

The Evolution of the Lock

The use of locks, a means to raise or lower boats from one water level to another, dates back well over two thousand years. The first locks were known as **flash locks**. A small gate (the flash lock) was placed into a dam that had been built to raise the water level of a river for navigation.

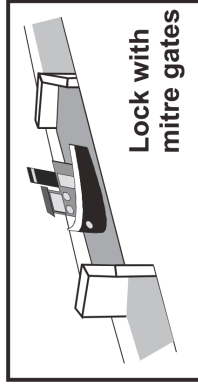
The procedure for a boat going downstream was simple, on the approach of a boat the gate was lifted and the boat would shoot through the gate at an impressive rate of speed. The procedure for going upstream was not so simple, the boat was connected to a winch or a team of horses, the gate was then opened and the boat was drawn through the gate against the powerful current.

To improve on the flash lock, the Chinese, on the Grand Canal, built **slipways** into the dams where boats were hauled up and down by gangs of labourers. However this method led to damage of the boats and subsequent pilfering of cargo. In AD 983 a Chinese canal engineer by the name of Chhaio Wei-yo built the first **chambered lock** with a rising gate at either end. Boats could now enter the chamber and be lowered or lifted by just using one chamberful of water rather than the immense amount of water used with a flash lock.

In 1485 the Duke of Milan's engineer Bertola da Novato built the Bereguardo Canal which incorporated the first modern locks. The **gates** were **mitre shaped** (perhaps based on earlier designs by Leonardo da Vinci) which caused the gates to close tightly due to the pressure of water.

The **mitre gate** is so efficient that it is still the most common

lock gate seen on the canals of the world including the Rideau Canal.



Rideau Canal National Historic Site parks.canada.gc.ca



Maintained and operated by Parks Canada, it is the oldest continuously operated canal in North America. The locks are operated today much as they were when first opened in 1832. Each lock is unique and the lock staff are always ready to offer assistance.

About The Rideau Canal

Between 1826 and 1832 portions of an Aboriginal canoe route along the Rideau and Cataract Rivers were transformed from untamed rivers and lakes into the Rideau Canal. The purpose was to provide the British army with a safe military supply route avoiding the direct but exposed route along the St. Lawrence River which had been threatened during the War of 1812.

The canal was designed by Lt. Colonel John By of the British Royal Engineers. It was built, for the most part, by independent contractors under the supervision of Colonel By and his staff. Hundreds of Irish and French Canadian labourers, Scottish stonemasons, and British Sappers & Miners battled the Canadian wilderness, nineteenth century working conditions and malaria to complete this wonder of a canal system.

The Rideau Canal is a unique part of our Canadian heritage, linking our old national capital of Kingston, with our present day national capital of Ottawa. In 1925 it was designated as a National Historic Site of Canada; in 2000, as a Canadian Heritage River; and in 2007, as a UNESCO World Heritage Site.

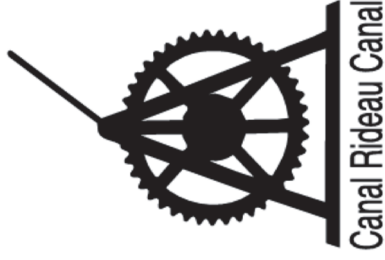
FRIENDS OF THE
RIDEAU

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www.rideaufriends.com



How A Lock Works



When you watch a Rideau Canal lock in operation you are looking at a marvellous engineering system that uses water, gravity, human muscle power, and a basic system of levers and gears to move boats up and down from one water level to another.

This brochure is compliments of:

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Lock: a watertight chamber with gates at either end used for raising or lowering boats between differing water levels by means of sluices and valves that let water in and out of the chamber.

Locking Up

- 1) The water in the lock chamber is at the same elevation as the downstream navigation channel. The lower lock gates are cranked open using hand open using hand winches, known as “crabs.”
- 2) Boats proceed into the lock and the boaters hold onto drop cables along the lock wall.

3) The lower gates are cranked shut and the valves in the lower gates are cranked closed (the lock chamber is now watertight).

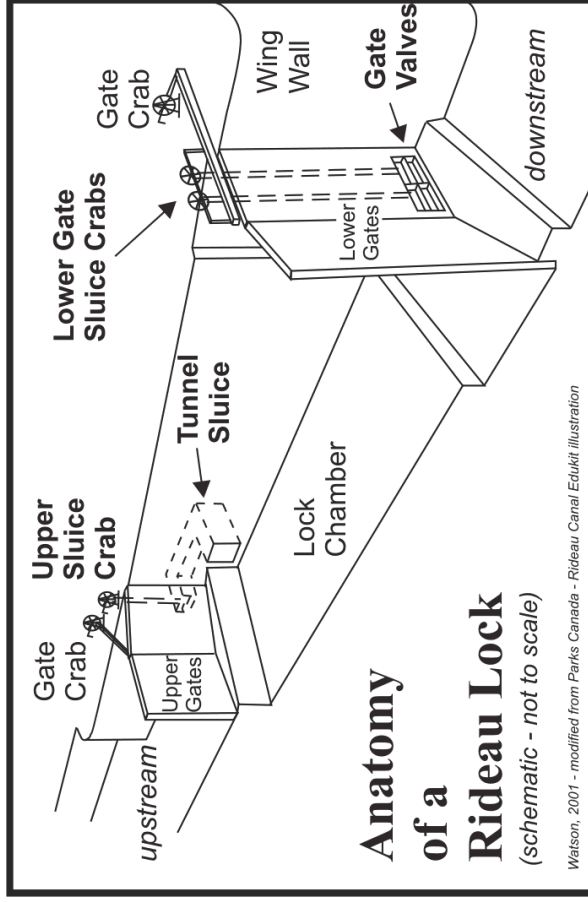
4) The lock staff move to the upstream end of the lock and slowly open the upper sluice valves. These valves allow water to enter the top of the lock through tunnel sluices. As these valves are opened, water from the upstream side flows into the lock, filling the chamber up to the

upstream water level. Note that the sluice valves are opened slowly to prevent excessive turbulence in the lock. As the water depth in the lock chamber increases, the lock staff fully open the valves.

5) When the water in the lock chamber reaches the upstream water level, the upper gates can be cranked open, allowing the boats to leave.

Locking Down

- 1) The water in the lock chamber is at the same elevation as the upper navigation channel. The upper lock gates are cranked open using hand winches, known as “crabs.”
- 2) Boats proceed into the lock and the boaters hold onto drop cables along the lock wall.



3) The upper gates are closed and the lock staff make sure the upper sluice valves are closed.

4) The lock staff move to the lower gates which have valves built right into them. These valves are slowly opened and water drains from the chamber, lowering the boats to the downstream water level.

5) When the water in the lock chamber reaches the downstream water level, the lower gates can be opened and the boats float out.

Some of the locks, such as those at Beveridges, Clowes, Kilmarnock, Narrows and Newboro have gate valves in the upper gates rather than tunnel sluices. Ask the lock staff at these locations why this is.

Some Interesting Lock Facts

- The amount of water used in an average Rideau Canal lock lift (3 m/10 ft.) is 1.3 million litres (280,000 imp. gal.) To drink a lock dry, you would have to consume 5.6 million cups of water.
- The gates of the locks are made with Douglas Fir at the canal shops in Smiths Falls. They last an average of 20 years before they need to be replaced.
- There are 45 locks along the Rideau Canal plus two more locks at the entrance to the Tay Canal.
- The highest single lock lift is 7.9 m (26 ft.) at Smiths Falls and the lowest lock lift is 0.6 m (2 ft.) at Kilmarnock.
- There are four types of gate opening mechanisms on the Rideau – the *endless chain crab system*, the *swing bar crab system*, the *push bar crab system* and the *electric-hydraulic system*. Can you tell which type of gate opening mechanism you're looking at?
- A Rideau Canal lock chamber is 40.8 m (134 ft.) long (sill to sill) by 10.1 m (33 ft.) wide. The maximum vessel length that can fit into a lock is 33 m (110 ft.) to allow room for the upper breastwork and the swing of the lower gates.
- It cost £822,000 to build the canal in 1832. It would cost over well over \$500 million to replace all the canal structures today.
- The lift from Kingston to Upper Rideau Lake (the highest point on the system) is 50.6 m (166 ft.) in 14 locks. The lift from Ottawa to Upper Rideau Lake is 83.8 m (275 ft.) in 31 locks.
- The canal extends 202 kilometres (125 miles) from Ottawa to Kingston. Along this distance there are 292 islands and 1091 kilometres (675 miles) of shoreline.

