

A Short History of the early Welland Canals
which was the start of the
St. Lawrence Seaway in the Niagara area

A presentation by Ron Potts
to the IEEE Hamilton Life Member Chapter
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The St. Lawrence Seaway



Shipping news

The 3,700-kilometre Great Lakes and St. Lawrence Seaway system is the world's longest deep-draft navigation network, serving more than 100 commercial ports and moving more than 160 million tonnes of cargo a year. The four-year, \$500-million upgrade to the system includes automating the locks connecting the Great Lakes and St. Lawrence River, rebuilding walls and gates for the locks and installing hands-free mooring. In addition, shipping companies that use the route are investing \$1-billion in new ships that are bigger and more efficient.

EQUINOX CLASS CARRIER

Algoma Central Corp. is building a fleet of eight Equinox Class, efficient dry-bulk carriers in China. They will be Canadian flagged and crewed and operate on the Great Lakes. The Algoma Equinox is the first.

Exhaust scrubbers

Reduces 97% of sulfur dioxide emissions

Efficiency

Ship employs technology to reduce energy consumption

Advanced hull

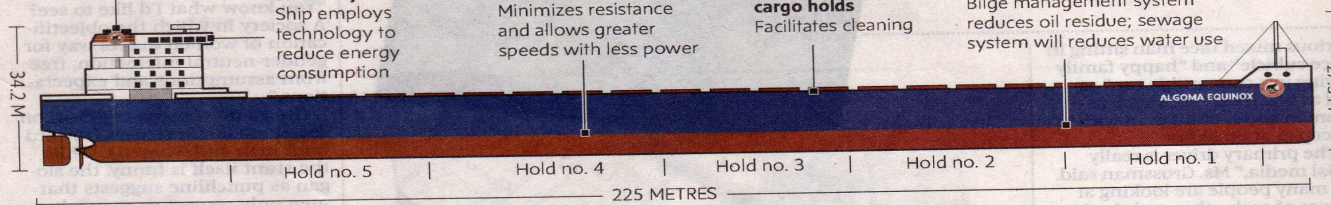
Minimizes resistance and allows greater speeds with less power

Low-residue cargo holds

Facilitates cleaning

Water management

Bilge management system reduces oil residue; sewage system will reduce water use



EFFICIENT MEANS OF TRANSPORT

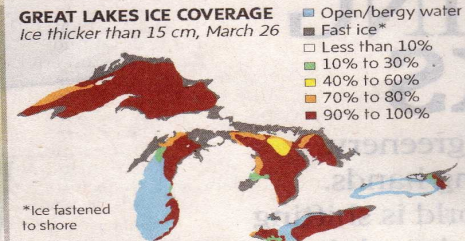
The number of rail cars and trucks it takes to transport the contents of one ship.



GREAT LAKES-ST. LAWRENCE SEAWAY

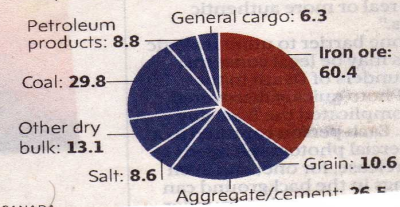
GREAT LAKES ICE COVERAGE

Ice thicker than 15 cm, March 26



GREAT LAKES CARGO BREAKDOWN

More than 164 million tonnes of goods are transported per year. In millions of tonnes



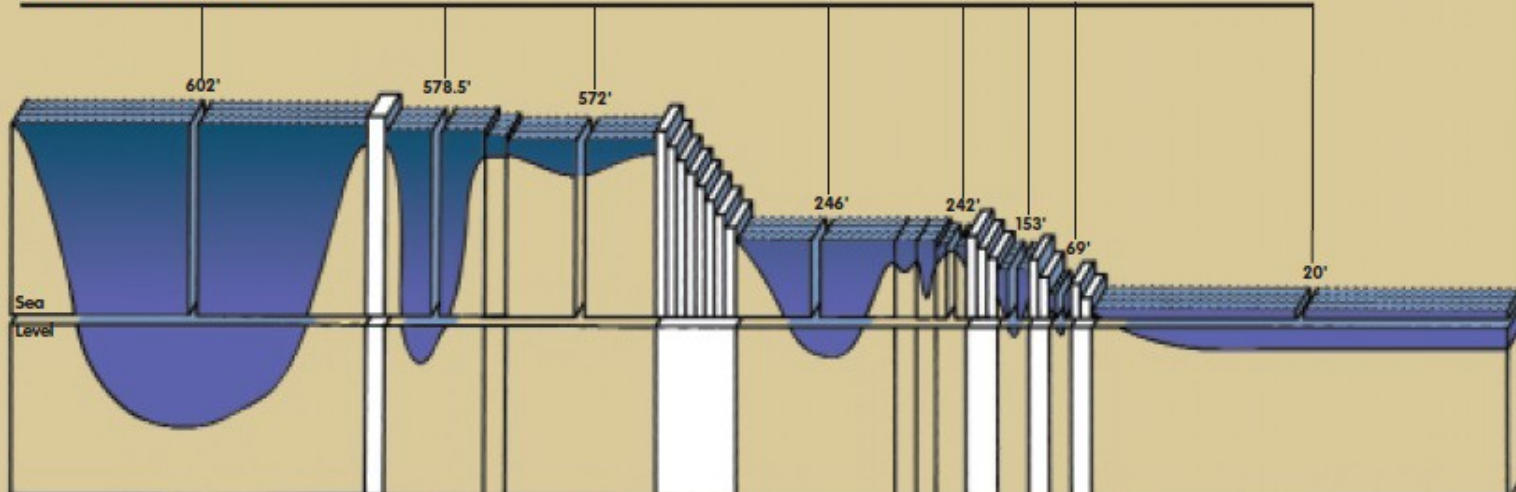
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SOURCES: ALGOMA CENTRAL CORP.; MARINE DELIVERIES; ENVIRONMENT CANADA

Total Mileage Duluth to Atlantic: 2342 Miles (3,700 kms)

FEET ABOVE SEA LEVEL



Lake Superior: 383 Miles

St. Mary's River: Soo Locks—70 Miles

Lake Michigan: 345 Miles

Lake Huron: 223 Miles

St. Clair River-Lake St. Clair-Detroit River: 77 Miles

Lake Erie: 236 Miles

Welland Canal: Eight Locks—28 Miles

Lake Ontario: 160 Miles

Thousand Islands Section: 27 Ft. Channel—68 Miles

Lake St. Lawrence: 44 Miles

International Rapids Section: Three Locks and Dams, 27 Ft. Channel—44 Miles

Lake St. Louis

Lake St. Francis Section: 27 Ft. Channel—30 Miles

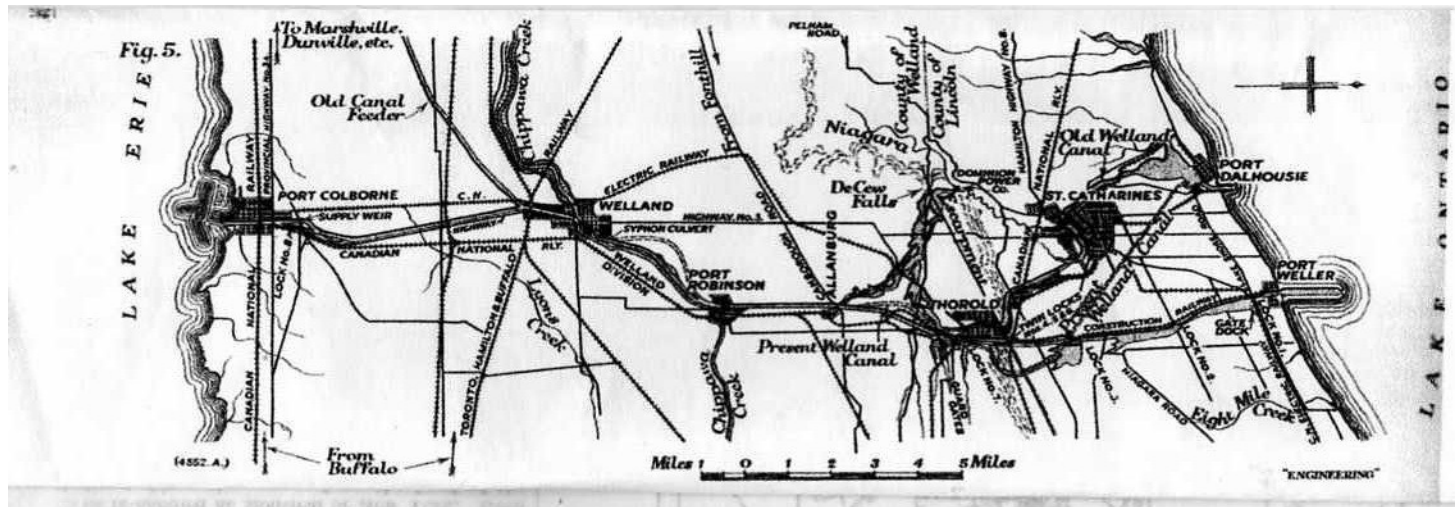
Soulanges Section: Two Locks, 27 Ft. Channel—16 Miles

Lachine Section: Two Locks, 27 Ft. Channel—31 Miles

Tide Water Section: Deep Water from Montreal to Sea—1000 Miles

The First Welland Canal 1829

- In 1824 Mill owner William Merritt started the Welland Canal Company.
- Construction started In 1829.
- Two years later the fist vessel went through the canal.
- The canals' route was from Port Dalhousie through Thorold to Port Robinson on the Welland River and on to Chippawa. The route then followed the Niagara River to Lake Erie.
- In 1883 the canal was extended to Port Colborne.



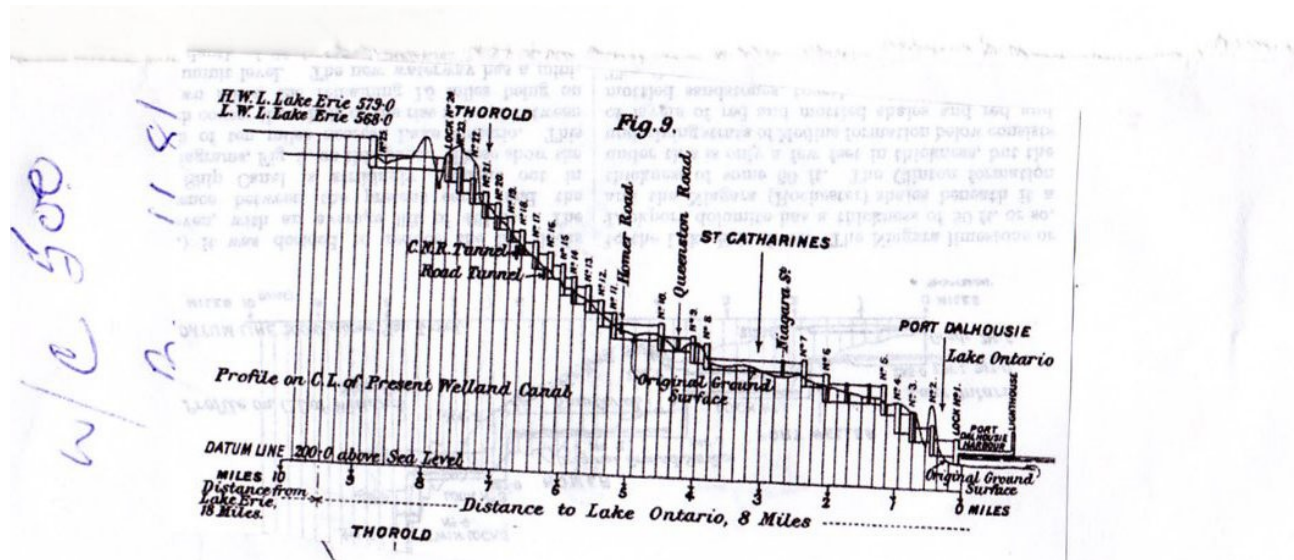
Canal Route

The First Welland Canal 1829 cont'd

- The Canal was 44km. long with 40 wood locks.
- George Keefer built a Mill behind the escarpment edge which eventually became the town of Thorold.
- The increasing size of ships on the Great Lakes made the requirement of a larger canal necessary.
- The Government purchased the Welland Canal Company and planned a second canal.

The Second Welland Canal 1845

- Construction began in 1841 and completed in 1845.
- With 27 locks of cut stone, this canal followed the same route through Thorold. This part was covered over in 1900.
- Lock 1 was at Port Dalhousie with Lock 7 reaching Niagara Street. Lock 9 reached Queenston Road.
- At Lock 16 was a road tunnel; the CN Railway was a tunnel at Gate `18.
- The Town of Thorold was at Gate 21 and Lock 26 was the last of the step sequence with Lock 27 about 3 miles from Lake Erie.



2nd Canal Locks

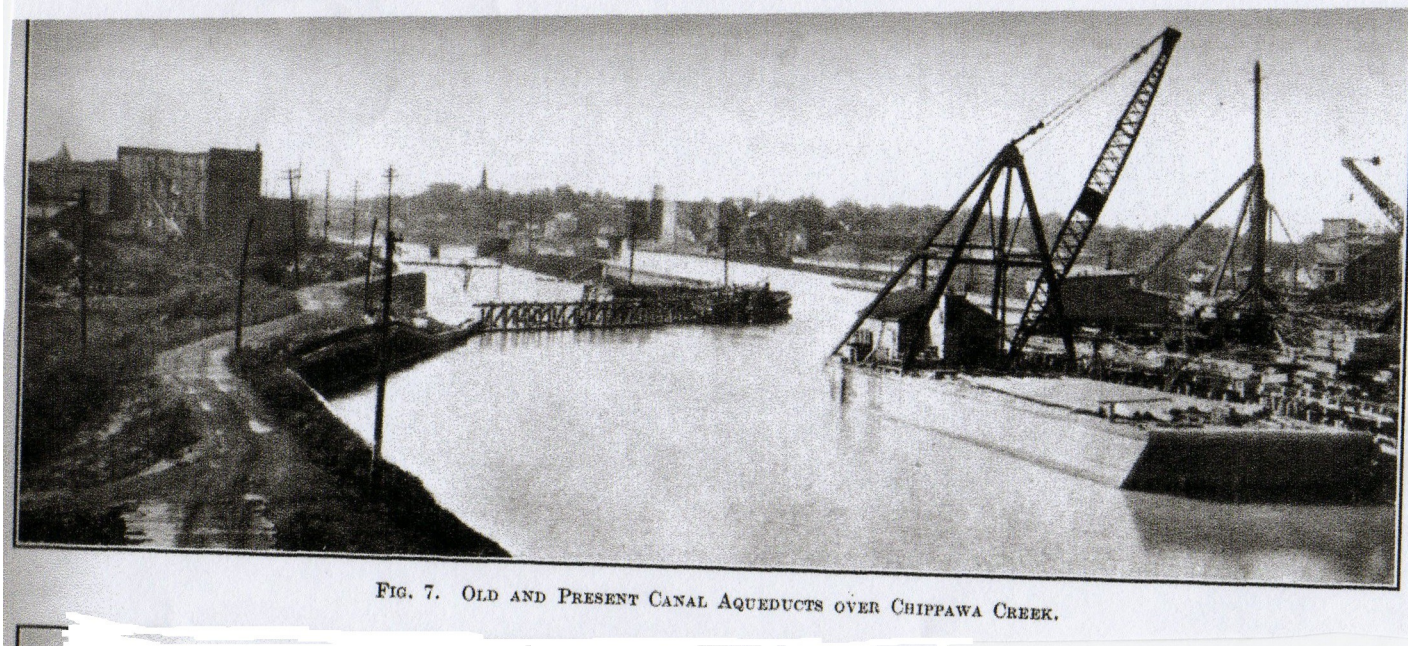
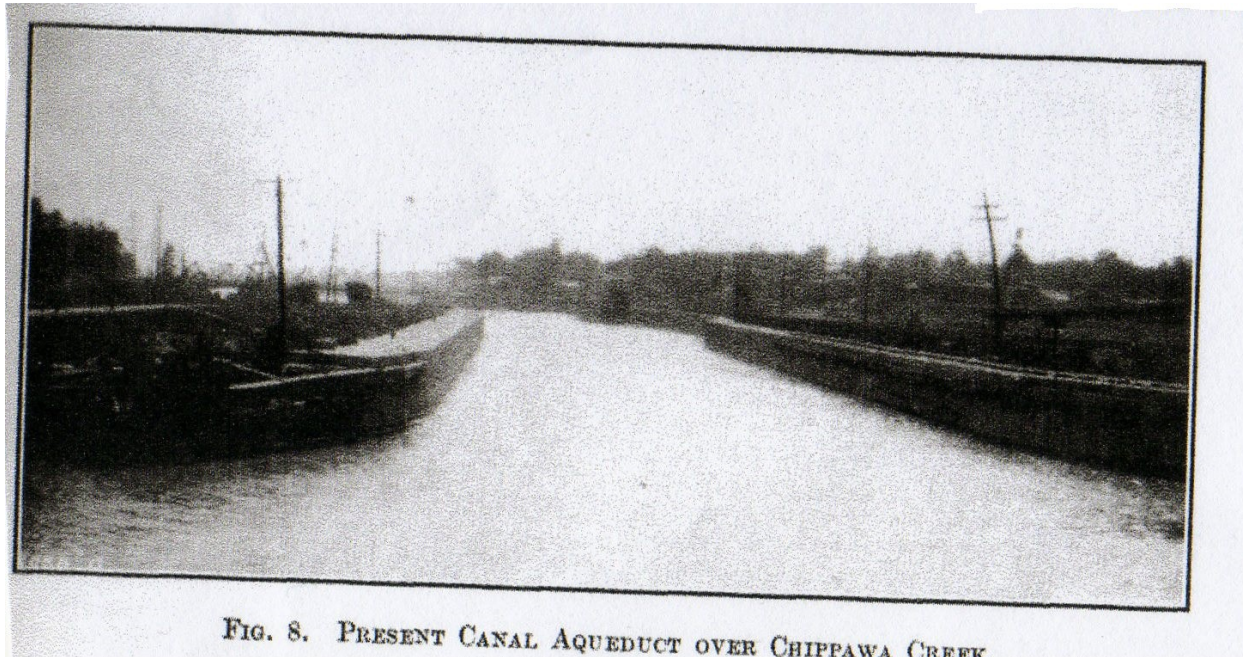


FIG. 7. OLD AND PRESENT CANAL AQUEDUCTS OVER CHIPPAWA CREEK.

Second Canal at Chippawa Creek 1831



Second Canal at Chippawa Creek 1933

The Second Welland Canal 1845 cont'd

- A branch canal from Dunville to Port Maitland using the Grand River was also built.
- Modifications to the 2nd canal continued. Increasing the depth to 10ft., by raising the banks and lock walls in 1853.
- By 1881 the canal had been connected to Lake Erie due to increased traffic, but the connection by the Grand River was discontinued.
- In 1870 the government started to consider a uniform system for the St.Lawrence Seaway and a third canal.

The Third Welland Canal 1881

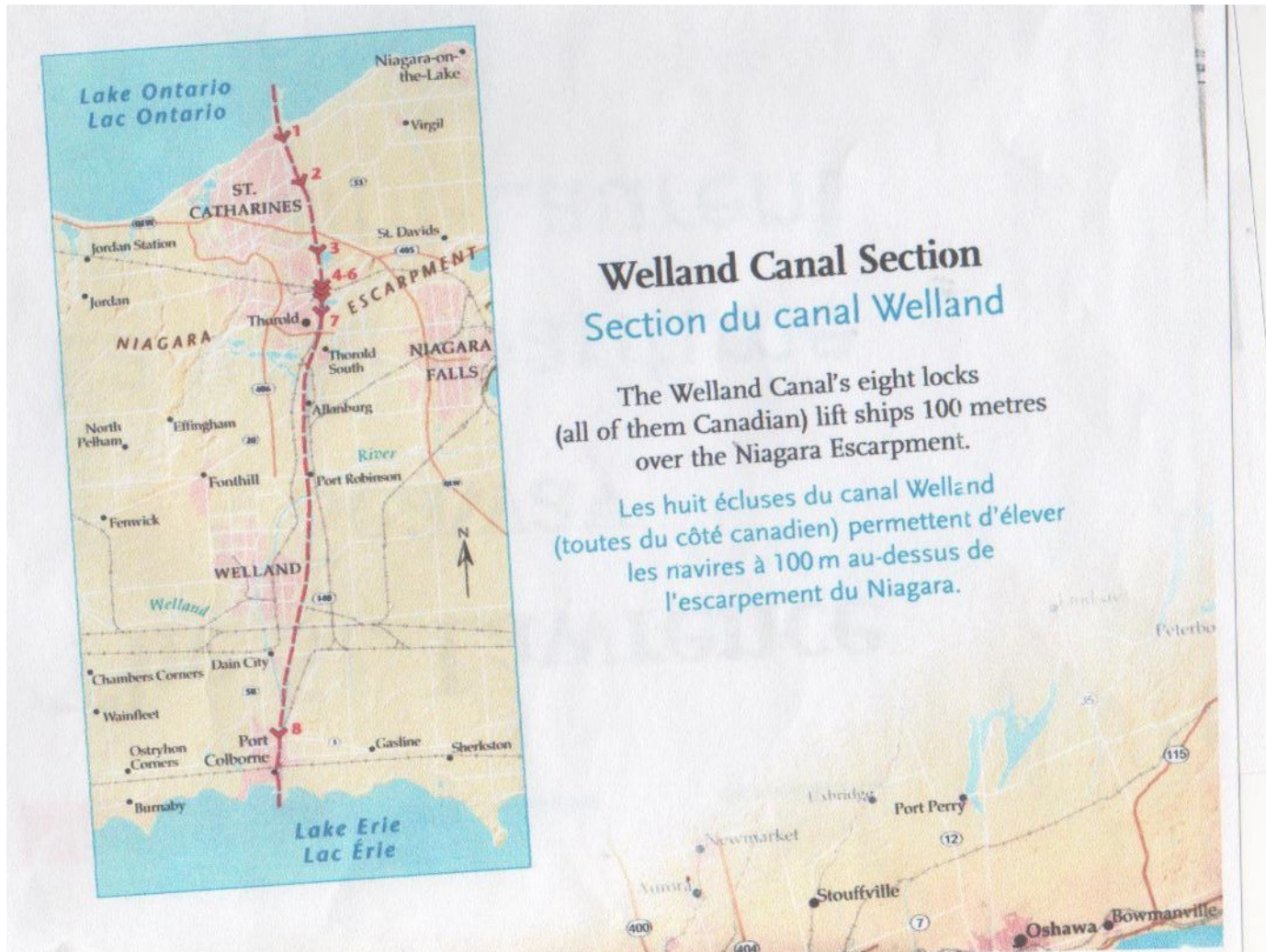
- With 26 stone locks.
- The third canal followed the same route as the previous ones from Port Colbourne
- until it reached Allenburg.
- It then by-passed Thorold and followed the Ten Mile Creek valley down the escarpment to Port Dalhousie.
- The remains of some locks can still be seen.
- The third canal was kept free of industry by Government policy.

The Third Welland Canal 1881 cont'd

- The northern entrance was actually at the mouth of Ten Mile Creek known as Port Weller 3 miles east of Port Dalhousie.
- 25 masonry lift locks 370 ft. x 12 ft. finally made 14ft. to the sills were constructed between Allensburg and Port Dalhousie some 25 miles.

The St.Lawrence Seaway - The 4th Canal

- Lock 1 started in 1913, then delayed until 1919, then finally started in 1922-3 and again in 1926 and completed in 1932.
- Seven locks between Port Weller - Lake Ontario and Port Colborne –Lake Eire with a combined vertical lift of 99.4 m., with a transit time of 12 hours and approximately 42 km of the Welland Canal.



The St.Lawrence Seaway - The 4th Canal cont'd

- A comparison n of the Welland Canal with the Panama Canal is interesting. Welland has 7 locks and Panama 3, the the depth of both canals is similar at 82ft.9 for Welland and 82ft.0 for Panama.
- The size of the locks gives Panama a much wider width of 65ft verses 48 ft and the Panama gates weigh 3 times as much as Welland, 150 tons each verses 48 tons.
- Labour rates during construction of the 4th canal were 25 to 30c per hour in 1923 rising to 75 to 85c in 1927, for trades including Carpenters Electricians and Machinists

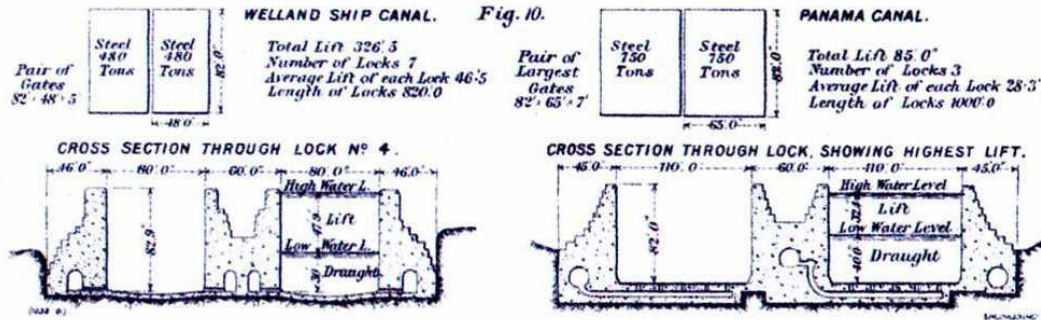


TABLE I.—TYPICAL RATES FOR LABOUR (CENTS PER HOUR), AND WORKING HOURS ON WELLAND SHIP CANAL WORKS.

Year.	1913.	1914.	1919.	1919-20.	1920-21.	1921.	1921-22.	1922-23.	1923.	1923-25.	1925.	1927.
Carpenters	35 19	40 19	60 10	70 8	80 10	64 10	70 10	70 10	75 10	80 9	80 10	85 8
Drill operators .. .	22 10	27 19	50 19	55 8	65 10	52 10	52 10	45 10	50 10	50 10	50 9	— 9
Electricians	30 19	55 10	60-65 10	75 8	60 10	70 10	70 10	75 10	75 10	70 10	— 9	— 9
Expert Labour .. .	20 10	—	40-45 10	45 8	55-60 10	44-48 10	45 10	50 10	55 10	—	—	—
Hoist operators .. .	35 19	35 19	65 10	65-70 8	80-85 10	64 10	70 10	70 10	75 10	75 10	70 10	75 —
Machinists	30 19	35 10	60 10	70 8	82 10	65 10	72 10	65 10	70 10	70 9	65 9	70 9



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THE FOUR WELLAND CANALS

DIAGRAMMATIC COMPARISONS

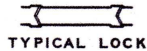
FIRST WELLAND CANAL

STARTED 1824 — COMPLETED 1829



TYPICAL VESSEL

LENGTH 100 FT. — CARGO CAPACITY 185 TONS



TYPICAL LOCK

LENGTH BETWEEN GATES 110 FT.
 WIDTH OF LOCK 22 FT.
 DEPTH OF WATER OVER SILLS 8 FT.
 SINGLE LIFTS 6 FT. TO 11 FT.
 NUMBER OF LOCKS 39

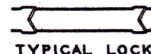
SECOND WELLAND CANAL

STARTED 1842 — COMPLETED 1845



TYPICAL VESSEL

LENGTH 140 FT. — CARGO CAPACITY 750 TONS

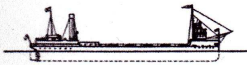


TYPICAL LOCK

LENGTH BETWEEN GATES 150 FT.
 WIDTH OF LOCK 26 FT. 6 IN.
 DEPTH OF WATER OVER SILLS 9 FT.
 SINGLE LIFTS 9 FT. 6 IN. TO 14 FT. 3 IN.
 NUMBER OF LOCKS 27

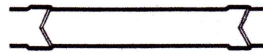
THIRD WELLAND CANAL

STARTED 1875 — COMPLETED 1887



TYPICAL VESSEL

LENGTH 255 FT. — CARGO CAPACITY 2700 TONS



TYPICAL LOCK

LENGTH BETWEEN GATES 270 FT.
 WIDTH OF LOCK 45 FT.
 DEPTH OF WATER OVER SILLS 14 FT.
 SINGLE LIFTS 12 FT. TO 16 FT.
 NUMBER OF LOCKS 26

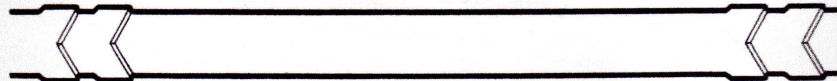
WELLAND SHIP CANAL

STARTED 1913 — COMPLETED 1932-33

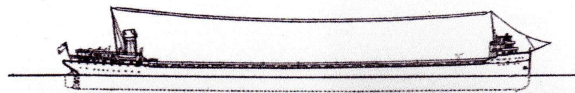
LENGTH BETWEEN INNER GATES 859 FT.
 WIDTH OF LOCK 80 FT.
 DEPTH OF WATER OVER SILLS 30 FT. (REACHES 25 FT.)

SINGLE LIFTS 46 FT. 6 IN.
 NUMBER OF LOCKS INCLUDING 3 TWIN 8
 TOTAL LOCKAGE 325 FT. 6 IN.

THE GUARD LOCK AT HUMBERSTONE IS 1380 FT. LONG BETWEEN INNER GATES



TYPICAL LOCK



TYPICAL VESSEL

MAXIMUM LENGTH 820 FT. & CARGO CAPACITY 25000 TONS AT 24 FT DRAFT.