

AMERICAN CANALS

BULLETIN OF
THE AMERICAN CANAL SOCIETY

BULLETIN NUMBER 90

Editorial Address—968 Chapel Road, Monaca, PA 15061

AUGUST 1994



THE PRESIDENT'S MESSAGE

I thought it appropriate to start my column with the Panama Canal bulletin masthead, which is this year celebrating the canal's 80th anniversary - 1914-1994. Issues of the biweekly *PANAMA CANAL SPILLWAY* have more than the usual number of historical articles, including a special supplement to the August 12th issue in memory of Dr. William C. Gorgas, who overcame bureaucratic resistance to make Panama safe from mosquito-borne disease. The *SPILLWAY* is published by the Panama Canal Commission, Office of Public Affairs, Unit 2300, APO AA 34011.

The National Canal Museum is coming closer to reality, with a Pennsylvania state grant approved for a new cultural center in Easton. (See separate article this page.) If all goes well Easton's Canal Museum will be moving there along with new visitor centers for the Delaware and Lehigh Navigation Canal National Heritage Corridor, and the Crayola Museum. The folks at the Canal Museum have worked long and hard for this day!

Speaking of Heritage Corridors, the August newsletter of the National Coalition for Heritage Areas has a list of relevant legislation recently introduced in Congress, and about half of it concerns canals. Included are the Fox-Wisconsin, Blackstone, Champlain Valley, Ohio & Erie, Augusta Canal, Illinois & Michigan, Ohio River Corridor, and Lowell National Historical Park. Other corridors with pending legislation probably have more canal and river historic resources for canal buffs to work with. To work with the Coalition write or call NCHA, P.O. Box 33011, Washington, DC 20033-0011, (202) 673-4204.

The National Park Service is making public participation and outreach a top priority in its proposal to further designate and promote such National Heritage areas. To share your ideas with NPS or to ask for details, write the National Park Service, Recreation Resources Assistance Division (782), Washington, DC 20013-7127 (attn: Heritage Partnerships); (202) 343-3780.

Most state transportation museums focus only on trains and automobiles, but you'll also find canal events and canal articles in the *New Jersey*

Transport Calendar, published by the Friends of the New Jersey Railroad & Transportation Museum, P.O. Box 592, Newton, NJ 07860, and sent to me by Sam Hopper. I know that more than a few of the "Friends" are also canal buffs! This is a great way to spread the word to those who may not yet be members of your canal society. Can we encourage more transportation museums to include canals, at least in their newsletters?

The Canal History and Technology Press (Hugh Moore Park, P.O. Box 877, Easton, PA 18044-0877) has published *Canals and American Cities*, edited by Ron Carlisle and introduced by Lance Metz, with articles on the St. Anthony's Falls Canal, the Pennsylvania Canal in Pittsburgh, and the Santee, Alexandria, James River & Kanawha, and Delaware & Raritan canals. This excellent book is proof that good canal archaeology is going on in America and that each canal and site has its own story to tell, and information to contribute. Don't let any agency tell you that "all locks are alike." And don't let any agency get away with a canal-related project without the active participation of the local canal buffs - that's us. Without a canal specialist to continuously watch the excavation and help with the report, even the best professional archaeologists can publish information which is very strange, rather useless, and dismaying to canal researchers!

Lastly, here are some tidbits from the nation's press:

The Niagara Falls Convention & Visitors Bureau reported that some visitors ask, "Is Niagara Falls turned on daily, and does the water run a different way each day?"

And a travel brochure, which shall remain nameless, laments that the mules which once towed ships through the Panama Canal have all been replaced by electric ones, alas!

Don't forget the International Canal Conference at Peterborough, Ontario, September 20-23, 1994. There may still be room for a few last minute arrivals. Call John Lewis, Trent-Severn-Waterway (705) 742-9267.

Bill Trout

NATIONAL CANAL MUSEUM

Efforts to establish a National Canal Museum have taken a momentous leap forward with the release of Pennsylvania Capital Redevelopment funds for Two Rivers Landing, a new cultural center within the City of Easton, Pennsylvania.

The Canal Museum will relocate to a new enlarged National Canal Museum at Two Rivers Landing. The shared facility will be home to the new Crayola Visitors Center, the new National Heritage Corridor Visitors Center, and the relocated and expanded National Canal Museum.

On May 2, 1994, Governor Robert P. Casey announced approval of the \$2.85 million state grant for the Two Rivers Landing project which is estimated to cost between \$7 and \$8 million. The National Canal Museum exhibit area, collection storage and exhibit fabrication will occupy 14,400 sq. ft. of Two Rivers landing. In addition to the core exhibit area of 5,000 to 8,000 sq. ft., there will be 3,000 sq. ft. for changing exhibits. Museum offices, library and archives will also be located in the complex.

(From "The Locktender," *Summer 1994*, published by the Hugh Moore Historical Park and Museums, Inc., Canal Museum, P.O. Box 877, Easton, PA 18044.)

ERRATA

Some of our readers have called our attention to the misspelling of "Roundout" in the article on the D&H Canal Trip. It should be "Rondout."

The Publisher

NEW COLUMBIA RIVER LOCK

Among the winners of the 1994 Chief of Engineers Design and Environmental Awards Program is the Bonneville New Navigation Lock on the Columbia River, Oregon.

Bonneville Lock and Dam is located on the Columbia River 40 miles east of Portland, Ore. The original project (spillway dam, powerhouse and navigation lock) was completed in 1937. Between 1986 and 1993, the Corps designed and oversaw construction of a new navigation lock to relieve the bottleneck to river traffic caused by the original lock, which was too small by current standards. The new lock accepts a standard five-barge tow, decreasing lockage time from nearly eight hours to about 30 minutes. A swing bridge at the downstream end of the new lock allows access to the rest of the project. It was necessary to relocate an entire field of water wells used by the nearby state-run fish hatchery.

American Canals

BULLETIN OF THE AMERICAN CANAL SOCIETY

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AMERICAN CANALS is issued quarterly by the American Canal Society, Inc. Objectives of the society are to encourage the preservation, restoration, interpretation, and use of the historic navigational canals of the Americas; to save threatened canals; and to provide an exchange of canal information.

Annual subscription to AMERICAN CANALS is automatic with A.C.S. membership. Send dues payment (\$15 minimum) to Sec'y/Treas. Charles W. Derr, 117 Main St., Freemansburg, PA 18017. Single copies may be purchased at \$3.00 from the publisher.

Manuscripts on subjects consistent with the objectives of the A.C.S. are welcome. They should be sent to the editor.

CASCADE LOCKS A Heritage Park for Akron's Future

The CASCADE LOCKS PARK ASSOCIATION (CLPA) is a group of citizens and organizations dedicated to preserving Akron's heritage and to redeveloping the heart of the city. It is committed to preserving, cultivating and beautifying the remaining watered locks which form the unique **Cascade Locks**. Cascade Locks, which was recently designated as a National Register Historic District, is comprised of locks ten through fifteen, the gateway for the Ohio & Erie Canal Corridor between Cleveland and Zoar, Ohio. The goal is a park which will emphasize Akron's industrial heritage, showcase historic buildings and canal era structures and of course, open to public appreciation of the Cascade Locks of the Ohio & Erie Canal.

More than a historical monument, the **Cascade Locks Park** will anticipate the future. It will be the gateway for the Ohio and Erie Canal. Akron is the mid-point between Cleveland and Zoar, the proposed heritage corridor for NE Ohio. From Akron, hikers, bikers and those wanting only a casual stroll can head to the north, following the towpath trail of the Cuyahoga Valley, the Metro Parks, and the National Recreation Area into downtown Cleveland, ending at the Flats. Taking a southern direction, the corridor will wind its way through rural farm land and interesting canal towns to the terminus at Zoar. Regardless of direction, the Cascade Locks Park will be the corridor's central point - the staircase that ascends to the Akron Summit.

TRIALS AND TRIBULATIONS

By Bill McKelvey

The Pennsylvania Canal Co. *versus* Bentley.
On the 17th of November 1868, Ambrose H. Bentley brought an action on the case against the Pennsylvania Canal Company, for negligence in permitting the tow-path of their canal to be in so bad condition that a mule of plaintiff drawing a canal-boat was killed.

The case was tried before Graham, P.J., December 7th 1869. The plaintiff's evidence was, that in the summer of 1868, he was going westward on the canal with an empty boat; he had to his boat two teams of two mules each; the leading team was ten or twelve feet before the hind team in which was a blind mule; near the aqueduct over Delaware run there was a hole in the tow-path; the railing on the wall along it was off; the leading team passed safely around the hole, without afterwards stopping; the tow-line attached to the leading team rubbed against the hind mule's leg; the leading mule in the hind team passed the hole; the hindmost mule broke into the hole, pitched forward against the leading mule, both fell over the wall, and the leading mule was killed. The plaintiff gave evidence also of the dangerous character of the place, of the care he took to avoid the danger, & c.

The defendants gave evidence for the purpose of showing negligence on the part of the plaintiff; amongst other evidence, that a blind mule was not suitable to use for towing a canal-boat; that the leading team should have stopped after passing the hole till the hind team had come up; that other teams had passed the hole in safety.

The plaintiff submitted three points and the defendants ten.

The 2d, 3d, 5th and 10th points of the defendants, with their answers, were as follows:—

2. Before the jury can find a verdict for the plaintiff he must show that his employees used that degree of care and prudence necessary to have prevented the injury, and he must show affirmatively that no negligence on the part of his employees contributed to the injury.

Answer: "This is not the law. If the defendant alleges negligence on the part of the plaintiff or his employees, he must prove it. The plaintiff to recover must show negligence on part of defendant; and if to avoid the consequences of such negligence, defendant alleges the plaintiff was negligent, he must prove it."

3. If the jury believe that plaintiff's employees used a blind mule in the towing of his boat, the plaintiff must show his employees exercised more than ordinary care and caution in passing or attempting to pass the opening in the tow-path, otherwise he cannot recover.

Answer: "If the plaintiff used a blind mule in towing his boat, the law would require him to use proper and ordinary care under the circumstances, to wit, that one of his mules was blind; and if he failed to use such care as was prudent and necessary, considering that he had a blind mule in his team, then he cannot recover, if the blindness of the mule contributed to the accident and loss sustained."

5. If the jury believe from the evidence that plaintiff's employees might have avoided the injury by stopping one of his teams passing off the aqueduct bridge, and he failed to do so, and thus contributed to the injury, he cannot recover.

Answer: "If the jury believe from the evidence on this subject, that the plaintiff's employees were guilty of negligence in not stopping one of his

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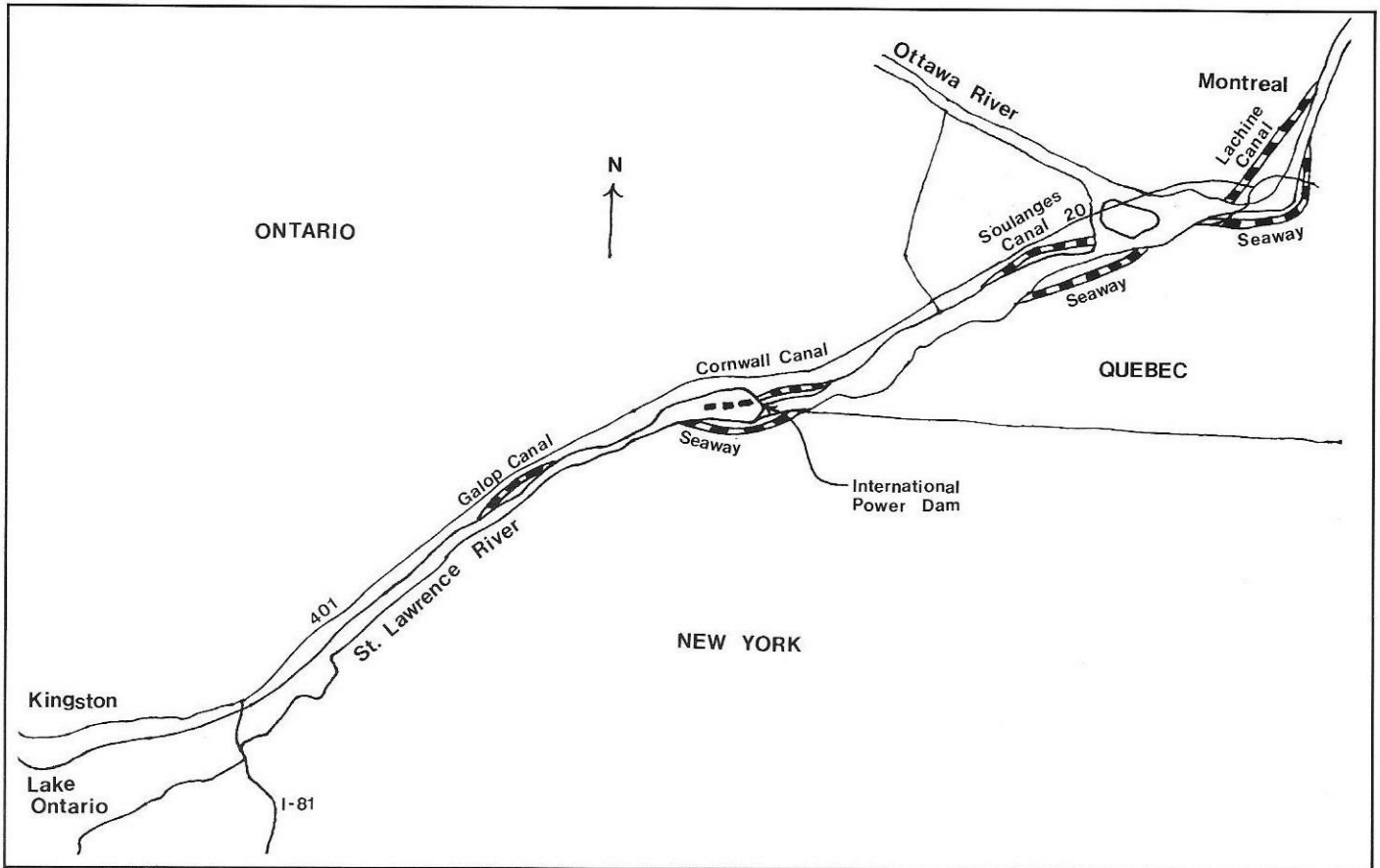
William E. Trout III, editor and publisher.

teams passing off the aqueduct bridge, and thus contributed to the injury, the plaintiff cannot recover. By ordinary care, you will understand such as a sensible man, a prudent and cautious man, would exercise in the transaction of his own business."

10. The verdict ought to be for the defendant. Answer: In answer to this point the court submitted to the jury the question whether the plaintiff was entitled to recover under the evidence or not.

The verdict was for the plaintiff for \$160.

OLD SAINT LAWRENCE RIVER CANALS



By David G. Barber

With the opening of the Saint Lawrence Seaway in 1959, the older 14-foot draft canals along the north side of the river went out of use. Some of these were submerged by the new Lake St. Lawrence power pool formed behind the international dam near Messina, NY and Cornwall, ONT. The rest of the canals just seemed to disappear from discussion. Having seen limited points on these older canals when crossing them on prior trips to the area, I knew that something remained, but that was all. So after an August cruise last year on the Kawartha Voyageur like that described in *American Canals #84*, I spent a couple of days in exploration, along the north bank of the St. Lawrence River.

Galop Canal

Going downstream from Lake Ontario and the Thousand Islands, the first of the old canals I encountered was the Galop Canal. In *The Canals of Canada*, Robert Leggett reports that this canal was originally two shorter canals which were later combined by a wall alongside the river. The canal begins west of Cardinal, Ont. with an intact wall that separates it from the river. The entrance is visible from Route 2.

Closer to Cardinal, but still west of town, a side road leads to the guard lock which is now a public park and mooring area. The large lock is intact as well as the adjacent control spillway. A foot bridge leads across the chamber. The canal is full of water both above and below the lock. On the river side of the lock is a second chamber that allowed ships to reenter the river after bypassing the first rapids. This lock has its gates closed and is filled in between the gates. But currents clearly show that water is passing through the chamber

despite the fill. Below this lock, the exit channel is full of water and leads back to the river. The area is set up for visiting boats and includes a sign giving the name of the canal.

Continuing east on the main canal, it remains intact and full of water to the west edge of the village of Cardinal at the point that the access road comes in from the Route 401 exit. At the west edge, the canal splits with a south arm returning to the river. This route remains in water as a park,

but its end is truncated by new industrial construction although connected to the river.

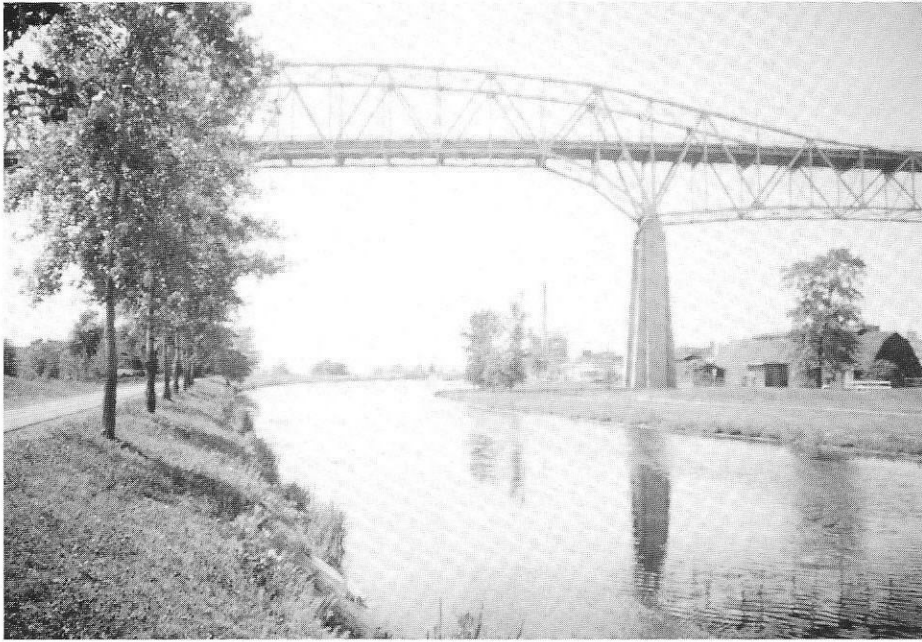
The main canal apparently continued left into a deep cut separating the main village from the land to the north. This cut, which parallels Route 2, has been filled in to the next bridge site. At this next bridge site, the main road of the village and a railroad branch cross the canal line. Two end

(Continued on Page Four)



Cornwall Canal, North chamber of second lock below power dam, looking west.

OLD SAINT LAWRENCE RIVER CANALS



Cornwall Canal. View west at the International Bridge (overhead).

a town playground. This lock has a long and a shorter chamber, side by side, plus a spillway structure. Footbridges cross both chambers and the spillway providing access to the bike path.

Further east, a second intact lock with two chambers and spillway structure also exists. This lock has a paper mill along its north side which probably explains why the canal retains its water. At this lock, the shorter chamber on the river side is filled in between the closed lock gates. The longer chamber and the canal above and below remain watered. Also below the longer chamber, two lock gates are visible, submerged in the canal.

Just below this lock, the Cornwall to Messina Bridge passes high over the canal, providing clearance to ships that haven't passed this way in 40 years.

East of the international bridge, the watered canal soon comes to an end and all water is diverted to the south, back into the river. Beyond this point, the canal has been obliterated by new construction of civic buildings in the business area of Cornwall, but the route is apparent. At the east end of this area, the canal rejoined the river at what is now the dock area for Cornwall. At this site, an oil tank farm is built on top of the canal route, but the lower end of the entrance locks is visible.

From here to the next rapids, the section of the river is known as Lake St. Francis.

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supports for supporting a swing bridge in the open position remain. Beyond the bridge site, the watered canal resumes in a deep cut and then on the river's edge towards Iroquois.

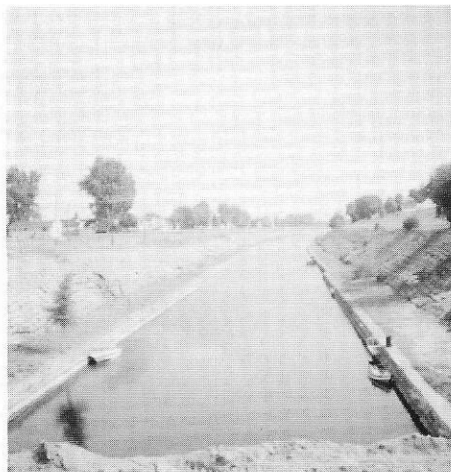
Approaching Iroquois, Ont. from the west, the canal moves away from the river, passing north of a hill. Still full of water, it is crossed by the access road to the modern seaway Iroquois Guard Lock and control dam. Just east of the road crossing is the old Iroquois Lock which lowered ships back to the river level. This lock is intact today although much of its height has been back flooded by the power dam downstream.

Other Williamsburg Canals

Next down river, ships passed through a series of short canals known collectively with the Galop Canal as the Williamsburg Canals. These canals and the villages near them were flooded out by the Lake St. Lawrence power pool.



Soulanges Canal. View of Lock 5, looking west from railroad swing bridge.



Galop Canal. View of canal channel, looking east from the block-off point at Cardinal.

Cornwall Canal

Continuing east, the next canal I encountered was the Cornwall Canal, which had its east end at Cornwall, Ont. and which bypassed the Long Sault Rapids. Today, this drop is handled by the Eisenhower and Snell Locks on the south bank in New York.

Lock 21 at the west end of the Cornwall Canal is submerged under the power pool. However, information on this lock is noted on a series of historical panels along the Long Sault Parkway and the lock itself is noted as a site for scuba divers to explore.

Nearer to Cornwall, the canal emerges from under the international power dam and immediately becomes a parkway with a bike path along the river side. The canal is supplied with water through a special section of the power dam which is said to be removable if Canada ever desires to build a lock here.

Continuing east an intact lock is passed near

Soulanges Canal

After the river crosses into Quebec, the Soulanges Canal begins east of Coteau Landing. This canal had five locks and provided navigation between Lake St. Francis and Lake St. Louis. Today this drop is handled by the Beauharnois Locks and Canal on the south bank of the river.

The Soulanges Canal continues just east of the village alongside Route 338 which parallels it for its length. At the start, a campground is on the river side. The canal is watered for its entire length.

Just east of its beginning, the canal is crossed by a local road on a swing bridge and then enters Lock 5, a guard lock. This lock is intact with its gates in the closed position. Water can be observed flowing through the lock, bypassing the gates through the side tunnels. Gate operating motors remain, but are unwired. A water bypass is on the south side of the lock. Very elaborate concrete guide walls guard the entrance to the water bypass above and below the lock.

After the local road crosses the canal just west of the lock, it turns sharp left. On the outside of this left turn, a small derelict light house is visible in the woods. This light house is the higher, inland light of a pair of light houses that would have served as a range of lights to guide ships into the west end of the canal.

Beyond the lock, the canal is crossed by a railroad swing bridge which is intact except for its drive motors and controls. An interesting thing about this railroad bridge is that looking south through the bridge, two other swing bridges can be observed in line crossing channels of the river. These other swing bridges would have been necessary for ships choosing to run the rapids, as was commonly done.

Continuing east, the watered canal is paralleled on the north side by the highway, Route 338, which was once the main east-west road from Montreal. After some distance, a very ornate, brick power house is passed on the south side of the canal. This power house used canal water, discharging it into the river to the south. While time did not permit exploration, a few streams crossed the canal in this area, apparently by culvert.

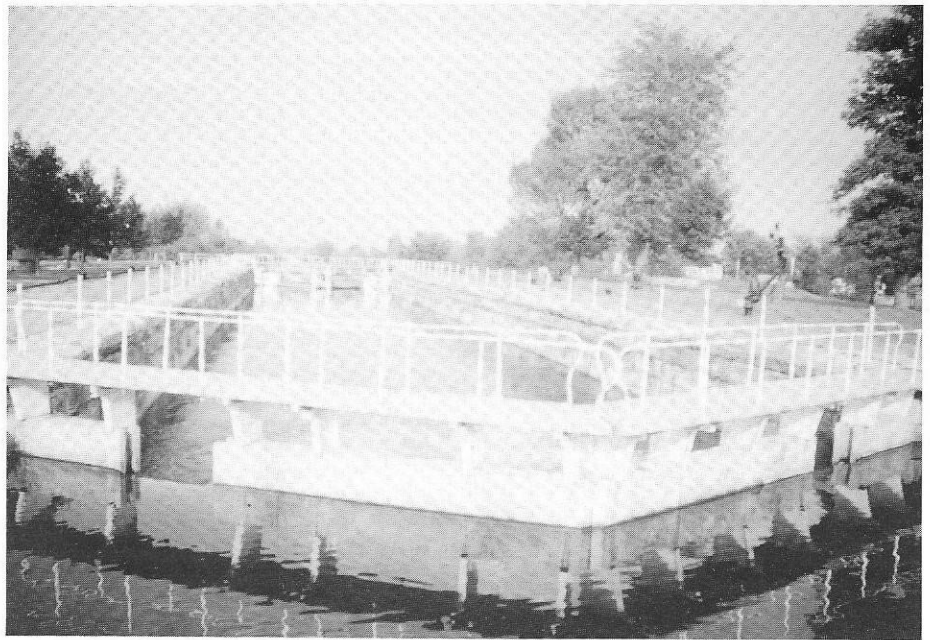
After a very long level, Lock 4 is reached. This lock is on the edge of the highway and is preceded by a miter guard gate. Both the guard miter gate and the lock's lower miter gates remain, although deteriorated. The upper gate on the lock has been recently replaced by a concrete weir built in the "V" shape of the original gates. Both the guard gate and the lock are bypassed on the south side by control gates. These are not accessible across the canal.

Further east, occasional cross roads are conducted across the canal on culverted fills at former swing bridge sites. One other item of note is that all power lines crossing these canals still cross at heights sufficient for the ships that once used them.

At the west edge of the village of Pointe des Cascades, the main road curves to the left away from the canal to go north, but a village street continues to follow the canal edge. Shortly, a new bridge crosses the canal and just beyond is Lock 3. Lock 3 is in a park and has its lower gates closed and holding water. Notches cut into the lower gates discharge water into the basin below to maintain levels. A series of oil drums float on the water below the lower gates to keep local kids from jumping off the lock walls. This only causes them to do their swimming at Locks 2 & 1 to the east.

At Lock 3 is a small local canal museum which documents this canal and the earlier canals in the area. Unfortunately, all the descriptions at the museum are in French only, limiting their value to those of us who only know English. However, the maps and photos are informative in any language. Outside the museum on the lock grounds are many anchors of several styles with placards, also only in French. These anchors apparently were lost by ships navigating the Long Sault Rapids and were recovered from the bed of the river when the rapids were temporarily dewatered during seaway construction.

Continuing east along the north side of the canal a grassy path and a paralleling gravel driveway lead to a campground and then shortly Lock 2 and then Lock 1, followed by the terminal breakwaters from the canal. Both locks are intact, but overgrown. Lock 2 has its lower gates closed holding back water while at Lock 1 it is the upper gates that are closed. Side ponds exist on the south side of the locks and bypass water is channeled on that side. The entrance channel from Lake St. Louis to Lock 1 can be entered by pleasure craft. A lower range light house is east of Lock 1 on the north side. The upper light is on the north side of Lock 2. Both of these light houses



Soulanges Canal. Lock No. 3, looking east.

seemed to be recently painted.

At this point the canal ends and navigation enters Lake St. Louis. Here two of the outlet channels of the Ottawa River enter the St. Lawrence from the north. The eastern of these two channels is paralleled by the lock at Ste. Anne de Bellevue which allows navigation up the Ottawa valley. This lock is located close under the Route 20 bridge.

Judging by the large number of pleasure craft at both ends of the Soulanges Canal, I would expect it would be a popular cruising route if ever it was reopened. Of course, the present seaway serves the same purpose, but it is built to a much larger scale.

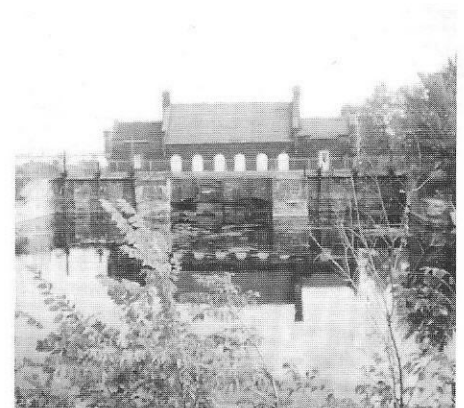
Lachine Canal

The last drop in the St. Lawrence is the Lachine Rapids from Lake St. Louis to Montreal. Today's seaway makes this step with the Ste. Catherine and Lambert Locks and connecting channel on the south bank. The earlier route is the Lachine Canal from Lachine to Montreal Harbor on the north side of the river away from the shore.

From information I had read, I expected to find this to be a route through an industrial landscape ending at filled in locks at the lower end. Instead,



Soulanges Canal. Lock No. 1, looking west.



Soulanges Canal. Power house at the mid-point.

I found a park and bikeway the entire length and the lowest two locks just ending a complete rebuilding, making them fully navigable and operable. The canal would best be explored by bicycle.

The canal's western end is at Lachine where the large entrance basin was filled with all kinds of pleasure craft. Several tour boats were also moored there. Continuing west along the north shore of Lake St. Louis was the channel of an earlier smaller canal.

At the basin, two lock chambers of different size led east. The northern, smaller lock had been filled in. The larger south lock had a fixed foot bridge across its west end and a large steel Dominion Bridge barge moored in the chamber. A derelict industrial building was on the wide island between the chambers. These locks were apparently the guard locks for the canal.

Just east of these, a city street crossed the canal on a culverted fill. The canal continued east intact and watered with St. Patrick Street on the south side and a railroad track in between. The area all along the canal was obviously industrial, but it has been nicely landscaped.

Continuing east several movable bridges of various types cross the canal. These are now fixed

(Concluded on Page Six)

OLD ST. LAWRENCE CANALS



Lachine Canal. Lower distant view of Lock Number 1, north chamber.

(Concluded from Page Five)

in place, but most have not been altered greatly. The highway leading to the Mercier Bridge crossed at a very high level.

After some distance, Lock 4 is reached. Again two chambers of different lengths exist with the longer north chamber being most intact with gates and the smaller south chamber being used as a bypass spillway. Footbridges connect the two sides of the canal across the chambers.

A little to the east of Lock 4, a vehicular tunnel carries city traffic under the canal.

Later on another street crosses the canal on two parallel lift bridges of different design. The west bridge is a bascule bridge while the east one is a rolling lift. Both bridges cantilever from the north bank.

Lock 3 is encountered just east of Des Seignurs. It is similar to Lock 4. Just to the west of the lock, the street is carried across the canal on an intact swing bridge. The bridge pivot shares the lock island. The smaller, south chamber has been converted to spillway use.

Near the east end of the canal, two side by side railroad bridges cross the canal. The west one is a swing bridge serving local rail lines. It pivots on an island in the canal.

The east bridge carries electrified tracks into the station to the north of the canal. The bridge and the wires have obviously been altered since the canal was closed. It does not appear to be a swing bridge, but also seems unlikely to lift vertically. The method of opening remains unknown to me.

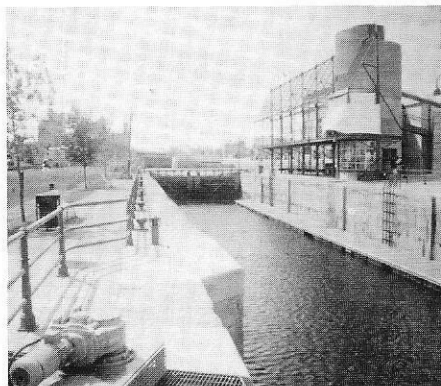
Just west of these two bridges, a second tunnel carries Wellington street under the canal.

East of these bridges was apparently a large basin which has now been mostly filled in. The fill blocks the exit from the north channel under the railroad bridges, but the south channel carries around the south edge of the basin in a curve and leads to the east outlet. Part way around this arc, a spillway discharges water into a channel leading into Montreal Harbor. This basin marks the start of the large group of grain elevators along the south side of the canal. Grain was the principal cargo of the St. Lawrence Canals and these elevators transferred the grain from the small lakers to ocean going ships.

At the east end of the basin, the canal passes under an elevated highway bridge carrying Route 10 and then a new lower level city street bridge and immediately enters Lock 2 followed by Lock 1. Both Locks have two chambers with the south ones being smaller and now used as a bypass spillway. The lock island between the chambers is continuous between the locks and also supports the center pier of the eastern bridge. Rather than being buried as I had heard and as maps show, these four locks have been just rebuilt with new gates on all chambers, floating docks in the north chambers, and operating controls and motors on the north chambers. A cafe was open in a new building just north of Lock 1 and a control tower was still being completed. Apparently it is planned to take tour boats into these locks in the near future. These boats will have to be only one deck high to pass under the new fixed bridge at the west end of Lock 2. The entire area has been landscaped in keeping with the landscaping of the adjacent parts of the port area.

Just east of Lock 1, the canal exits into Montreal Harbor across from a dock for cruise ships.

Apparently, Montreal is doing something about its navigation heritage at the east end of the Lachine Canal. I hope the restoration work will continue west.



Lachine Canal. Interior of Lock No. 1. North Chamber, looking west.

CANAL CALENDAR

Through November 20, 1994

"Visions of the Past: The Collection of the Canal Society of New York State" Erie Canal Museum Syracuse, NY

September 10 & 11, 1994

Cruise on Lakes Huron and Superior and the St. Mary's River. Contact: Great Lakes Lighthouse Keepers Assn., P.O. Box 580, Allen Park, MI 48101

September 14, 1994

Canal Society Lecture, Buchanan Library 2:00 P.M. - Erie Canal Museum, Syracuse, NY

September 17-18, 1994

Canadian Canal Society - Peterborough Safari - Boat trips on the Trent-Severn.

September 19-23, 1994

International Historic Canals Conference 1994 Peterborough, Ontario. Registration closed August 19.

September 30 - October 2, 1994

Fall Tour, Canal Society of Indiana, Grand Rapids, OH. Featuring the Wabash and Erie Canal. Contact: CSI 302 E. Berry Street, Fort Wayne, IN 46802

October 9-14, 1994

C & O (MD) Second Annual full length bicycle trip. Contact: Sonny DeForge at (301) 530-8830.

October 14-15, 1994

Pennsylvania Canal Society. Morris Canal Field Trip. Holiday Inn, Phillipsburg, NJ - headquarters. Contact: "Zip" Zimmerman, 1361 River Road, Yardley, PA 19067

December 10 & 11, 1994

Christmas at the Canal. Old Santee Canal Story Landing House will be decorated in 19th century style.

December 11, 1994

C & O Canal Annual Frostbite Hike (MD) Contact: Ken Rollins at (804) 448-2934.

BOOK REVIEW

By Bill Shank

HERE AND NOW-OHIO'S CANALS: THE SANDY AND BEAVER CANAL by Linn Loomis of Newcomerstown, Ohio, is about as complete a record as anyone could put together on a little-known nineteenth-century canal. Linn Loomis must have walked every one of the 73 miles of the Sandy and Beaver, which connected the Ohio and Erie Canal at Boliva, Ohio with the Ohio River at Glasgow, Pennsylvania.

His new book, with 134, 8-1/2" x 11" pages on excellent quality paper stock, contains a glossary of 120 canal terms, 320 photographs taken by the author, a bibliography of canal related publications and other materials, and of course maps, showing exactly where the S. & B. Canal ran, plus its complete history, and two tunnels!

The book also contains a complete index to text, parks along the route, reference materials, not to mention individuals and other sources from which the author has verified so much of his written material. This is a book that every canal buff in Ohio, as well as other states in the northeast, should add to his library.

Price of the book is \$26.00, which includes postage and handling. Copies may be ordered from the author at 59821 County Road Nine, Newcomerstown, Ohio 43832.

ROBERT FULTON — CANAL DELINEATOR (PART 2)

By Don Postle

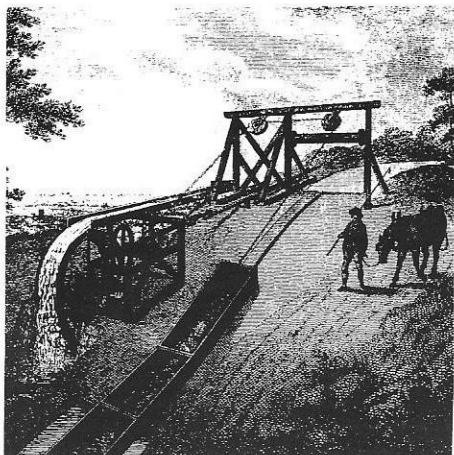


Plate 4. A medium plane for a small ascent, using a water wheel driven by water from the upper canal level to raise the boats on their wheels up the incline. See text for the full cycle.

(Publisher's Note:) We publish here the second section of Don Postle's review of Robert Fulton's 1796 "Treatise on the Improvement of Canal Navigation." Fulton firmly believed that the expensive locks and aqueducts being built on the British Canal System in the 1700's were not necessary, and that the same results could be achieved with smaller canals and boats using inclined planes between canal levels and cable viaducts over the streams. The motive power for his devices were "Tub and Cistern" lifting motors with the tubs alternately filling and emptying from the upper levels of the canal. Chains attached to the tubs, winding over windlasses at the top of the cisterns, provided the desired movement of the boats on the planes. In some cases the "lift" of the boats was completely vertical.

Space does not permit us to show all the many devices which Fulton developed. In some cases we have shown only the elevation views from his facile pen. But at least these drawings will give the reader some idea of his ability to clearly illustrate his plans. Such drawings undoubtedly influenced the builders of such later developments as the Morris Canal and the Allegheny Portage Railroad.

Fulton described the operation of the double plane, dealing first with loaded boats descending (a descending trade) and empty boats ascending, as for example shipping coal from a mine located above a valley. "In this case, let it be supposed a number of loaded boats are at top, and empty boats at bottom; the man hooks the preparer (rope attached to boat) to a loaded boat in the upper canal and the man below hooks an empty boat to the leading chains; water is then admitted into the tub, which, giving motion to the whole machine, draws the loaded boat over the bridge, to the stopper, and at the same time raises the empty boat near to the summit of the plane; this done, the preparer is hooked to a second boat; the loaded boat is hooked to the leading chains, and also another empty boat is hooked below. The tub being cast out of gear to relieve the works, the man lets go the stopper; and now the loaded boat, by its descending weight, raises the second on the bridge, draws the first empty boat into the upper canal, and raises a second empty boat into the place quitted by the first; thus a regular rota-

tion of passing is kept up, in a descending trade, without the use of water to any but the first boat ..." etc.

In an ascending trade (loaded boats ascending) or an alternate trade, the full water tub furnishes the power to raise loaded boats, and so uses more water.

In estimating time of passage on a plane of 200 feet vertical drop, he assigned one-half minute each to three operations: Hooking the preparer to a boat; Hooking the boat to the leading chains; drawing water into the tub, if necessary. He assigned one and one-half minutes for the boat to pass the plane, requiring total passing time of three minutes. Thus in a twelve hour period, the plane could pass 1,920 tons, which "is adequate to the greatest canal trade which the most sanguine imagination can conceive ..."

Fulton devoted one chapter to describe his ideas on navigation on small canals using 4-ton boats, and another chapter on the savings of water, using his proposed design.

He suggested that since planes could accommodate elevation changes as great as 200 feet, his design would result in levels of from one to 10 miles in length. He proposed that a boatman would be assigned to only one level, hauling both loaded and light boats both directions." This mode of a man always working on the same pond (sic), and in the neighborhood of his own house, will be productive of boatmen, as any kind of horse will set a poor man up in business; the size of the boats enabling him to take a weight proportioned to the strength of his horse... Besides, as the whole object is to get them conveyed from one machine to another, he needs but little capacity, as he has nothing to do with machinery. Thus, almost any kind of man will do for a boatman, and hence a competition will arise on the different ponds, and competition will not only produce attention and civility, but also moderate charges".

As to a comparison to the amount of water used, locks versus planes: He presented calculations to estimate that planes would require between one-fifth and one-tenth of the water needed by locks, depending on the lock capacity. (Apparently, locks in the late 1790's in England were constructed to accommodate either 25-ton or 40-ton boats). He also offered a table detailing the cost of constructing an inclined plane with 100 feet vertical rise, compared to the cost for the necessary locks, and claimed that the plane would cost approximately one-third the cost of the locks.

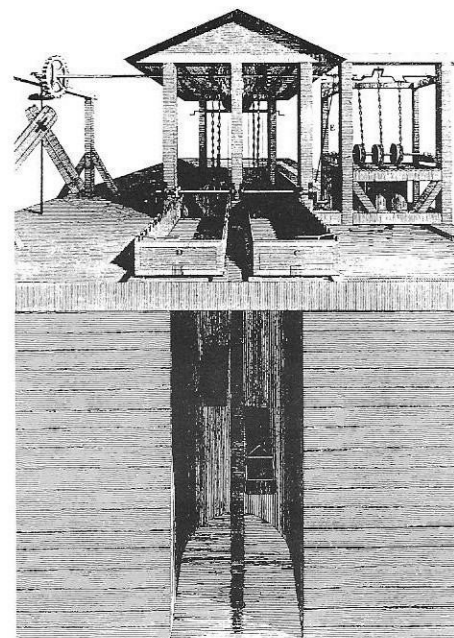


Plate 11. Fulton's caption for this vertical lift reads: "The mode of passing a descending trade and saving water by means of the pumps." Read the text for Fulton's detailed operation. Note some similarities here to the operation of the hydraulic lift locks at Peterborough, Ontario.

Plate 4, The Medium Plane for a small ascent. He considered this to represent appropriate mechanism to pass a string of ten 4-ton boats up or down an incline with 20 to 30 feet vertical difference. In this case, he recommended a water wheel as the source of power, and since this power would need to be applied continuously during the ascent of a string of ten boats, he calculated a water need for the wheel to be 288 tons; for the same string of boats descending, a water need of 48 tons. A lock passing the same cargo tonnage would require 266 tons of water, each direction, so on average, he claimed a water saving using his method. In the process of passing 10 loaded boats down the incline, water power would be needed only until the third boat of the string

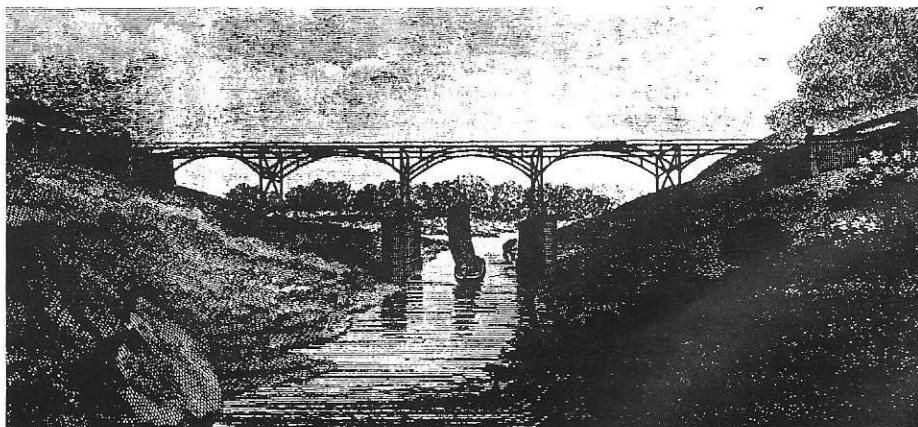


Plate 8. A horizontal plane, two tracks wide, with cars impelled by a bucket and well at one end, and moving in opposite directions across a river on a light frame-work. (No aqueduct needed.)

had crested the bridge leaving the upper canal. At that point of the passage, water to the wheel could be shut off, permitting gravity to furnish the remaining power need. The idling water wheel would then act as a governor to control the speed of descent of the string of boats.

Method for crossing valleys was illustrated in Plate 7: The Mode of crossing Rivers and gaining height at the same time. This represents a situation where the height of the valley walls are different. Here he recommended a double inclined plane in order to maintain a flow of traffic. The power source was a single tub-in-well system.

Plate 8, One Mode of Passing rivers independent of aqueducts: Here he suggested a double horizontal plane that could be constructed for one-third the cost of an aqueduct. The power here is also to be supplied by a tub-in-well machine, which he reported capable of moving one ton of canal cargo for each ton of water used.

Plate 9. The Perpendicular Lift for Passing an alternate Trade. This illustration represented Fulton's first suggestion for obviating locks.

"Although I have already explained the mode of passing the boats, which, I conceive, will be productive of systematic navigation, and ought to be universally adopted till a better is discovered; yet the four following plates will exhibit machines for transferring the boat by perpendicular lift. These machines were originally intended for small canals, as lateral cuts from those of greater dimensions, in order to extend into such districts as could produce from fifty to four hundred tons per day; principally to convey manure and fuel, and thereby relieve the country by a medium carriage, between the large canals and cartage.

This, for a long time, was the extent of my thoughts; the idea of an universal system did not arise, till I discovered the great saving which would be produced by such lateral cuts. I then wished to render the canal equal to a trade of more than four hundred tons per day, and capable of performing the work of a large canal; in which, there was nothing wanting but an improvement in the machinery to produce expedition; but this baffled every experiment for some months. At length the rotary movement, and boats with wheels, occurred; and they exhibited the power of passing valleys. On revolving the thought, I found it would answer the purpose, by performing the most important trade, producing system, and simplifying the machinery: It has consequently raised small canals (in my opinion) from lateral cuts, to the most extensive and important communications."

Plate 11. The Mode of Passing a Descending Trade and saving the whole of the water by means of the pumps. "... while the trade descends; yet

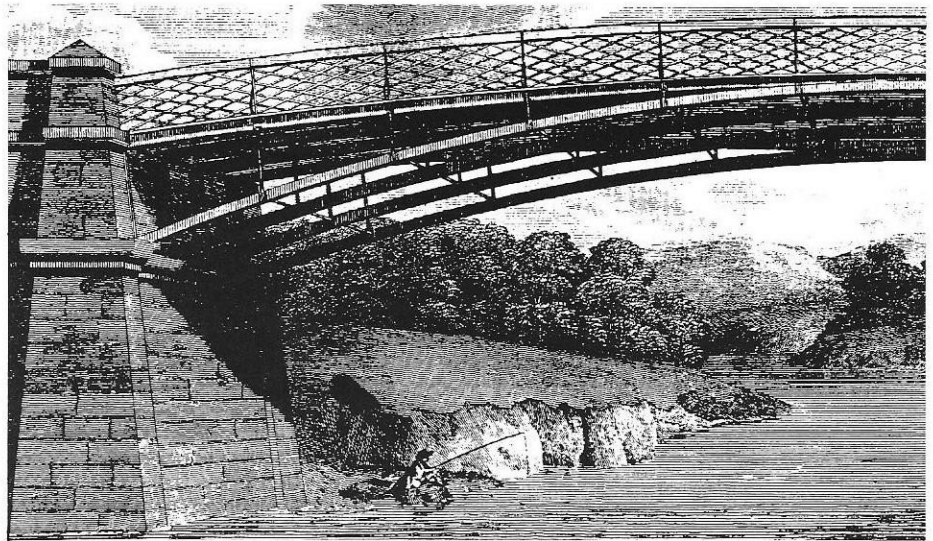


Plate 15. Fulton's design for an iron bridge, "showing the ribs and braces."

should it be found necessary, by a further extension of the canal, to form the apparatus for an alternate trade, the water tubs may be applied.

In the first case of a descending trade, there is but one pit, which must be thirty feet diameter, a capacity sufficient to suffer two boats to pass; over the pit a building must be erected, to cover and support the works; in the center of which a drum-wheel of one diameter is placed. On each side of the drum, two chains and a cage to receive the boat is suspended; which cage will move alternately between the upper and lower canals; on the end of the upper canal, and on the side of the pit, there are two gates, balanced so as to rise perpendicular, as at A and B; and opposite the gates, parallel to the canal, two lock-carriages, C and D, worked by rack and pinion, moving on iron rails; which carriages are constructed with one end open, and of a size to receive the cage and boat.

When the lock-carriage is moved forwards, it fits close to the end of canal in a groove; and the gate being opened, the water of the canal fills the carriage; which enables the man to float his boat in the cage; after which, the gate being shut, and a valve opened in the hind part of the carriage, below CD, to discharge the water, the carriage is run back and leaves the boat suspended over the pit; during this operation, the man below having placed an empty boat in the lower cage, the two boats are now ready to pass; the loaded one descending, raising that which is empty; and at the same time, by a crank movement taken off the end of the drum, three pumps are put in motion;

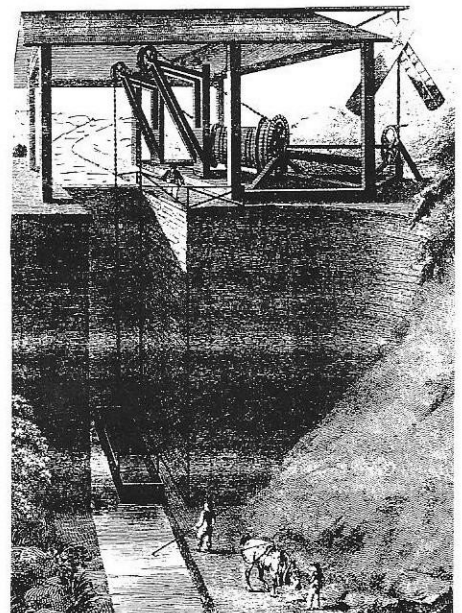


Plate 9. A vertical lift activated by a bucket and well arrangement. Note that the cranes are pivoted to permit them to lift and turn the boats from the upper to lower level, or vice versa.

and they raise the water, which was discharged from the lock-carriage, into a side pond, about twelve feet high, into the upper canal; by which the whole is saved. The empty boat having ascended, the second lock-carriage is run forward, and the gate of the canal being opened, the water filling the carriage, will float the boat into the upper canal; another for the purpose of descending, is then moved into the cage, and so on alternately."

Plate 15. Design for an Iron Bridge. Scale 1 inch to 10 feet. The Section shows the Ribs and Braces. Scale 1 inch to 4 feet.

Fulton included in his Treatise as a final chapter an eleven page letter addressed to the Governor of Pennsylvania. He entitled the chapter: to Thomas Mifflin, Governor of the Commonwealth of Pennsylvania. The letter was signed Robert Fulton and was dated London, March 1796.

The intent of the letter was to persuade the Governor of the beneficial effects of building Fulton-style canals across the western portions of Pennsylvania.

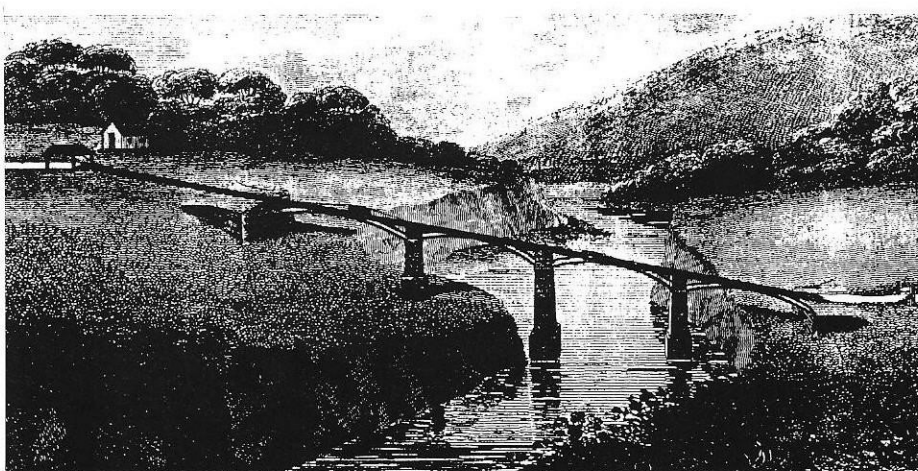


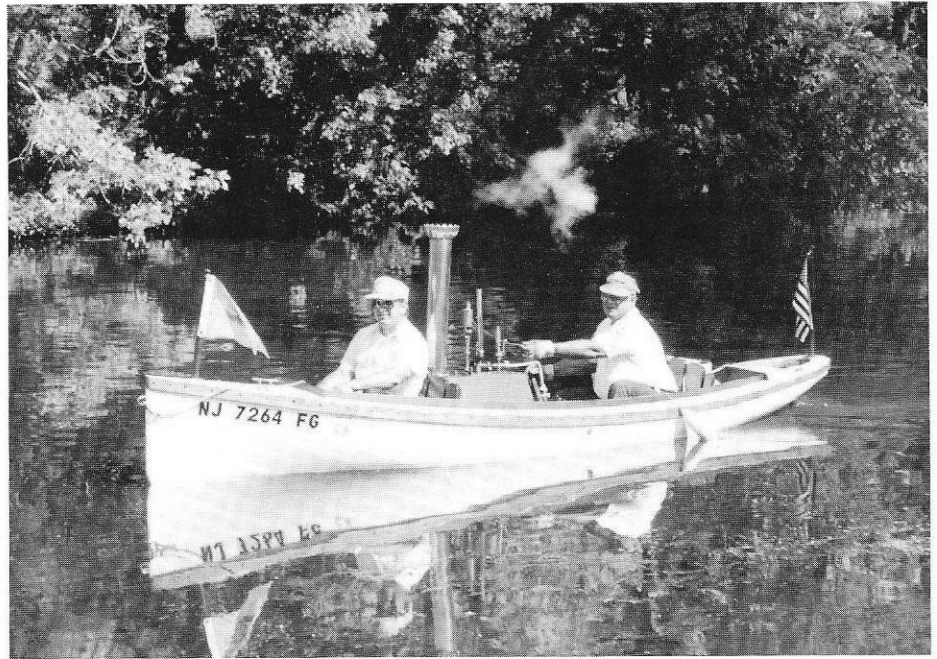
Plate 7. A double-track inclined plane for crossing a river and gaining height at the same time. Bucket and cistern driving machine at one end only.

Steam and Pleasure Boats Invade Delaware & Raritan Canal

By Bill McKelvey

All 1150 members of the Canal Society of New Jersey prayed for good weather for May 29th, 1994. Their prayers were answered! It was a beautiful, warm sunny day for the 25th Anniversary Celebration of the society. The main feature of the festivities was to be "boating on the Delaware and Raritan Canal for the first time in 62 years." Months of meticulous planning paid off as the big day at Somerset County's Colonial Park at East Millstone unfolded.

The 60 foot boom crane, (rented by Canal Captain's Press) a critical element to the launching of boats, arrived right on time. By the time it was set up along side the canal dock several boats had arrived. First in was Charles Roth of Glen Gardner with a steam launch, followed by: the wood fired steam boats of Livingston Morris, of Devon, PA with his "Muskrat;" and Ted Zimmer, of Manasquan; Bob Larson of High Bridge, in his "Norwegian Wood," a beautifully restored 1953 Chris Craft runabout; Addison Austin of LaBelle, Fl, with his outboard powered Woodson; another steam launch owned by Dave Belents of Mountaintside; John Anderson of Sussex brought his self built, rowed skiff, "Pegasus"; the largest vessel was the 28 foot rowed Whaleboat which was trailered down from Mystic Seaport Museum; and



Dave Belents conveys a passenger in his 16-foot steam-powered launch on the D & R Canal during the 25th Anniversary Boat Festival. (Photo by Linda House).

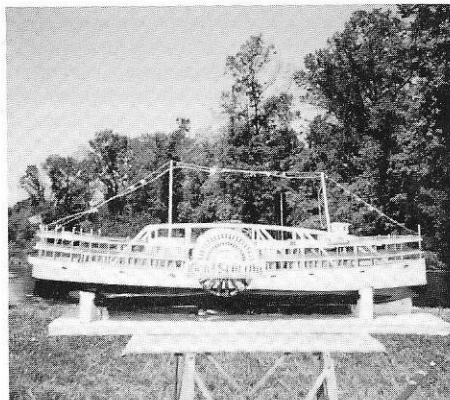


A fully-operational, steam-powered tug boat model of the type used on the D & R Canal until 1932. (Russell photo).

Charles Robe of Park Ridge brought an exquisitely hand constructed and detailed guide canoe which was fitted for electric propulsion.

The above boats offered rides to the public. Over 100 trips were made by these vessels and more than 400 passengers were carried during the day, and not a single one fell in. What a way to celebrate!

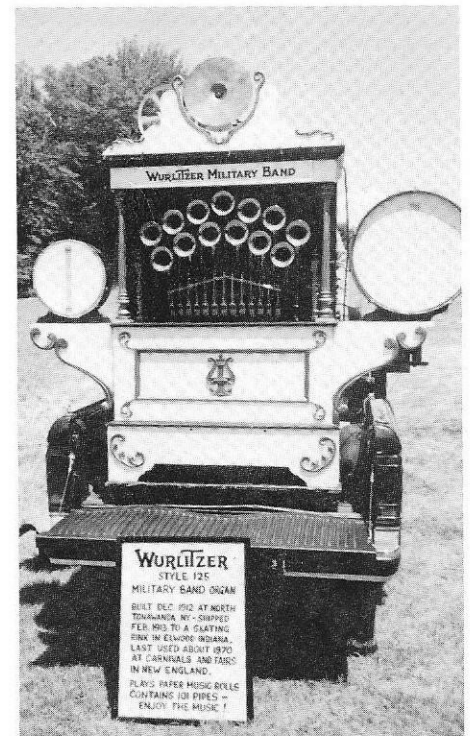
On display was a ca. 1910 wooden rowboat, "Penny," built by Heister's boatyard in Reading,



Model of the "General Slocum" steamboat which burned near Hell Gate in the early 1900's. (Russell photo.)



Linda House guards the various vessels of water collected from ten different canals and waterways in eastern United States, prior to the "Wedded Waters" ceremony. (Russell photo).



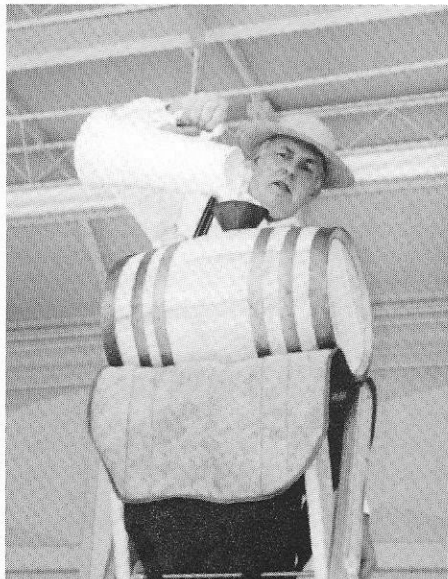
A 1912 fully-restored Wurlitzer Band Organ furnished music for the 25th Anniversary gathering. (Russell photo)

PA for the family's personal use on the Schuylkill Canal. The vessel is now owned by Robert Grubb of Pottstown, PA. The Heister family built canalboats and operated excursions on the canal for many years. Restored antique outboard motors were displayed by Tom Luce of Westfield.

In addition to the passenger carrying vessels, the following radio controlled steam and electric powered model boats participated: "Miss Lake Hiawatha," "Gen'l. Slocum," "Catherine," "African Queen," an Erie RR harbor tug, "PT 109," and several others.

The park area was alive with the sounds of a Wurlitzer Band Organ brought by Rusty King and Jack Hardman's barrel organ. Shortly after noon there was a short ceremony with remarks by Bill Moss, President of the Canal Society; Jim Amon, Executive Director of the Delaware & Raritan Canal Commission; Frank Torpey, Chairman, Somerset County Park Commission; and Greg Marshall, Head of NJ Parks & Forestry; followed by a "wedding of the waters."

Several dozen not-for-profit groups had tables to promote their causes. Friends of the NJ RR & Transportation Museum, United RR Historical Society of NJ, and Railroadians of America were well represented. A good time was had by the three to four thousand people who attended. Well done, Canal Society of NJ...



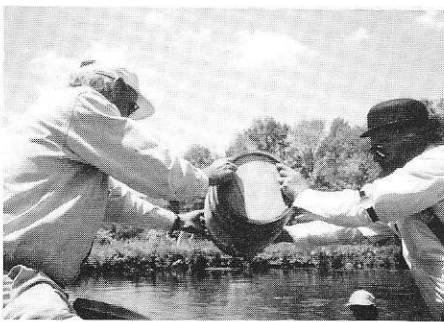
Bill McKelvey adds water from the Schuylkill Canal to the barrel. (Russell photo).



Bill Moss, CSNJ President, pours Morris Canal water into the "Wedding of the Waters" barrel, while Bob Barth looks on. (Russell photo).



Bob Barth, Vice President of CSNJ (left) and Jim Amon, Executive Director of the D & R Canal Commission, convey the "Wedded Waters" barrel to the Canal for the final ceremonies. (Photo by Linda House).



Jim Amon and Bob Barth pour the "Wedded Waters" barrel into the Delaware and Raritan Canal, following appropriate ceremonies. (Photo by Linda House).

BROWNSVILLE MUSEUM

From E.E. Liggett, Liggett and Associates, we are informed that a group has been organized in Brownsville, Pennsylvania to preserve transportation history in the Monongahela Valley. The organization is the Brownsville Area Railway & Transportation Society and for starters they have use of 3,000 sq. ft. of space in the former freight station of the Monongahela Railway.

There is a lot of river history centered in the Brownsville area and we are pleased to learn that the locals are taking an interest. The Steamboat Museum at the Duquesne Ice Harbor proves that an old freight house can be a wonderful location for a museum and we wish the Brownsville folks well.

Inquiries regarding the Brownsville museum may be directed to:

Brownsville Area Railway & Transportation Society,
Attention Gene Leggitt,
P.O. Box 1,
Brownsville, PA 15417

(From the S&D Reflector, Sept. 1993)

NEW BOAT ON THE ERIE

A new boat, "The Liberty", is now available for cruises out of Lyons, New York. It holds 49 passengers and offers chartered trips, buffet dinner and evening cruises with narrated canal studies. Operated by David and Barbara Conroy, who have winter quarters at Matlacha, Florida but summer quarters at Lyons, NY. For full information on Erie canal tours, write 37 Layton Street, Lyons, NY, or phone (315) 946-4108.

NEWS ITEMS

The editorial staff of *AMERICAN CANALS* solicits news items, photographs, or drawings of canal or waterway activities — worldwide. Such items should be sent to the editor. Due credit will be given for all material published.

THE OTHER LOCK AT SCHUYLERVILLE, NY

By David G. Barber

In *American Canals* #86, Mary Cassai reported on a cruise along the Champlain Canal aboard the *Emita II* and mentioned that during a stop at the lock at Schuylerville she observed a second, smaller lock located parallel to and west of the barge canal lock and on the old Champlain Canal. Despite the overgrowth that now covers it, this second lock is more interesting than it first appears.

In the tables included in *The History of the Canal System of the State of New York, Vol. II, Noble Whitford's* list for the locks of the old Champlain Canal show Lock 9 as located south of Schuylerville (sta. 731 + 75) and just north of the point that the Boston & Maine Railroad (Fitchburg RR) crosses the river and canal (Sta. 720 + 40). However modern Lock C-5 is north of Schuylerville. Whitford's tables also show that old Champlain Canal Lock 10 (Sta. 1,588 + 62) was located just north of the Northumberland Dam.

So what is the lock next to Lock C-5?

Further examination of the lock itself shows that it is built of concrete whereas the old Champlain Canal locks are masonry. Remains of wooden miter gates are at the southern, lower end. A steel dam closes the upper end holding back a higher level of water in the channel to the north. A drop gate was probably originally located there. The lock itself is built to the old canal's lock dimensions.

Careful study of the site and of Whitford's *The History of the Canal System of the State of New York* and his *History of the Barge Canal of New York State* reveals the answer.

The old Champlain Canal extended by land line on the west side of the Hudson River from its junction with the Erie north through Schuylerville to Northumberland. There, it entered the river in the pool of the dam. Originally, the old canal then used the river to Fort Edward as the current canal now does. In 1827, a separate land line was built on the east side of the river between Northumberland and Fort Edward most of which remains. After this improvement, canal boats crossed the river in the pool of the Northumberland Dam.

When the barge canal was built, several decisions were made. First most of the channel was put in the river between Troy and Fort Edward. Second, it was decided to locate Lock C-5 about 3/4 of a mile south of the Northumberland Dam and construct a new straightened channel on the approximate route of the older channel. This bypassed the rock ledges that exist just down river of the dam. However, it also raised the water level in the channel between the dam and the new lock to the new height of the Northumberland Pool. Whitford shows the crest of the Northumberland Dam as 102.53 feet elevation.

While this increase in height wasn't a big problem for the new barge canal, it did flood out the old canal north of Lock C-5 so that today its curved course is only visible, but not obvious, to the west of the current channel. From the upper deck of the *Emita II*, these curves can be picked out by a discerning eye.

In the barge canal project, local pressure caused a third decision to be made. That was to retain in use the older canal from Lock C-5 to the Schuylerville Basin to allow older boats to still enter the basin in the village. To do this, a junction lock was built next to Lock C-5 on the original alignment to take care of the difference in water level between the new channel north of the lock and the established level in the old channel to the south. This junction lock is what lies next to Lock

WATER LEVEL CONTROL On The Ohio & Erie Canal

By Terry K. Woods

Maintaining the proper amount and depth of water in each level between locks of a canal was of utmost importance to those men who engineered and constructed it. This meant that an adequate supply of water must be fed into the canal at various points to account for losses due to evaporation, seepage, and lockage. The engineers who planned the Ohio & Erie used all the standard water supply methods. Natural and man-made reservoirs were employed to supply water to the canal on its two summits. Feeder dams across the major streams it followed and several minor streams it crossed, coupled to short feeder channels fed the remaining route at selected intervals. There were also slackwater-crossings of several of the larger streams the canal intersected on its route to connect Lake Erie with the Ohio River that could be used as water supply sources.

Of nearly equal importance, however, was the requirement to maintain a proper depth of water in each level, so that none would be too low to support navigation or so high that water would flow over the embankments, damaging them. When the first section of the Ohio & Erie Canal was constructed from Akron north to Cleveland in 1825-27, the water was passed between levels through the locks, themselves. Lock chambers were filled by allowing water to flow from the higher level through a masonry culvert, built within the stone walls of the lock, into the chamber. The chamber was emptied by letting water flow into the lower canal level through paddles or wickets within the lower lock gates.

No formal locktenders were employed at every lock on the Ohio & Erie Canal during its earliest days. Crew members of the boats navigating the canal were required to run on ahead to fill, or make each lock before their boat arrived. Often the paddles in the lock culverts or gates were left in such a position that one or the other of the adjacent levels would overflow, or go dry. These same conditions could occur when floating debris, common to all new artificial waterways, would collect within the lock culverts and obstruct the flow of water.

A design change was made to all locks constructed after 1827 to include what the Canal Commissioner's report for that year called 'sluices' or 'feeders' and 'tumbles' to pass a controlled volume of water around each lock from level to

C-5 today. Just south of the Schuylerville Basin, the Fish Creek Aqueduct was removed and its north abutment converted into a spillway to discharge water flowing down the old canal into Fish Creek which soon enters the Hudson.

Adding the lifts of the Troy Sloop Lock, the three locks of the Waterford Side-cut and old Locks 5 to 9 gives a water elevation in the old canal at Schuylerville of 95.41 feet. Adding the lifts shown in the NOAA Charts for the Barge Canal from Troy Lock to Barge Canal Lock 5 gives a water elevation above Lock 5 of 101.3 feet. This is a difference of about 5.9 feet.

After a while, the older boats ceased to be used and traffic into Schuylerville Basin ended. The junction lock was therefore abandoned and it and the channel into Schuylerville became overgrown. However, water still flows down the old channel and it is probably still navigable by canoe although I have yet to try.

level. All new locks were constructed with this feature and all locks constructed before this date had the new feature added. The Canal Commissioner's report for 1832 describes the recently completed Ohio & Erie Canal in some detail. One of the features described was these channels, which now carried another name.

"Around each lock, except for a few whose particular circumstances don't require water regulation, has been constructed Regulating Weirs - comprising a channel by which the water is passed from the higher to the lower elevation over a tumble of stone or wood erected to prevent water from cutting away the earth and depositing it below.

"These regulators are of great importance in preserving the equable level of water from one level to another, and keep it at a uniform height in each, at the same greatly diminishing the trouble and expense attendant upon passing water through the culverts.

"As water flow over these tumbles from the surface of each level to the next below, the upper level is not liable to be exhausted and no effort is required except to keep the regulators free of driftwood."

With the even flow of water between levels assured, there was still a need to keep any one level from overflowing due to heavy rains, extensive locking, etc. This was accomplished by installing at least one wasteway on each level. On the Ohio & Erie a wasteway was a stretch of towpath, 60 to 100 feet long, that was cut down to within a foot or so of the normal water level, lined with rip-rap or concrete, and bridged by a wooden towpath. A wasteway allowed high water to waste away out of the canal channel into the adjacent stream. Nearly every level on the canal contained at least one such wasteway. It was usually located a short distance below a lock. Several levels on the O & E contained more than one. On the 'Ten Mile level' below Navarre, two wasteways lie within fifty feet of each other.

There was also a requirement, however, to quickly lower the water depth in a level, or to drain it completely for repairs. Grooves built into the sides of each regulator tumble and the head of each lock allowed 'stop planks' to be placed into them, forming a temporary dam. A structure termed a sluice, or flood gate was installed in the towpath of each level to affect rapid drainage. Sluices came in two sizes on the Ohio & Erie, regular and very large. The regular sluices were nothing more than culverts, with the culvert mouth at the bottom of the channel leading under the towpath to the adjacent stream. A wooden framework, iron gearing, and gates were set up so that the amount of water flowing through the sluice could be regulated, or turned completely off. The two large O & E sluices, one located at a feeder stream just south of Navarre, and the other at the slackwater crossing of Sugar Creek at Canal Dover, were twin concrete piers (after the 1900's rebuild), with the same type of regulation as the smaller sluices. This allowed the vast amounts of excess water that could accumulate at these two points to be passed back into the Tuscarawas River upon demand.

A few locktenders were maintained on the Ohio & Erie during its later days. However, they performed the same duties that level walkers performed on other canal systems. They kept the regulators, tumbles, sluices, and wasteways clear of brush and rubbish. They kept the things working that assured the proper hydraulic operation of the Ohio & Erie Canal.