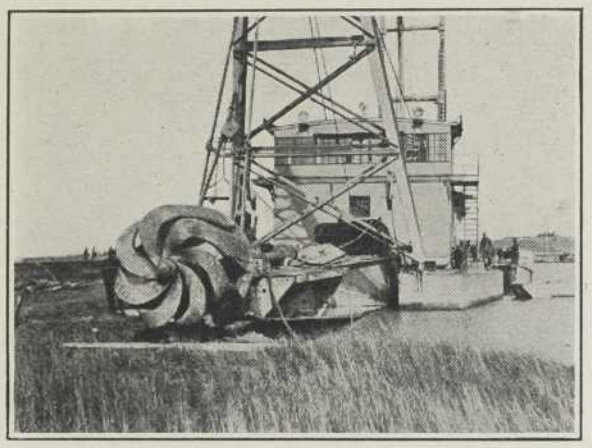
The two sketches reveal the character of the work under way at Beauharnois. The upper drawing shows the construction work to be of an embanking, rather than an excavating character. Save for a short stretch of some 400 yards, the route chosen lies from about 3 to 15 feet below the level of Lake St. Francis.

The lower sketch might be well compared to the aerial photograph on page 3. The ship channel serves a dual purpose: it will handle navigation and, at the same time, permits an adequate flow of water without creating an excessive speed of flow in the canal.

The banks have been placed nearly three-fifths of a mile apart so that the canal could, if necessary, handle the whole flow of the St. Lawrence and produce 2,000,000 h.p. at Beauharnois. Both the canal and the power house have been designed to permit such further expansion.

The maximum height of the canal banks is 24 feet. The settling basins for the output of the dredge beside the banks provide a width greater than that dictated by ordinary engineering practice.

To prevent erosion, the inner sides of the canal banks are being lined with rock.



For a Larger Flow

And this is the way the ship channel is excavated. The electric hydraulic dredge has a capacity of 1,100 cubic yards an hour; it has excavated 819,000 cubic yards in a month. The dredge moves forward as much as 200 feet a day, cutting the channel 27 feet deep by 300 feet wide. Later it will be increased to its full width of 600 feet.

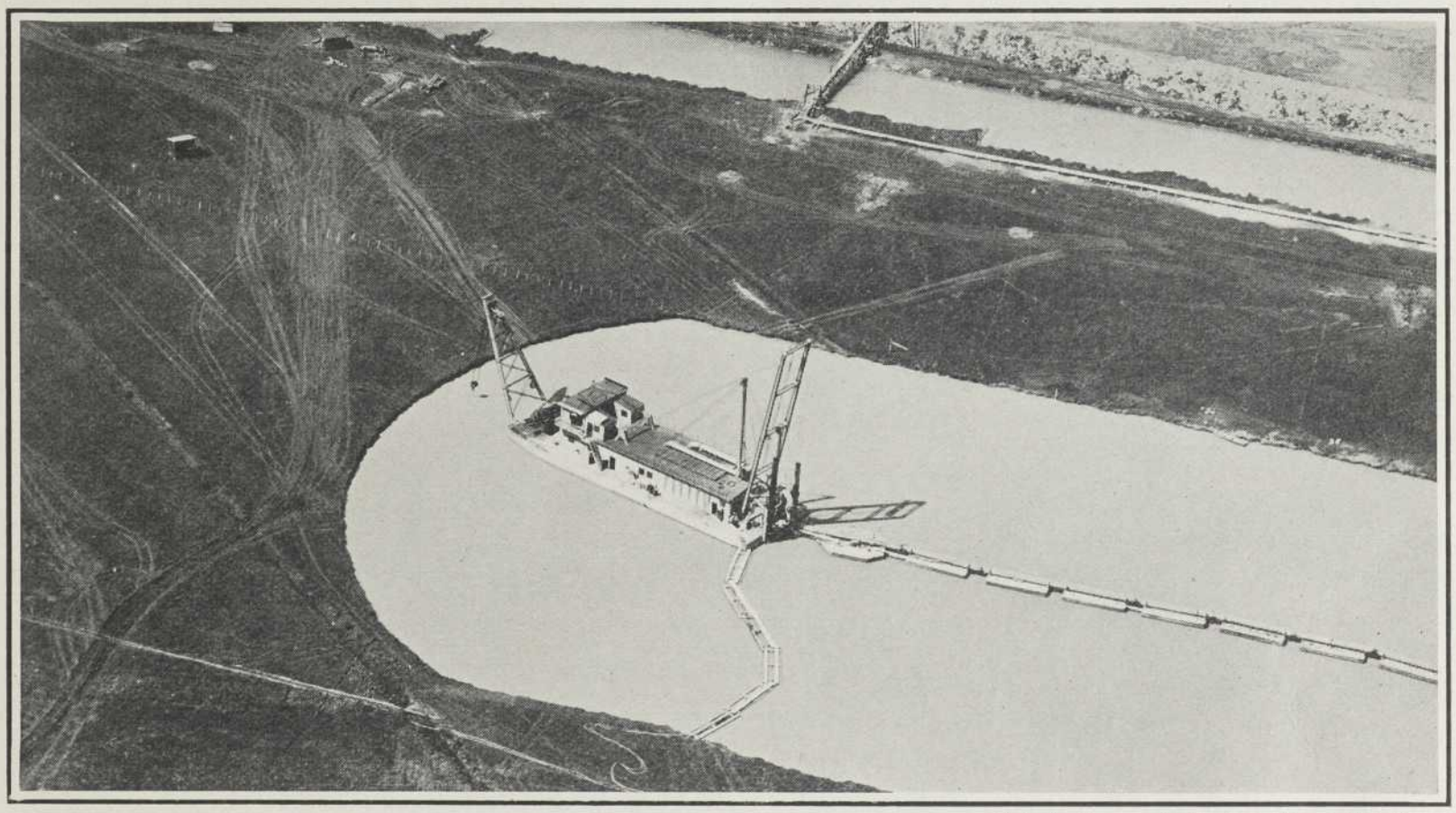
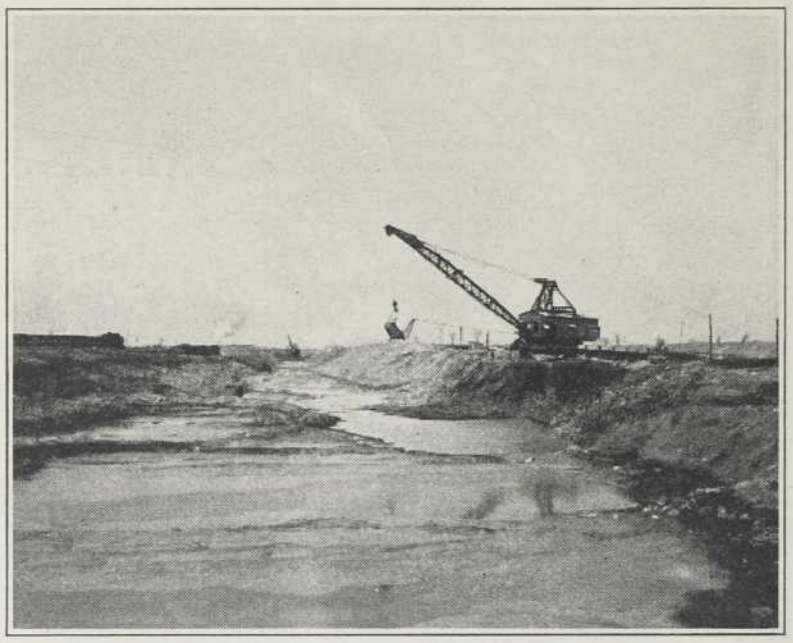


Photo by Compagnie Aerienne Franco-Canadienne

The cutter head, 7 feet in diameter, is operated by a 300 h.p. motor. It bites into the clay, which is pumped into the settling basins by a 2,200 h.p. motor. About a third of the material handled by the pumps consists of solid matter—hence the absence of splash as the clay drops into the settling basin. The pipe is over two feet in diameter; it handles rocks up to 18 inches in width.



A Mile of Boulder Clay

The electric hydraulic dredge is carrying out the entire excavation necessary in the bed of the canal, save for a distance of about a mile along the route. In this short section boulders are encountered in the marine clay, of which the sub-soil between Valleyfield and Beauharnois is composed. Here it has been necessary to excavate the ship channel in the dry. It is being carried out by two large electric draglines; one handling four and the other five cubic yards in each bucketful.

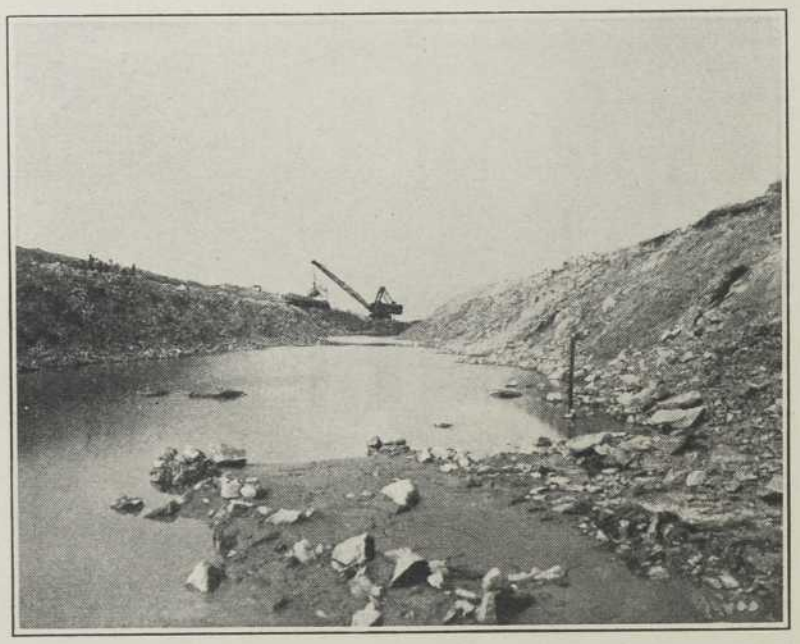
Like the rest of the equipment on the job, these shovels operate day and night. The upper picture shows the five cubic yard dragline in operation, and the lower one shows a section of the excavation work partly completed. The boulder clay taken out here is being used to rip-rap the inner sides of the banks at the western end of the canal. The rock taken from the power house will provide the rip-rap for the eastern half of the canal.

Mass production methods have been adopted in all the operations under way between Valleyfield and Beauharnois. Most of the equipment was designed specially to handle the type of material encountered along the route of the canal.

The route chosen for the canal follows what geologically was the original bed of the river. Thus the country, through which the new 15-mile watercourse passes, is flat, sloping imperceptibly down towards Beauharnois. No hills or valleys are encountered along the route.

There is, though, a very slight rise in ground in this one section, where at one time glaciers left boulders in the clay. The river, during prehistoric centuries, deposited this clay—a material which can be handled easily and at low cost by the equipment used in the construction of the canal.

The favourable contours of the territory and the type of material encountered have thus combined to make possible the development of this, the largest single power site in the world.



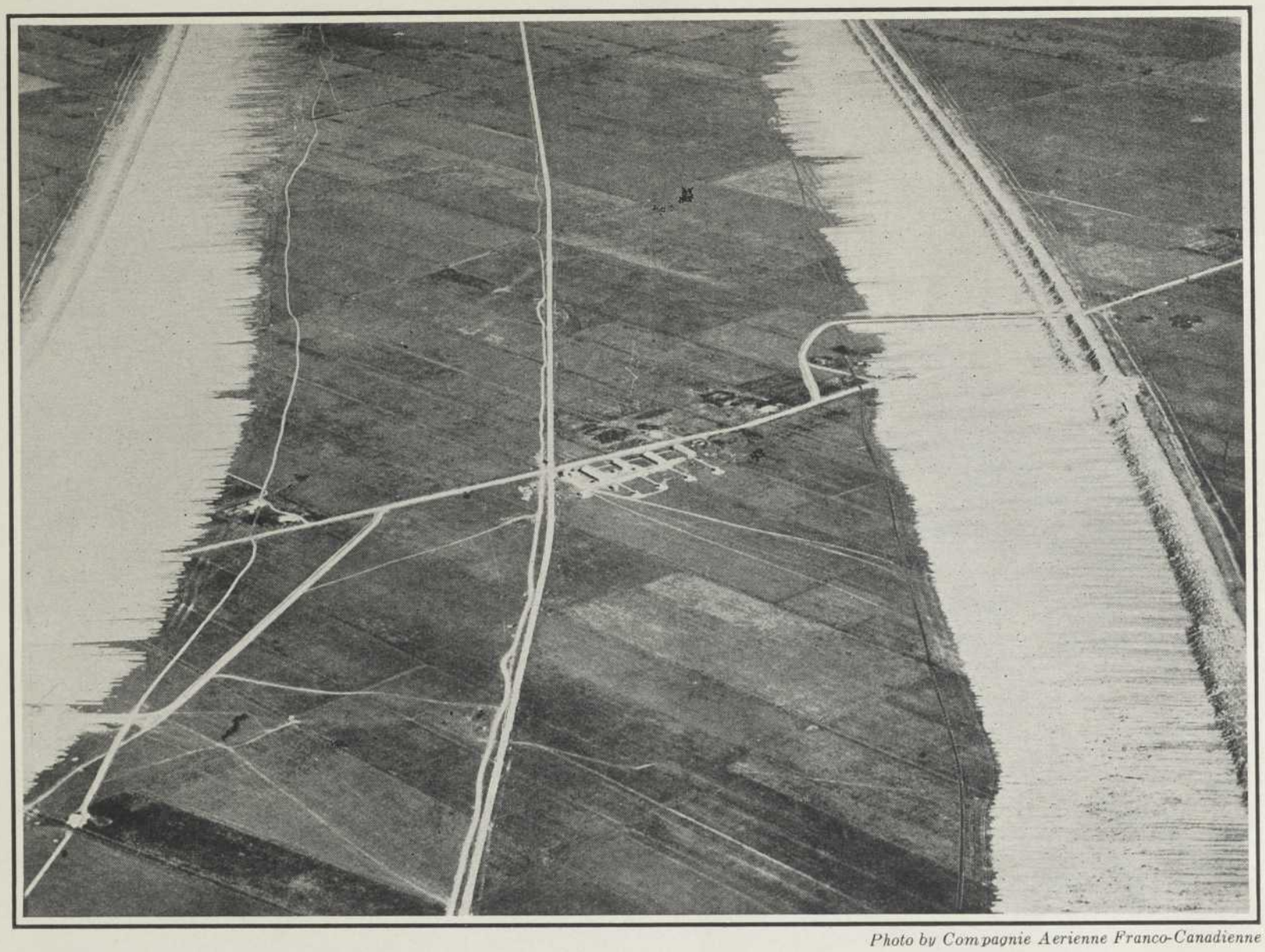
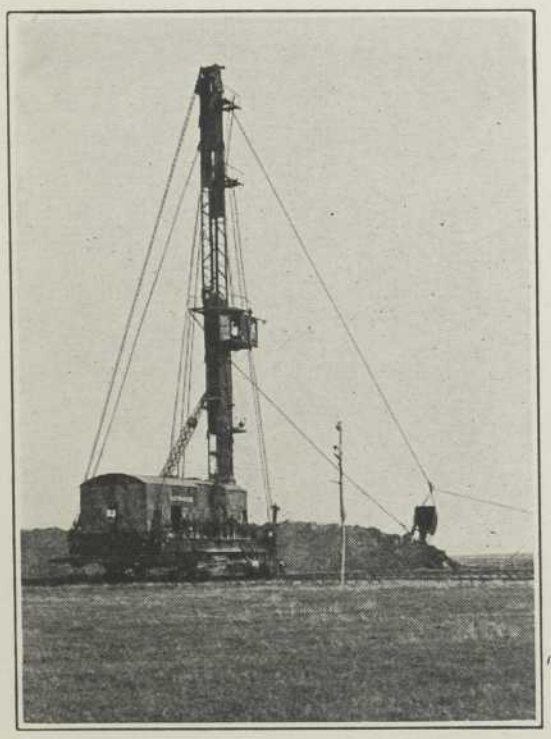


Photo by Compagnie Aerienne Franco-Canadienne



And the Rest of the Route

This is a typical stretch in the eastern half of the canal before the ship channel excavation began. On both sides lie the two dykes 3,000 feet apart. In the centre runs the construction railway. The embanking has been carried out by a battery of four steel tower excavators 135 feet in height, especially designed to carry out this type of work. The bucket on each excavator handles 10 cubic yards. It moves on a cable slung to the tail tower some 700 feet away.

In this section the dykes are about 23 feet in height. In the 1931 season, the electric hydraulic dredge will excavate the ship channel and fill settling basins along the outside of the banks. Here, due to the contours of the land, the dredge will have only to dig to a depth of about 12 feet to provide a navigable depth of 27 feet.

The Construction Work

During the 1930 season the material handled exceeded twice the cubic contents of the Great Pyramid of Egypt. The equipment often moved a daily total in excess of 60,000 cubic yards—a volume which would fill a gravel train 15 miles in length, the equivalent of the cubic contents of a 10-storey building occupying a site 120 feet square.

Up to the end of 1930 over 10,700,000 cubic yards of material were handled. For the initial 200,000 h.p. installation in the plant, it will be necessary to move some 30,000,000 cubic yards. Power from the initial installation will be used to move the remaining material necessary for the 500,000 h.p. installation.

In addition to the actual movement of material, the work completed during the first year's operations included the erection of five construction camps; the erection of one of the largest hydraulic dredges in the world; building, grading and track laying on 40 miles of construction railway; and the assembly and erection of all the large scale equipment designed to handle material along the route of the canal and to construct the power house.

The amount of material moved at the end of 1930 exceeded by 50 per cent the amount scheduled. The excavating equipment has exceeded its rated capacity, and has handled material at a cost below the estimates. Before the close of the year, the first steel work in the superstructure of the plant had been erected.

All of which ensures that the plant will be producing power by October 1, 1932, the date scheduled for its initial output of 200,000 h.p.

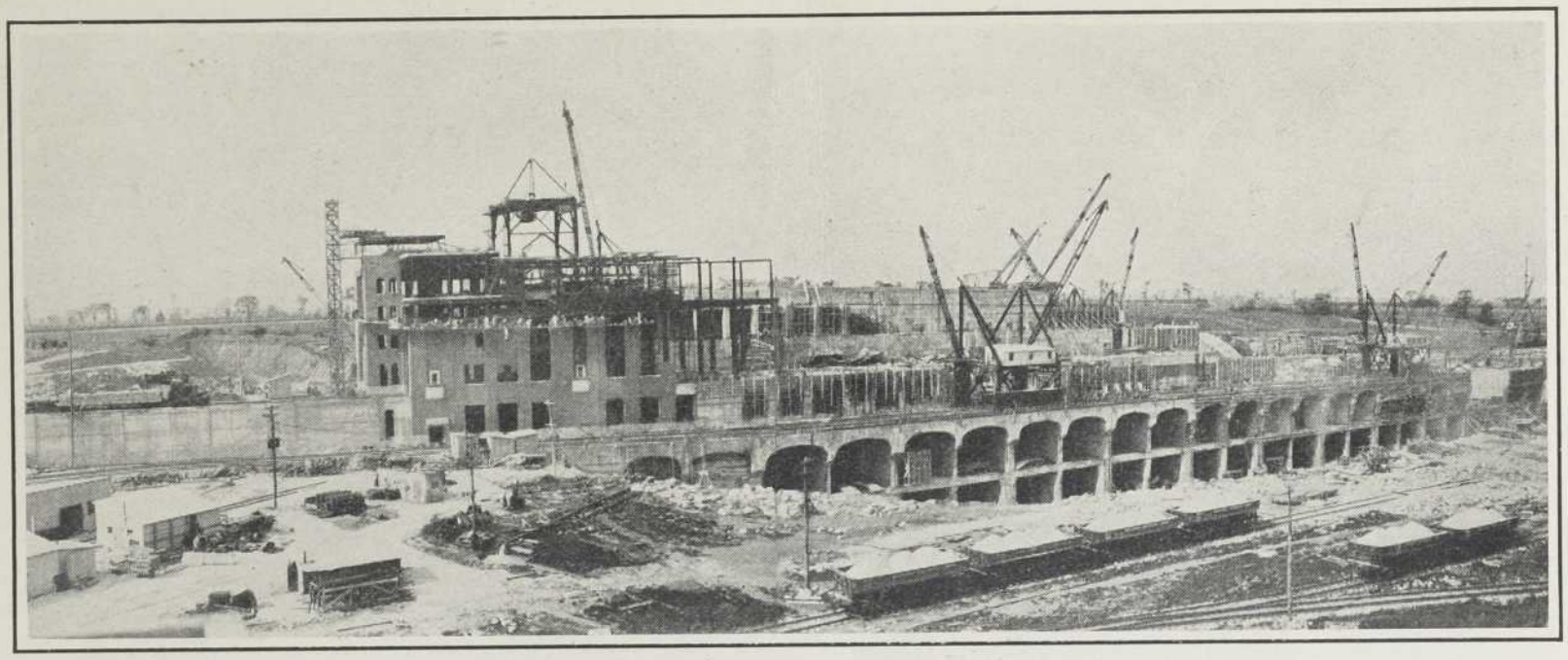
During the early months of 1930 the major construction equipment was placed in operation and rapidly brought up to its maximum efficiency. The electric hydraulic dredge, which is carrying out the largest proportion of the actual excavation, by the end of 1930 completed about half of the work required for the installation of the first 200,000 h.p. in the plant. In December of 1930, it was nearly halfway down the canal on its journey between Lake St. Francis and Lake St. Louis, the two wide reaches of the St. Lawrence being linked by the new power and navigation canal. Also, the erection of the two dykes over half a mile apart was largely completed in the 15 miles between Lake St. Francis and Lake St. Louis. Along much of the route the dykes have reached their maximum height.

By the end of 1930, at the power house and tailrace sites, over 500,000 cubic yards of rock were excavated from the total of 1,300,000 cubic yards which must be moved at that point. Some 40,000 yards of concrete were handled by the mixing plant; the power house will require 350,000 cubic yards in all. The first steel work for the superstructure of the plant was erected in November 1930.

In 1931 the steelworkers will follow in the path of the concrete placing operations and they, in turn, will be followed by the bricklayers erecting the superstructure of the plant.

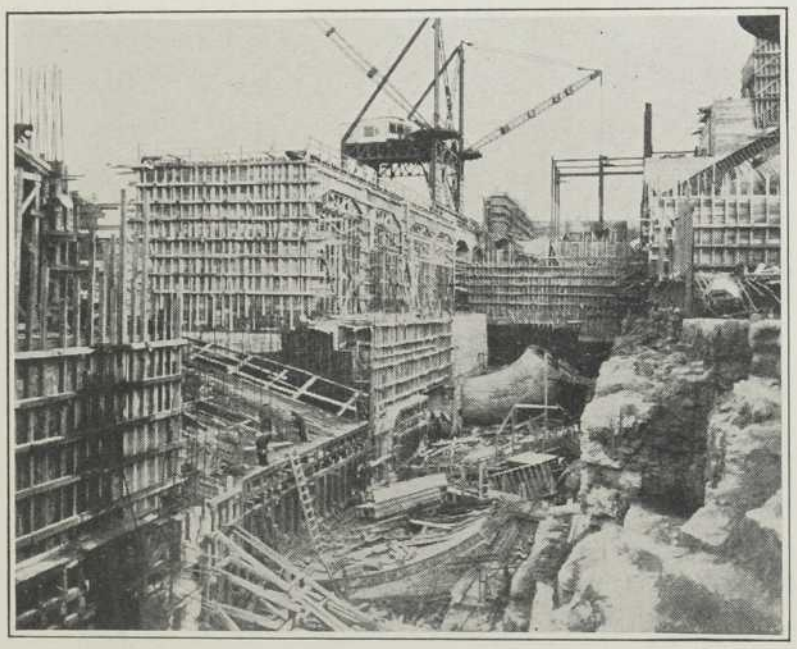
In 1930 the five construction camps housed about half of the 2,500 employees.

At Beauharnois there is a 20,000 barrel fuel tank which is filled by tankers docking at the corporation's own wharves; a completely equipped hospital; rock crushing, sand making and concrete mixing plant; forge; laboratories; warehouses and all the equipment which must be used to keep 2,500 men employed. During the season of operations, construction is maintained continuously to make the fullest use of the costly equipment, on which fixed charges constitute a substantial proportion of the total construction costs.



And then the Plant

Here is the well-advanced construction work on the power plant. At the right and in the background are two travellers each carrying two derricks; these were designed solely for concrete placing operations. The traveller on the left is moving on what eventually will be a highway on the downstream face of the power house; it is engaged in lifting a two cubic yard bucket of concrete from the flat car.

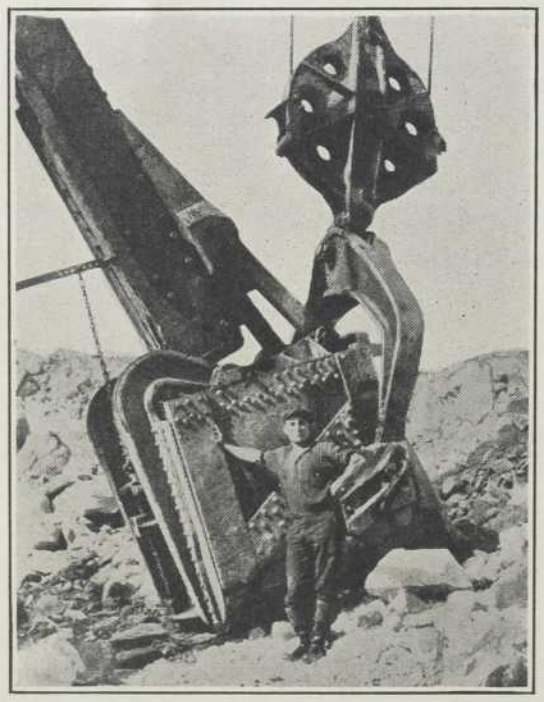


The excavation for the power house, 1,000 feet in length, has been completed. The bottom of the pit is 65 feet below the level of the surrounding country and 40 feet below Lake St. Louis.

On the downstream side of the plant, the tailrace excavation is nearing completion. The rock excavated from the tailrace goes to the rock dump or to the crusher and then to the concrete mixer.

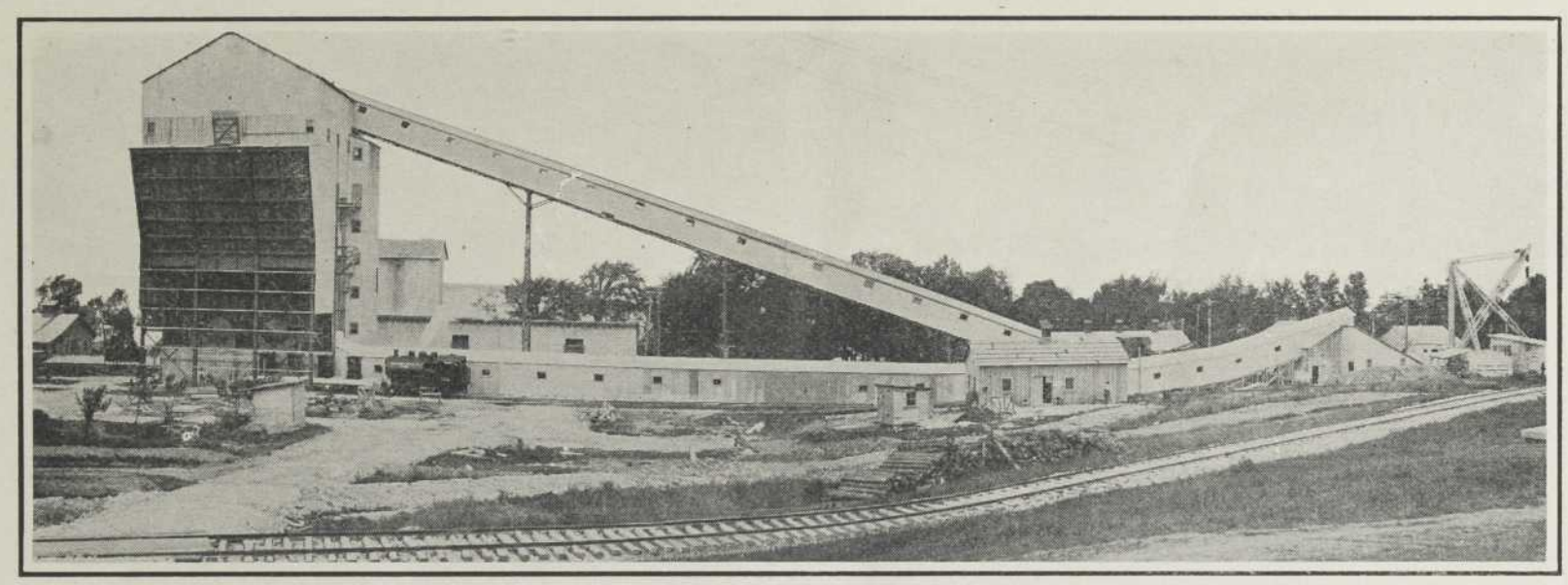
At the left is a view of the plant foundations. In the background is the draft tube form for the first 50,000 h.p. unit. Behind the draft tube are being installed two 8,000 h.p. auxiliary units for the plant purposes. To the right are seen forms for the bulkhead or the upstream face of the power house.

Along the canal route rock is encountered only at this point, where it provides suitable foundations for the power house. The plant is some 900 feet from the shore of Lake St. Louis.

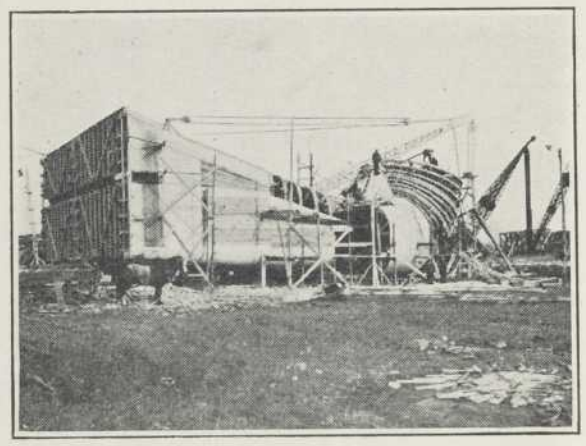


—And the Tailrace

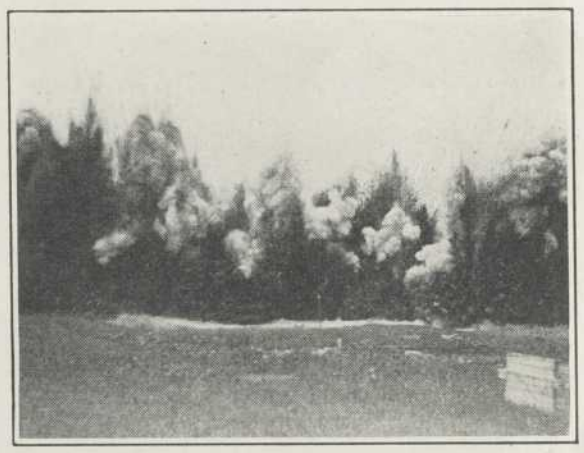
Here is the giant electric shovel which has completed the power house excavation at Beauharnois. It is here seen at work excavating the tailrace. When filled to capacity the shovel handles almost 10 cubic yards of rock—two bucketsful to a carload. As each rock train is filled, it moves off to the rock crusher or to the rock dump, and another train takes its place. The boom on the shovel weighs 80 tons and is 93 feet in length. The bucket itself is seen in the lower picture. The shovel, which weighs 550 tons, is operated by a 680 h.p. motor. The weight of the dipper handle and the dipper is over 30 tons. Day and night the shovel keeps steadily at work.

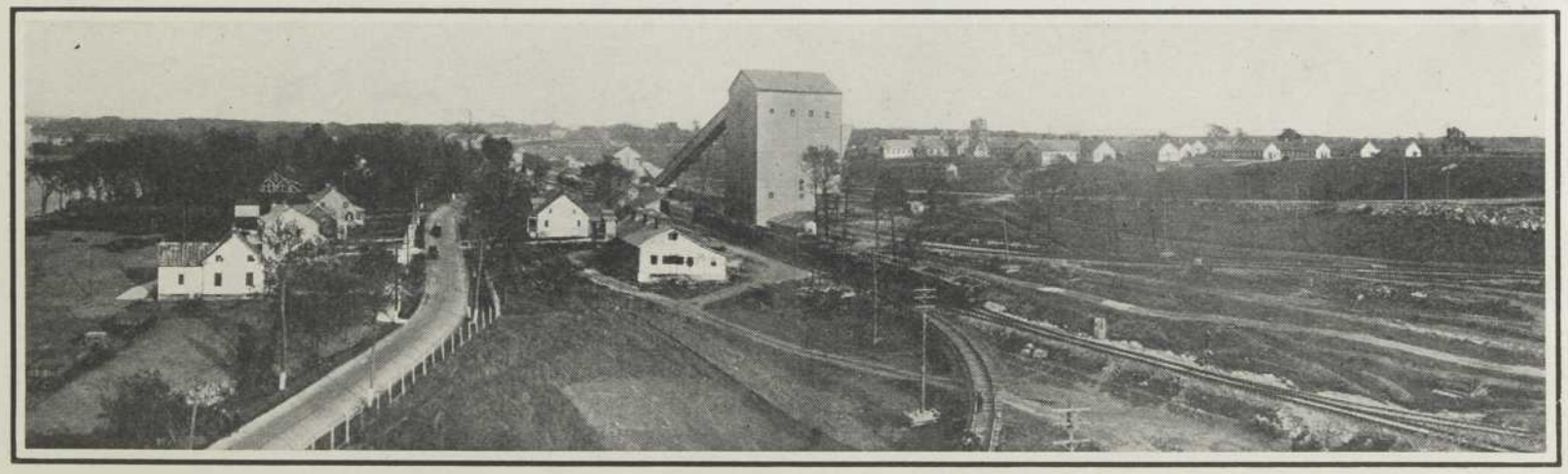


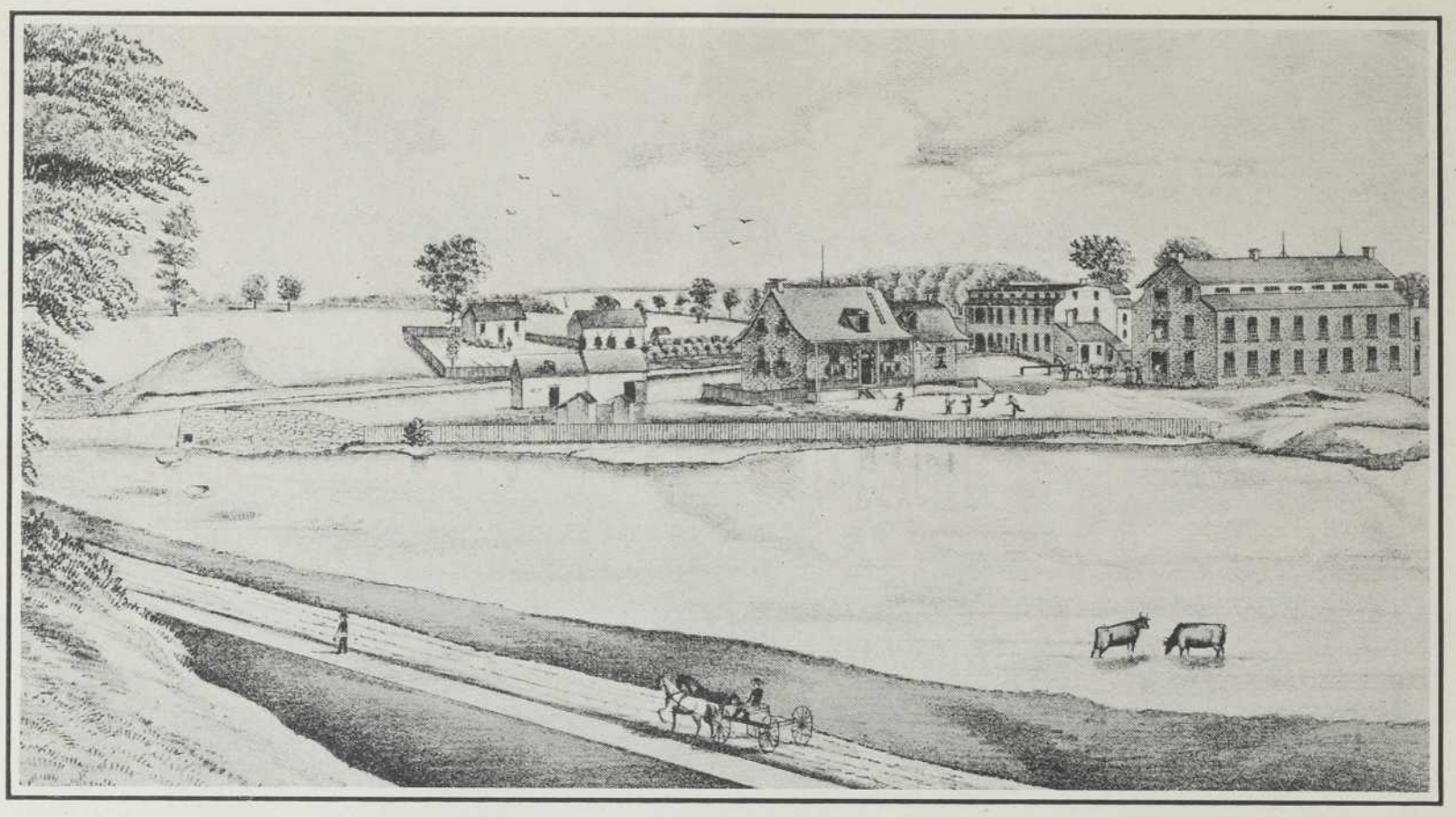
Scenes at Beauharnois



At the top is a view of the rock crushing and sand making machinery, and the concrete mixing plant with a capacity of 100 cubic yards an hour. In the front of the concrete plant is one of the trains which carries the mixture 150 yards to the power house. At the right is the construction work on a draft tube form for one of the 50,000 h.p. units, and a 50-ton dynamite blast at the tailrace site. Below is a panorama of the construction camp, concrete mixing plant and the shunting yards at Beauharnois; at the left is Lake St. Louis and some of the houses moved from the farms purchased along the canal route.

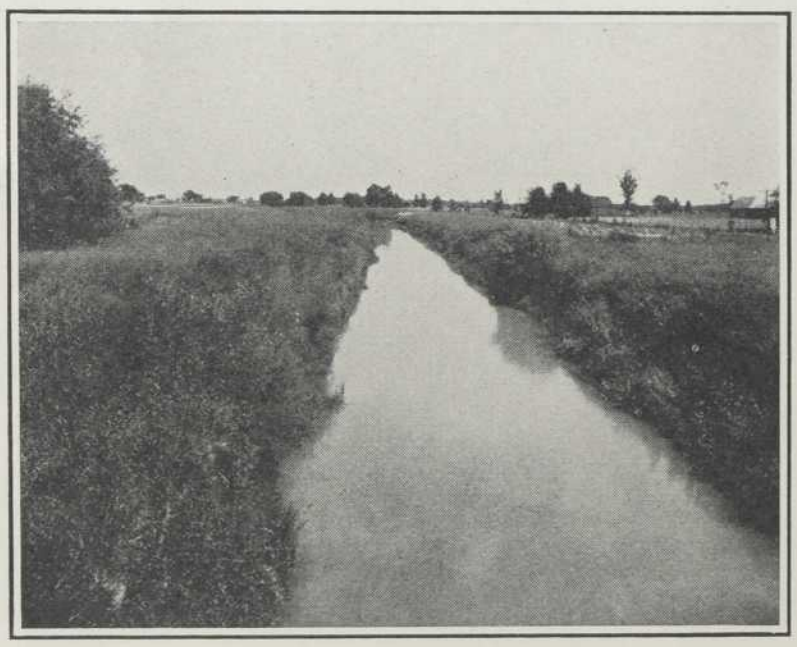






The Original Diversion Rights

About 1800 the Seigneur of Beauharnois erected a grist mill on Lake St. Louis at the mouth of the St. Louis River. To provide a more even flow in the stream at all seasons, he built a small feeder canal from Lake St. Francis to the nearby headwaters of the St. Louis. So for the first time water was diverted around the entire Soulanges section of the St. Lawrence. These fundamental diversion rights are still in existence, and are now held by the Beauharnois Power Corporation.



The old print of Beauharnois, sketched about 75 years ago, shows the old mill and the waterfall which provided the headrace for its operation. Below is a view of the small, still existent feeder canal, the basis of these ancient water rights from which grew the present gigantic conception.

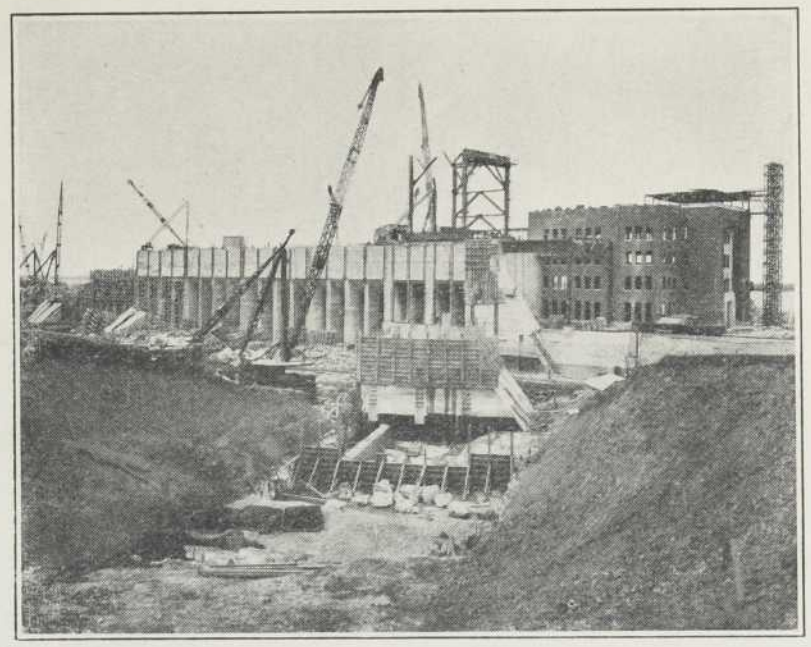


Photo by Compagnie Aerienne Franco-Canadienne

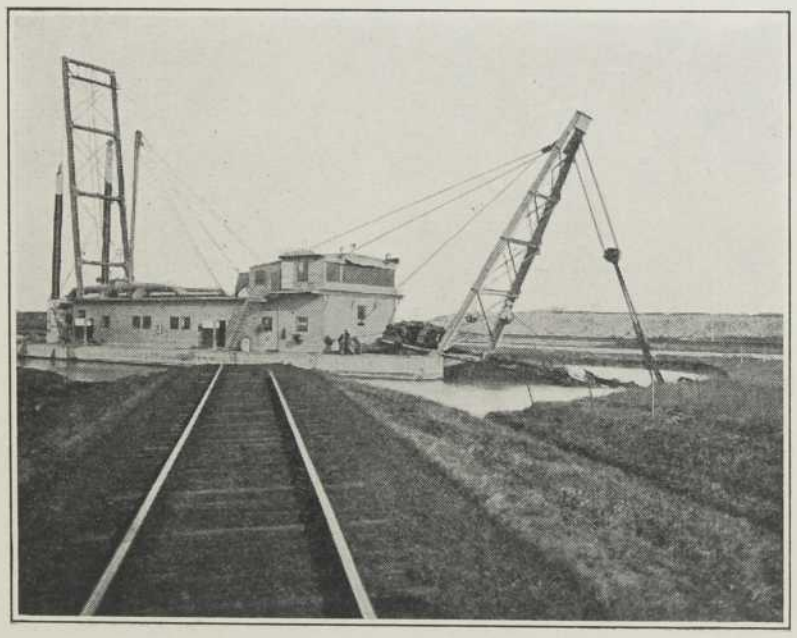
Construction Scenes

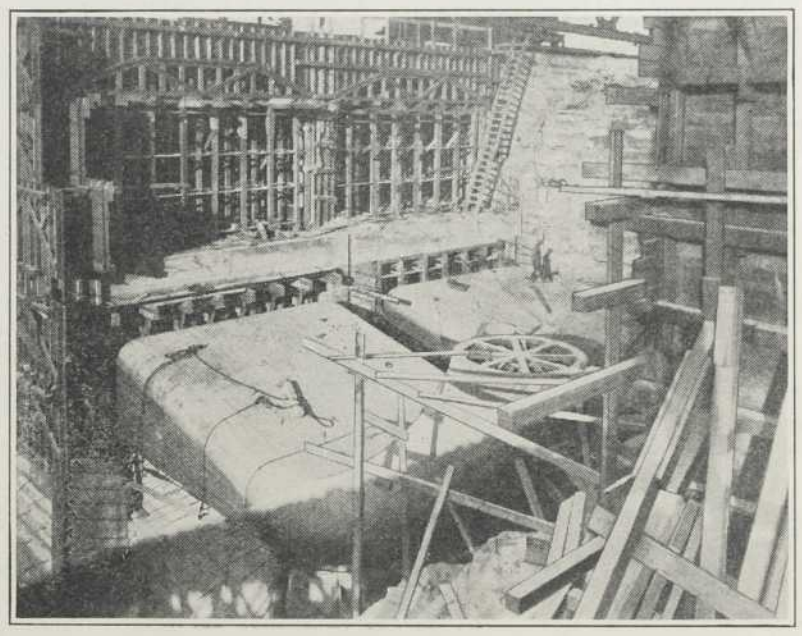
Upper left is one of the steel tower excavators engaged on dyking the north bank of the canal. The dyke here is 22 feet in height. The tower moves laterally on twin sets of rails. It is entirely electrically operated. The 10 cubic yard bucket scrapes off the topsoil, thus giving greater strength to the canal banks than if the clay subsoil were used.

To the right can be seen the construction work on the 500,000 h.p. plant. In the background is the service building, the derricks specially designed to handle the concrete, and the work on the bulkhead or upstream face of the plant.

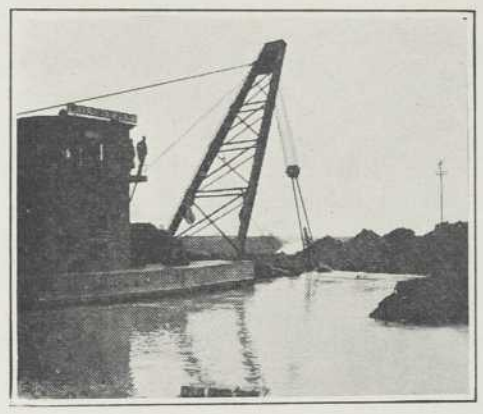
Lower left is the electric hydraulic dredge cutting its way through the N.Y.C. line near Valleyfield; in the background, the railway diversion and the north dyke of the canal.

Lower right is pictured the draft tube forms for the first two 8,000 h.p. auxiliary units for plant use.





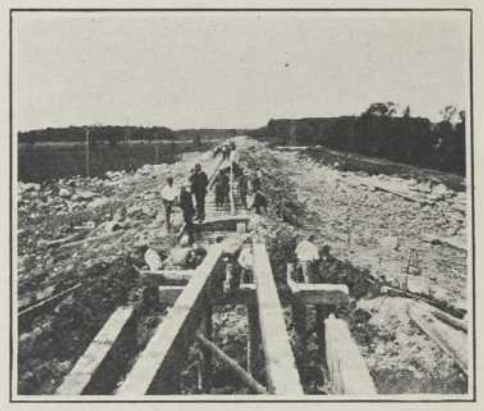
Component Activities



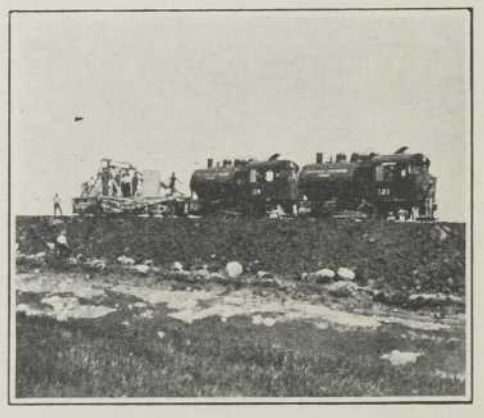
The chief activities under way on the Beauharnois undertaking are the erection of two canal dykes fifteen miles in length, the power house and tailrace excavation, and the construction work on the power house. But coupled with these major endeavours, there are the hundred-and-one component activities dependent on, or supplementary to the main work.

Here may be seen a ditch digger at work. The ditch will provide water for dredging operations in that section of the canal below the stretch of boulder clay which is being excavated in the dry.

The next picture shows the electric hydraulic dredge about to enter the short boulder clay section in the canal. It has completed some four miles of dredging at the western end of the canal. Its operations in 1931 will be confined to the eastern end of the canal, where, due to the slope of the land, it will not have to excavate so deep a channel.

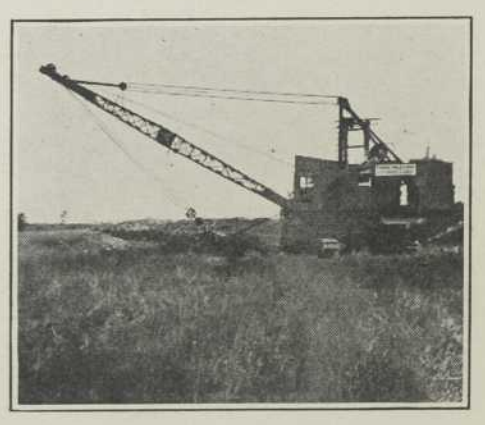


The next view is an aerial picture of one of the five camps. It is the Beauharnois camp. In the background is Lake St. Louis. It houses 500 of the 2,500 employees. Located here also is a completely equipped hospital, warehouses, a 20,000 barrel fuel oil tank, a forge, cement storage bins, and all those minor facilities which are required to keep 2,500 men steadily employed day and night.



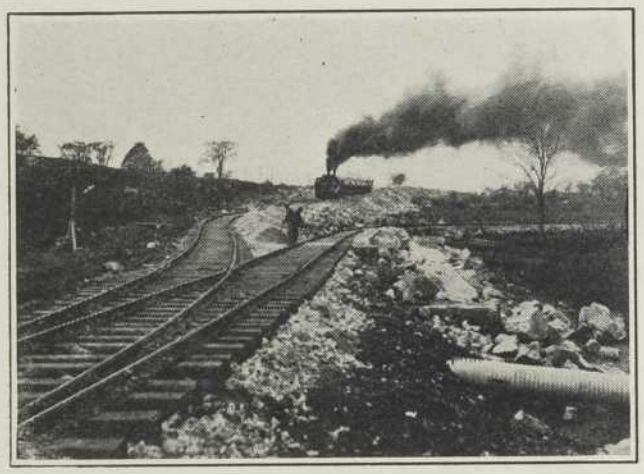
Next may be seen the work of making the fill on the Canadian National Railway diversion. In the foreground are the trestles from which the cars dump the earth.

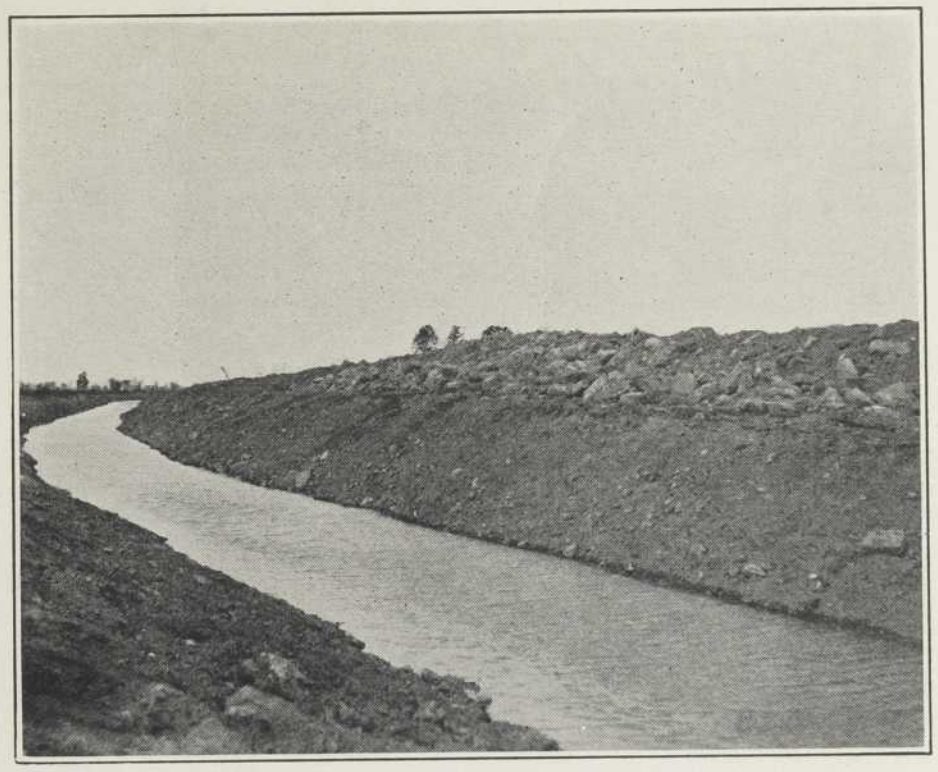
Then there is a view of one of the canal dykes. On top of the dyke is the construction railway. The two locomotives are pushing a spreader distributing the boulder clay placed there by the dump cars. The boulders will prevent the erosion of the canal banks.



And last is a view of a 5 cubic yard dragline. It is digging a ditch along the entire north bank of the canal to provide the drainage facilities now being eliminated by the construction of the canal.

Subsidiary Activities





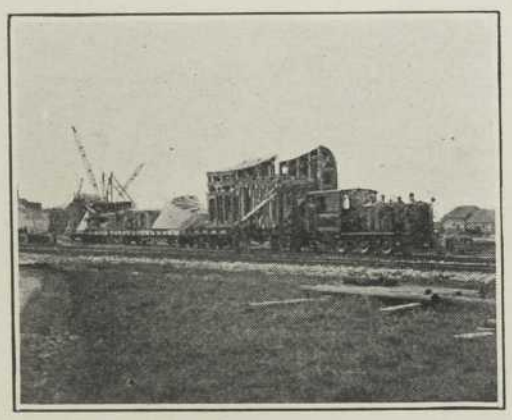
Here is one of the trains taking rock from the power house excavation to the rock dump. The rock will be taken later from the dump and used to rip-rap the canal banks. The rock is sandstone. It runs as high as 99½ per cent silica—as such, it has many important industrial uses.

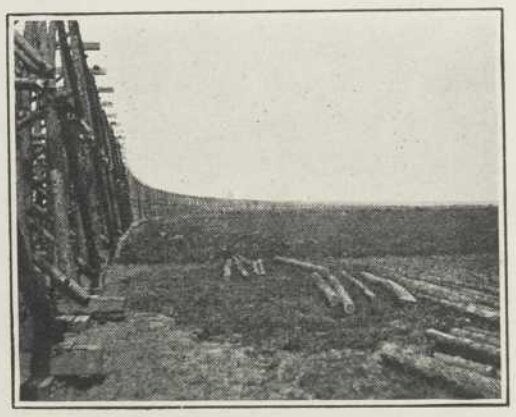
Upper right shows the diversion of the little St. Louis river, one of the many smaller jobs supplementary to main undertaking. The river cuts into the route of the canal. It has now been diverted, and parallels the south bank of the canal for a distance of a mile.

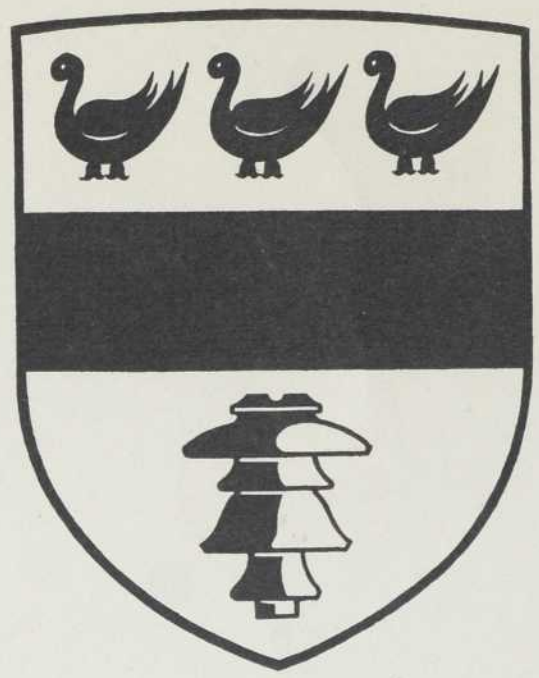
The lower pictures show a view beside the carpenter shop at Beauharnois. A train-load of concrete forms is being taken to the power house. Thus, carpenters erecting the forms do not delay the concrete placing operations at the power house site.

The camp hospital is up-to-date in every respect. It is completely equipped with laboratories and X-ray department. The staff includes a resident surgeon and two trained nurses.

Trestle work was erected to permit the C.N.R. line to cross the canal at right angles, thus reducing the cost of bridge construction. The diversion has been filled with material taken from the boulder clay section of the canal.







The device is the emblem of the Beauharnois Power Corporation. It is also the coat-of-arms of the old de Beauharnois family, to which has only been added the high tension insulator to signify power.

For centuries the de Beauharnois family was prominent in the life of Old and New France. It furnished Canada during the ancient regime with a governor and an intendant. The Governor, Charles, Marquis de Beauharnois, and his brother Francois were the first seigneurs of Beauharnois.

In heraldry the three birds on the emblem are known as martlets. These fabulous creatures have no beaks or feet. The legend grew that they lived in the air and ate ambrosia, the food of the gods. Hence they needed neither beaks nor feet.

In reality, the martlets originated in the times of the Crusades. Often knights came back from their travels with skins of oriental birds. These skins, of course, had neither beaks nor feet, and when included on a shield implied that the owner had been overseas.

So the emblem of the Beauharnois Power Corporation serves not only as a commercial mark, but recalls to the inward eye those memories of courts, pomps, ceremonies, and crusades which all formed part in the long chain of cause and effect leading to the present development of the St. Lawrence.

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