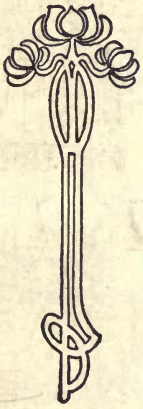
The Story of the New York State Canals

FRANK M. WILLIAMS
State Engineer and
Surveyor



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STATE OF NEW YORK
LINE OF BARGE CANAL
1916
Frank M. Williams
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LAKE ONTARIO
L. ERIE
L. CHAMPLAIN
NIAGARA
ORLEANS
GENESEE
WAYNE
MONROE
LIVINGSTON
ONTARIO
YATES
SENECA
TOMPKINS
CORTLAND
CHENANGO
OTSEGO
SCHOHARIE
ALBANY
RENSSELAER
COLUMBIA
GREENE
DELAWARE
ULSTER
SULLIVAN
DUTCHESS
PUTNAM
ORANGE
ROCKLAND
WESTCHESTER
NEW YORK
SUFFOLK
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ALLEGANY
STEUBEN
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TIOGA
BROOME
DELAWARE
SCHUYLER
HERKIMER
ONEIDA
MADISON
ONONDAGA
OSWEGO
JEFFERSON
LEWIS
ST LAWRENCE
FRANKLIN
CLINTON
ESSEX
HAMILTON
FULTON
SARATOGA
WARREN
WASHINGTON
Plattsburg
Fulton
Rome
Delta Res.
Hinckley Res.
Little Falls
Utica
Syracuse
Lyons
Clyde
Medina
Lockport
Rochester
Tonawanda
Buffalo
Geneva
Ithaca
Amsterdam
Glens Falls
Troy
Albany
Schenectady
Comers
BARGE CANAL
CAYUGA & SENECA CANAL
OSWEGO CANAL
CHAMPLAIN CANAL
Hudson R.

THE STORY OF THE NEW YORK STATE CANALS

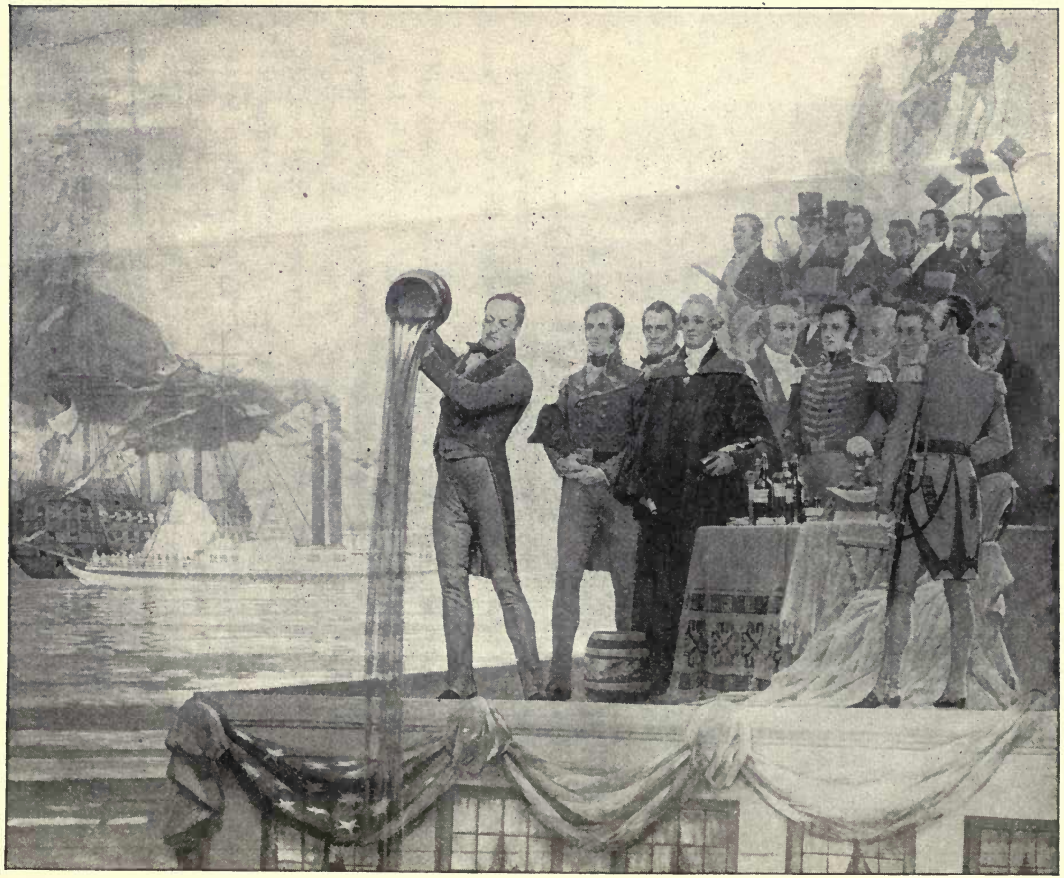
"GOVERNOR DEWITT CLINTON'S DREAM"

"As a bond of union between the Atlantic and Western states, it may prevent the dismemberment of the American Empire. As an organ of communication between the Hudson, the Mississippi, the St. Lawrence, the Great Lakes of the north and west and their tributary rivers, it will create the greatest inland trade ever witnessed. The most fertile and extensive regions of America will avail themselves of its facilities for a market. All their surplus productions, whether of the soil, the forest, the mines, or the water, their fabrics of art and their supplies of foreign commodities, will concentrate in the city of New York, for transportation abroad or consumption at home. Agriculture, manufactures, commerce, trade, navigation, and the arts will receive a correspondent encouragement. The city will, in the course of time, become the granary of the world, the emporium of commerce, the seat of manufactures, the focus of great moneyed operations, and the concentrating point of vast, disposable, and accumulating capitals, which will stimulate, enliven, extend and reward the exertions of human labor and ingenuity, in all their processes and exhibitions. And before the revolution of a century, the whole island of Manhattan, covered with inhabitants and replenished with a dense population, will constitute one vast city."

WHEN a man living in New York State, about a hundred years ago, wished to travel in any direction, he went by some river and lake route as much as he could, riding in a canoe or boat. Naturally the first forts were built on waterways so that they would be protected from the enemy.

There were few roads, and these were bad, and in early spring and rainy weather could not be used. Logs, placed across the road in low and marshy places, formed a rough and bumpy highway called a corduroy road. Plank roads were the best that existed. It was much pleasanter to travel by water and to carry goods that way. Few people lived west of the Genesee Valley, not because there was any lack of people anxious to live there, but because there was no way to bring their products to a market without heavy expense and great risk.

In order to open the western country to settlers, and to offer a cheap and safe way to carry their produce to a market, improvements in the natural waterways were made. The first canal locks were constructed in 1796 at Little Falls by a private company acting under a charter from the State. These made people eager for Governor DeWitt Clinton's plan for the state-owned Erie canal. This canal, begun in 1817, was laughed at by many who called it "Clinton's Big Ditch." Governor Clinton, however, forseeing its great use to the State, called it "The Grand Canal." The route of this waterway had been gone over and approved by President Washington, himself an engineer and surveyor.



"The Marriage of the Waters"

The Erie canal was opened October 25, 1825. It was 4 feet deep and about 42 feet wide and could float a boat carrying 30 tons of freight. The first boat to travel its full length was the Seneca Chief; its start from Buffalo was announced by the firing of a cannon, and this was echoed by the booming of a line of cannon all the way across the State to Albany and down the Hudson to New York city. The Seneca Chief carried two barrels of water from Lake Erie, which Governor Clinton emptied into the ocean at New York, the first "Marriage of Waters" between the Great Lakes and the Atlantic Ocean.

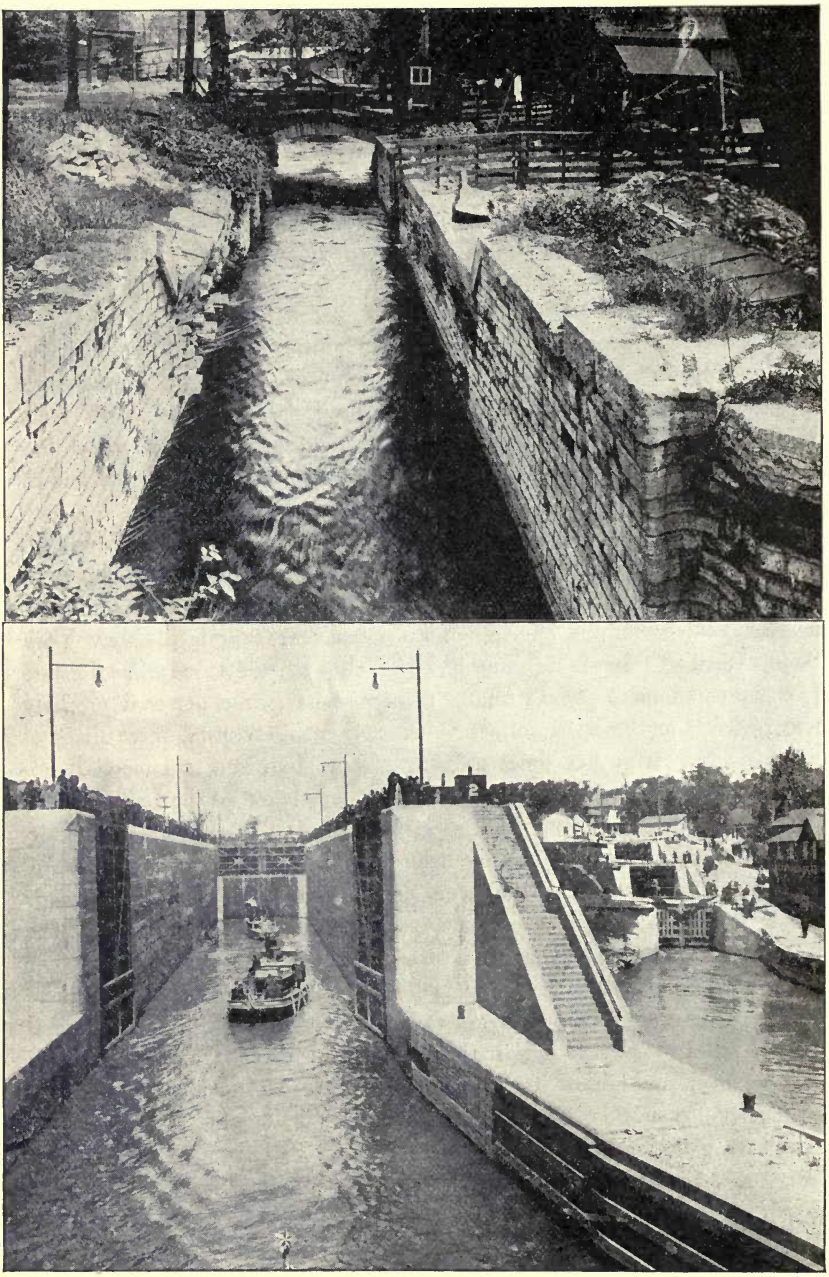
The Erie proved to be the world's greatest canal.

Its effect was soon felt, not only through the State but throughout the east and the Great Lakes region. Settlers flocked westward, forests gave way to sawmills and villages replaced these. Prosperous towns were established on the Great Lakes and the splendid chain of cities, which has won for New York the title of Empire State, sprang up along the line of the Erie canal.

The shipping which once went to Philadelphia, the nation's biggest seaport before the Erie canal, came to New York; the city grew by leaps and bounds and became the commercial center of the American Union. Sixteen years after the opening of the canal, the exports of New York were valued at three times those of Massachusetts, the value of real estate had increased more rapidly than the population, while personal property was nearly four times its former value, and manufacturing three times as great. There were five times as many people following commercial pursuits in New York as there were before the completion of the Erie canal.

Many other canals were built after people saw the success of the Erie, and for many years canals formed the principal trade routes in the State. However, the invention of the steam engine and the building of railroads struck them a severe blow. Some of them failed and were closed; the Chenango canal, connecting Utica and Binghamton, is an example of an abandoned canal. The Erie and main branches of the canal system were enlarged from time to time but still failed to hold their old popularity; and yet in 1882 it was found that the Erie had earned forty-two million dollars, over and above its original cost, expense of enlargement, maintenance and operation. At that time it had a depth of 7 feet and could float a boat big enough to carry 240 tons. In 1903, almost ninety years from the date of the beginning of Clinton's canal, the people of the State decided to again enlarge the canal and make it a Barge canal.

The Barge canal consists of four branches; the Erie, running across the State from Waterford on the Hudson river to Tonawanda, where the Niagara river is entered and followed to Lake Erie; the Champlain, running northward along the easterly boundary of the State from Waterford to Whitehall at the southern end of Lake Champlain; the Oswego,



Above: First canal lock in New York State built at Little Falls (1796); length 70 ft., width 10 ft. Below: At right, three locks at Waterford after first enlargement of Erie Canal; length of each 110 ft., width of each 19 ft. At left, new Barge Canal lock replacing three locks at right, length 328 ft., width 45 ft.

branching from the Erie canal north of Syracuse and running northward to Oswego on Lake Ontario; and the Cayuga-Seneca canal, leaving the Erie west of the Oswego junction and running southward, connecting with the two large lakes from which it takes its name. The enlargement of this last canal was not decided upon until 1909.

The Barge canal is one of the world's greatest feats of engineering. It is about ten times as long as the Panama canal and has many more engineering works and some of the most notable locks in the world.

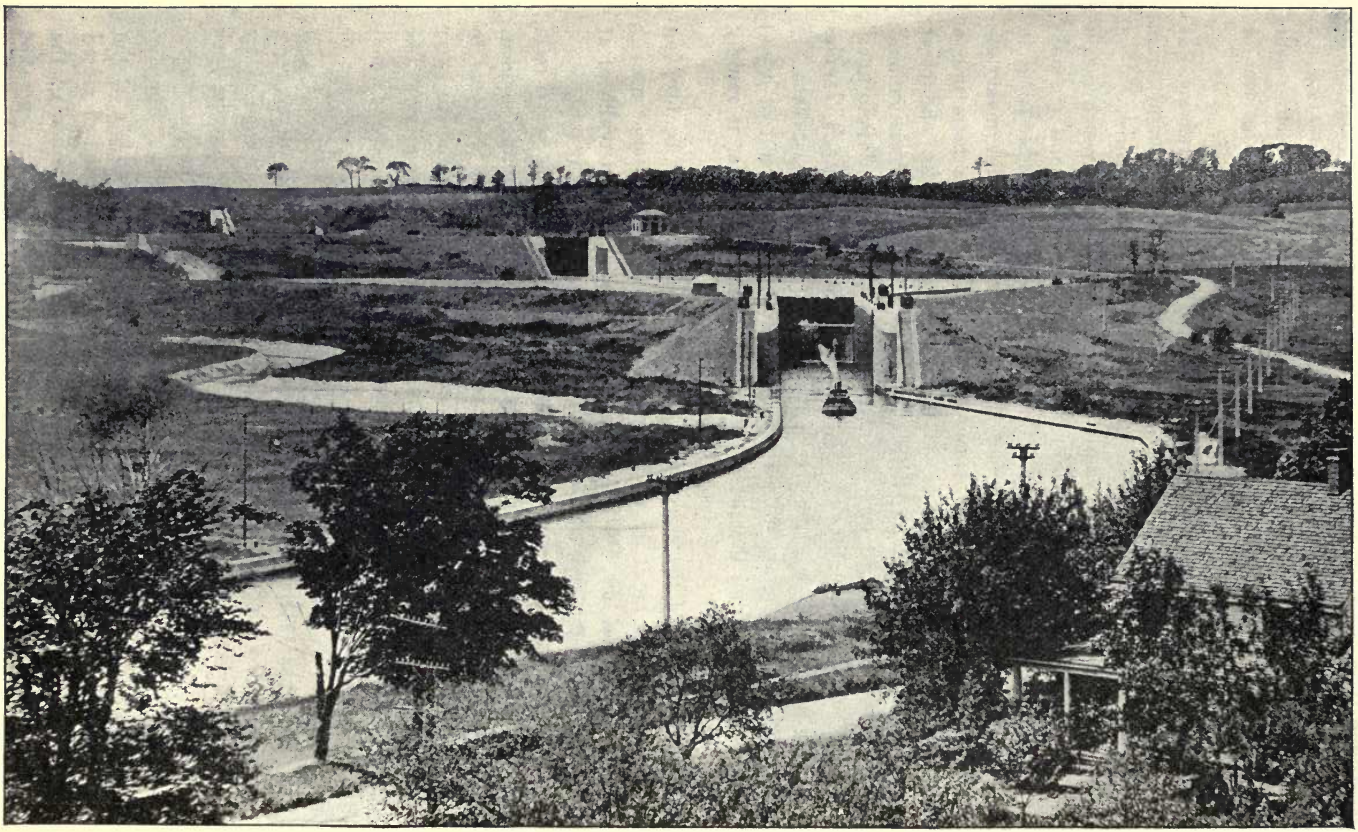
The old canals followed what is called a " land line " which means an artificial channel constructed by means of excavations and embankments, avoiding the natural streams and lakes wherever possible so as to be above danger of flood. The new system, on the other hand, makes use of all these rivers and lakes, whenever practical; it makes them into a canal (" canalizes them ") by the building of dams, locks, and other engineering works and obtains what is known as " slack water navigation." In fact, less than thirty per cent. of the Barge canal is built in " land line."

There will be 446 miles of Barge canals, the Erie being 339 miles long, the Champlain 61, the Oswego 23, and the Cayuga-Seneca 23 miles long. Of this total, 400 miles are completed and the most of it will be in operation during the present year, while the remainder is rapidly being finished.

The dimensions of the Barge canal vary according to the locality, but at all places it will be at least 12 feet deep. It is 125 feet wide in earth sections of the land line, 94 feet wide in rock cuts, and has a width of at least 200 feet in the beds of rivers and lakes through which it runs.

The Champlain canal will be completed in 1917 and this year it will be so near completion that through traffic will use it during the summer. The Oswego is finished, and the Erie canal will be finished next year to the point where it meets the Oswego, thereby making it possible to carry goods by Barge canal between Lake Ontario and the Hudson river. The Cayuga-Seneca will be finished this summer and in 1918 the entire canal will be completed and in operation, and will be able to float a barge of three thousand tons capacity.

All the locks (there are 57 in the Barge canal) are built of concrete and operated by electricity. They are filled with water and emptied by means of culverts, one in each of the side walls, opening into the lock chamber through 20 ports or openings located just above the lock floor. The lock gates are massive steel doors swinging on steel pivots. Some of these lock gates weigh more than 200,000 pounds each and are of the so-called " mitre gate " type. A pair of gates may be opened or closed in about 30 seconds. Their operation, as well as the operation of the valves which control the flow of water in the feed culverts, the operation of the power capstans, the buffer beams and all other lock machinery is



View of three of series of Waterford Locks, Erie Barge Canal

controlled by a series of small switches collected together in a small controller box located on one of the lock walls.

The Barge canal locks are 328 feet long and 45 feet wide. They will lift at one time from one water level to another six such boats as are at present in use on the canals. The most wonderful of these locks are the five at Waterford, near Troy, which have a combined lift of 169 feet, the greatest series of high lift locks in the world. These locks cost about one-quarter of a million dollars each. The lock at Little Falls has a lift of 40½ feet; this is remarkable because it has a greater lift than any lock on the Panama canal. The siphon lock at Oswego has a lift of 25 feet, is the first lock of this type to be built in the United States and the largest of its type in the world.

Other notable structures connected with the Barge canal are:

1. The movable dams. These dams, unique in this country, retain the waters of the Mohawk river and look like immense truss bridges, heavy steel gates being raised and lowered to govern the depth of water in the canalized river bed.

2. The big dams at Delta and Hinckley. These have created two lakes of about 5 square miles each, and store up water that is to be let into the canal channel during the dry summer months so that the depth of 12 feet can be maintained.

3. The massive steel guard gates which protect the various locks and other works.

4. The curved fixed dam at Crescent which is located just above the Waterford locks.

5. The 300 new bridges which carry the railroads and the highways across the Barge canal.

6. The automatic spillways which help to maintain the water levels in the canal.

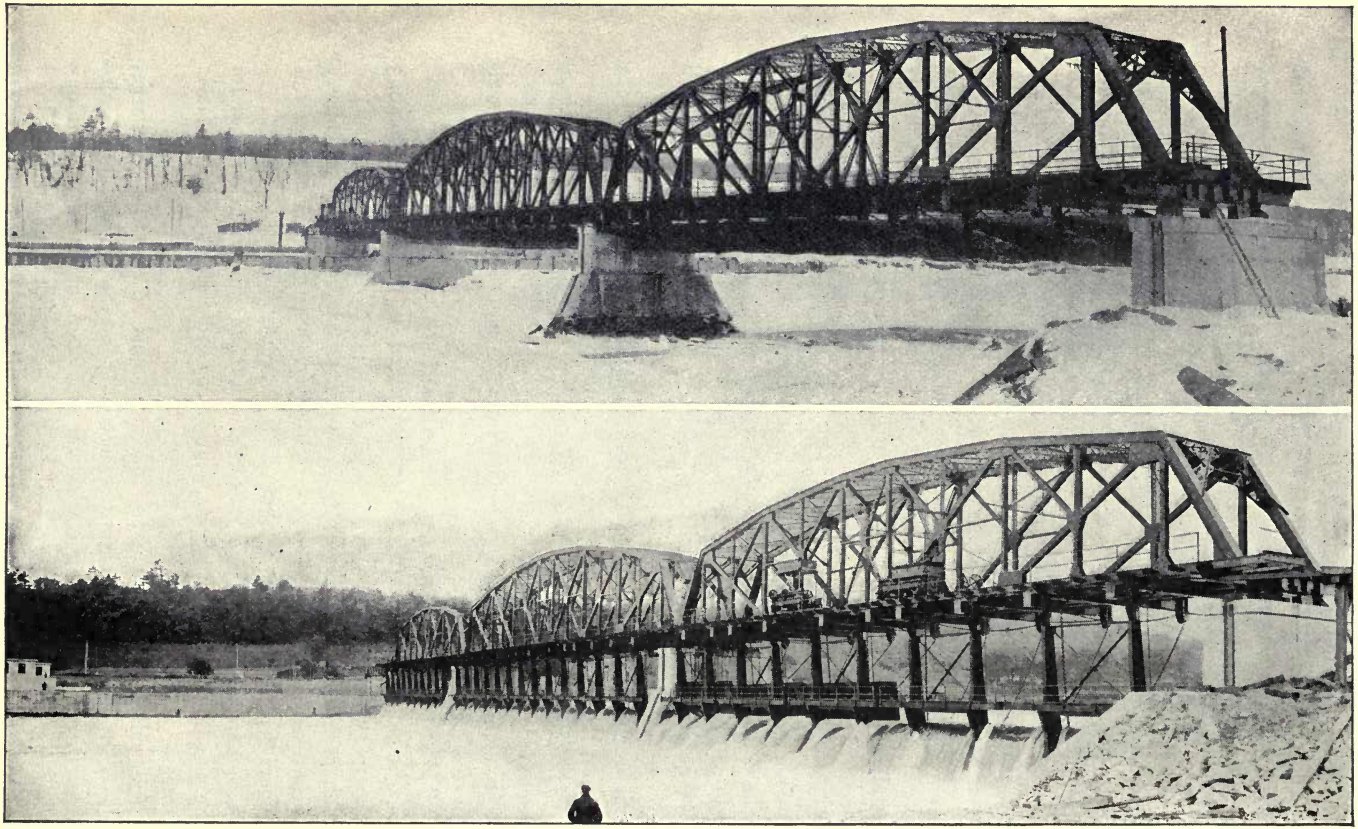
7. The 50-foot Taintor gates, the largest in the world.

8. The power houses where electrical power is created for operating the canal structures.

In the construction of the Barge canal a greater variety of machinery has been used than ever before used on any engineering undertaking; this machinery represents a cost of about $10,000,000.

This great inland canal will cost $150,000,000 and is being paid for by the people of New York State without any aid from the United States government.

There will be no towpaths on the new canal so that the big barges which will be used must be run by mechanical means. The State is also building Barge canal terminals at all the cities and important towns along the different channels. These will be provided with machinery to load and unload barges. It is quite certain that the Barge canal will serve to

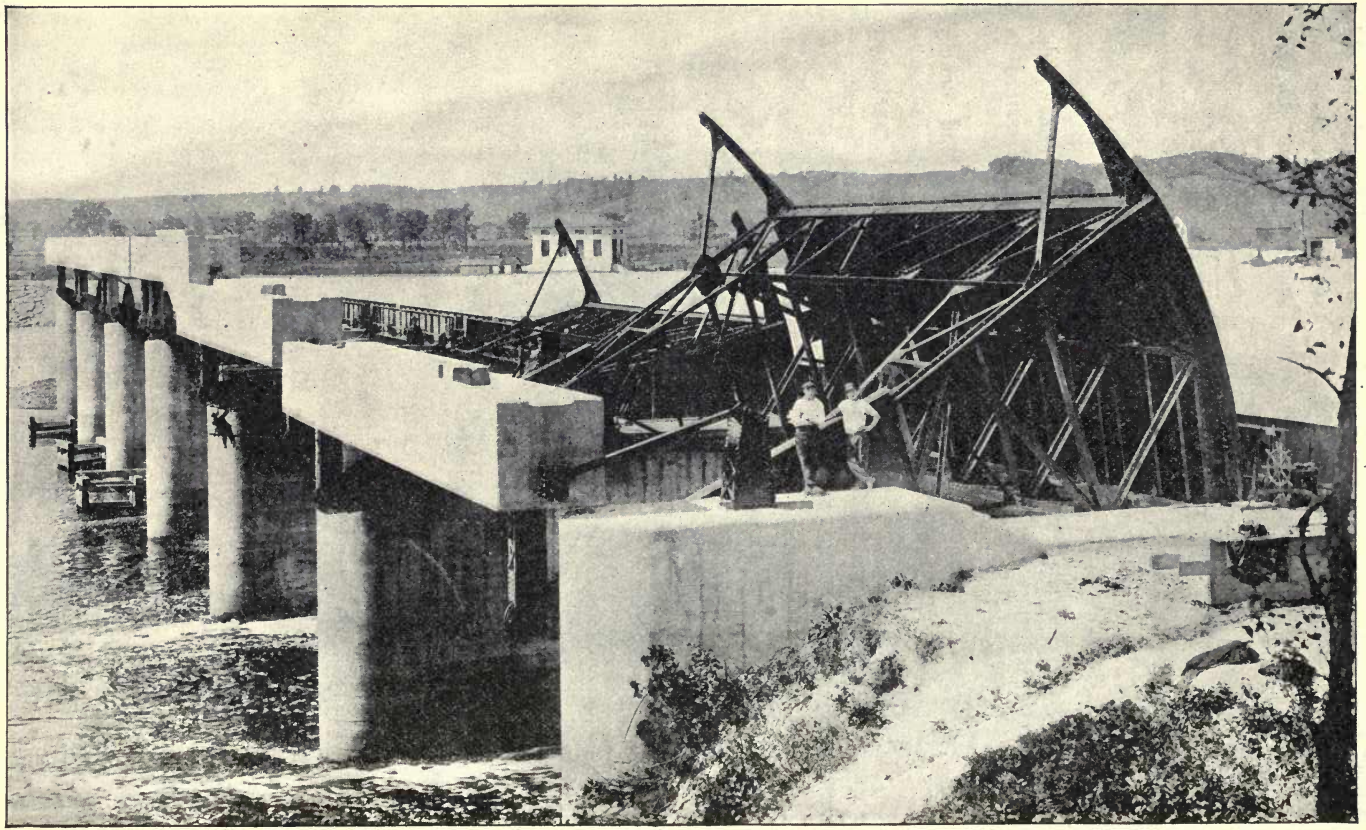


Movable dam in Mohawk River at Scotia (Erie Barge Canal). Above, Dam raised out of bed of river; below, Dam lowered in place, creating pool for Barge Canal navigation

attract once more the inland shipping that once passed through the old canals and did so much toward making New York the Empire State, and New York city the greatest metropolis in the American Union. DeWitt Clinton's dream will have become a reality.

LIST OF PROMINENT FACTS

A. First canal locks at Little Falls in 1796.
B. "Clinton's Big Ditch," begun 1817, completed in 1825.
C. What the Barge canal (1903) consists of:
    1. Erie — across State from Waterford on Hudson to Tonawanda.
    2. Champlain — north along east boundary from Waterford to Whitehall.
    3. Oswego — branching from Erie north of Syracuse and running north to Oswego.
    4. Cayuga-Seneca — leaving Erie west of Oswego canal and running south connecting with Lakes Cayuga and Seneca.
D. Length of canals:
    1. Erie — 339 miles.
    2. Champlain — 61 miles.
    3. Oswego — 23 miles.
    4. Cayuga-Seneca — 23 miles.
    5. Total — 446 miles.
E. Four hundred miles now complete.
F. Minimum depth 12 feet.
G. Width:
    1. 125 feet in earth sections.
    2. 94 feet in rock cuts.
    3. 200 feet in rivers and lakes.
H. Number of locks — 57.
I. Construction and operation:
    1. Built of concrete.
    2. Operated by electricity.
    3. Lock gates opened or closed in 30 seconds.
    4. Uniform length of locks 328 feet.
    5. Width of locks 45 feet.
    6. Lift of locks varies from 6 to 40½ feet.
J. Notable locks:
    1. Five at Waterford — combined lift of 169 feet.
    2. One at Little Falls — lift of 40½ feet.
    3. One at Oswego — lift of 25 feet.
        a. Siphon lock.
        b. First in United States — largest in world.



Taintor regulating gates in Hudson River (Champlain Barge Canal) near Mechanicville. Photograph shows concrete counterweights. These are the largest Taintor gates in the world

K. Notable features:

1. Movable dams.
2. Dams at Delta and Hinckley.
3. Massive steel guard gates.
4. Curved fixed dam at Crescent.
5. Three hundred railroad and highway bridges.
6. Automatic spillways.
7. Fifty-foot Taintor gates.
8. Power houses.

L. Total cost 150 million dollars.

M. Total cost of machinery used in construction, 10 million dollars.

DEFINITIONS

Slack water navigation. Navigation in a pool of water created by a dam.

Earth sections. That part of a land line where the soil is chiefly earth, and little rock is encountered.

Tons capacity. The maximum number of tons which a boat can carry.

Feed culverts. The hollow spaces or tunnels within the lock walls through which the water for filling or " feeding " the locks and for emptying them is carried.

Mitre gate type. A pair of gates which, when closed, form a definite angle at the point of junction.

Power capstans. A cleated cylinder revolving around a spindle, built on the lock walls, and operated by electricity. A rope fastened to a barge can be thrown around the capstan, and the barge can thus be towed into a lock.

Buffer beams. A steel beam resting in a pocket in one of the approach walls to a lock, and swinging on a pivot to meet the other approach wall in front of the lock gates. Buffer beams serve as protection to the lock gates.

Controller box. A steel box standing on a lock wall containing the switches which, when operated, open and close the lock gates and the valves in the " feed " culverts.

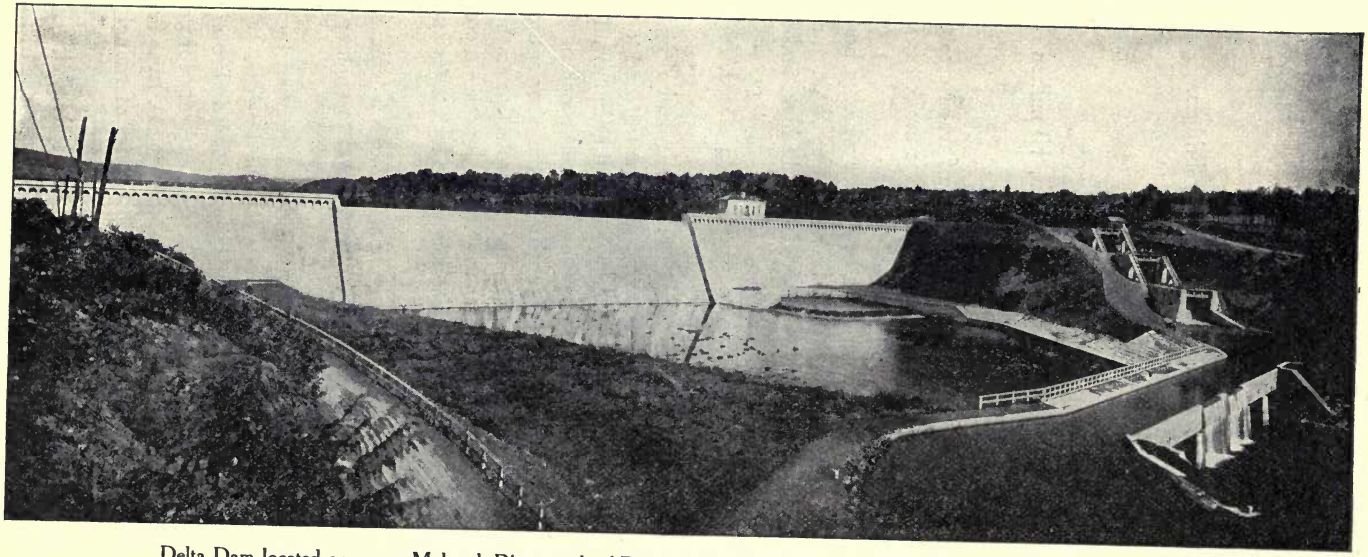
Lockage. The passage of a boat or boats through a lock. The raising or lowering of a boat or boats from one water level to another water level, by means of a lock.

Siphon lock. A lock which can be filled and emptied by means of a series of pipes and without the aid of any mechanical means.

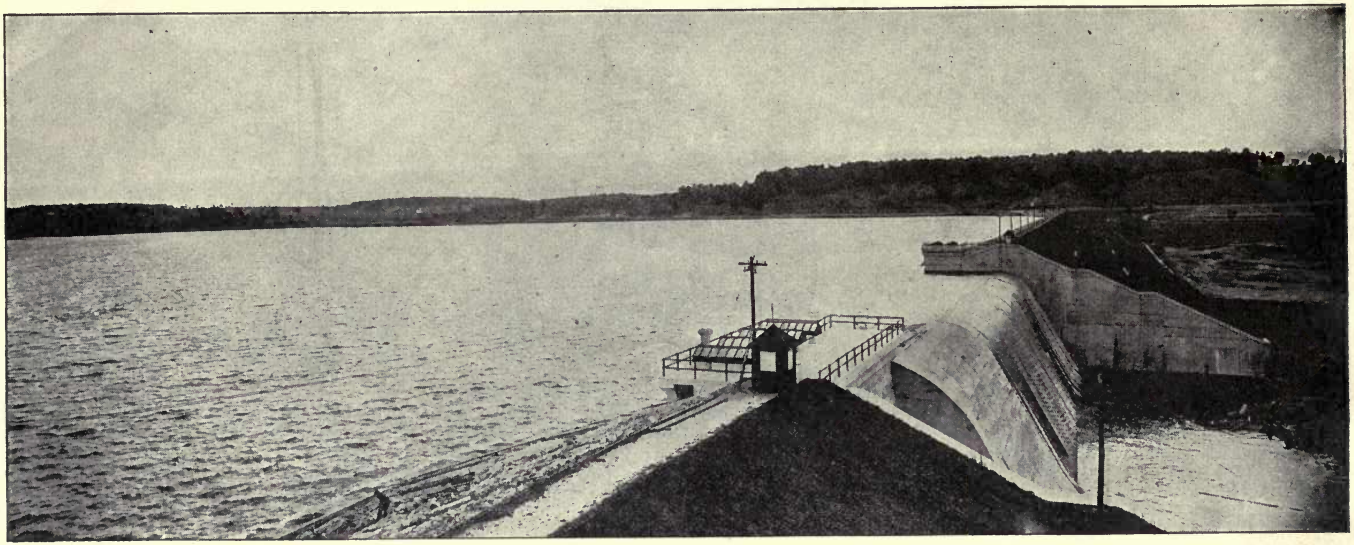
Movable dams. Dams which can be raised or lowered so as to keep the water in canalized streams at the depth which is necessary for navigation.

Truss bridge. A bridge supported by a truss. A truss is a structure whose members are collected in the form of a series of triangles so that it cannot be weakened unless the length of one of its members is changed.

Guard gates. Steel gates built across the canal channel, usually at the head of a series of locks, so that in case of accident to one of the locks, the gate can be lowered and the water supply shut off.



Delta Dam located on upper Mohawk River north of Rome. This dam impounds water for use in the Erie Barge Canal



Lake created by Hinckley Dam on West Canada creek for supplying water to Erie Barge Canal