AMERICAN CANALS

BULLETIN OF
THE AMERICAN CANAL SOCIETY

BULLETIN NUMBER 79 Editorial Address—Rural Route 1, Box 87T, Savannah, TN 38372 **NOVEMBER 1991**

PRESIDENT'S MESSAGE

A number of A.C.S. members made it to the Annual Conference on Historic Canals in Akron, which was a great success, thanks to Rory Robinson, Paul Labovitz, and an impressive number of volunteers, actors, and sponsors. These conferences have been the most stimulating and practical canal meetings I've ever attended. If you're interested in canal preservation and parks, it's the place to go to meet the professionals and the canal buffs. During a free period we had a brief get-together of A.C.S. members, something we'd like to make a regular part of these meetings. We all voted to take up Charlie Derr's suggestion to make A.C.S. a sponsor of the annual conferences by donating $500 in seed money for the next one, which might be on the Chesapeake and Ohio Canal.

Did you know that our National Park Service plans to demolish historic Bluebird Dam in Rocky Mountain National Park, spending twice the cost of repairing it, because it is in a wilderness area? They claim that their mandate is to remove "all works of man," but they will be putting up interpretive signs to show where it was! The case is one of several discussed in the 1990 annual report of the Advisory Council on Historic Preservation. The moral is, keep a sharp eye on N.P.S., and also on the historic mining and irrigation canals out west, which could be as useful for generating parks and trails there as the navigation canals back east.

Ex-Texan Warren Willmott told me about an ingenious use of "temporary canals" to move large oil tanks. I wrote to Exxon and Shell Oil, who explained that in the 1950s and 60s it was standard practice to build levees around a site and pump in water to float tanks for distances up to several hundred feet. Since the 1970s, however, a "hovercraft" technique has been used instead, blowing air under a tank to lift it off the ground. The "temporary canal" idea was also used years ago to dig permanent canals on the Atlantic Intracoastal Waterway in South Carolina, where dikes were built and water pumped in to float dredges to dig a canal across once-dry land. If you know of other ingenious uses of canals, send them to *American Canals.*

—Bill Trout

CANAL CRUISES AT CANAL FULTON

The Canal Fulton Heritage Society announces that three years of volunteer work are about to pay off, with the launching of the new canal boat, St. Helena III. The cruising season will begin in April 1992. Canal Fulton is south of Akron, on the Ohio and Erie Canal.

PENNSYLVANIA CANAL SOCIETY TOURS PAW-PAW TUNNEL

View of the west portal from inside the tunnel. Note the original wooden guardrail in the foreground, and the "rubbing rail" at the lower right, to prevent boats from coming in direct contact with the masonry tunnel wall.

by Bill Shank

Beautiful fall weather blessed all but about one hour of the Pennsylvania Canal Society fall tour of the west end of the Chesapeake and Ohio Canal, October 4 and 5, 1991. Driving into Cumberland, for most of us, involved a trip along the new Interstate 68 (former U.S. 40) and some gorgeous fall foliage in the mountains of western Maryland. One of the most impressive spectacles on this new route is the 380-foot-deep mountain cut at Sideling Hill, which can be seen for miles both east and west. On the north side of the cut is an interesting information center which features the geology of the area, so dramatically exposed by the cut.

Approximately 40 members of the P.C.S. from a three-state area attended the various sessions at the Holiday Inn in Cumberland Friday and Saturday evenings. Bob Keintz, Tour Director, showed a series of slides of the points to be visited on our tour. This was followed by David Johnson, of the C. & O. Canal Association, with more slides collected during his travels along the canal as a

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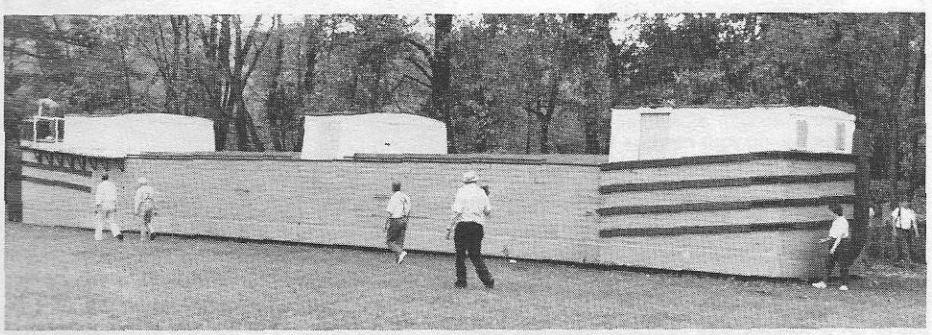

A land-based replica of a C. & O. Canal coal boat, built to full scale to show their size.

American Canals

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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 ($14 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.

WELLAND CANAL ANNIVERSARY

by Lou Cahill

The 110th anniversary of the opening of the third Welland Canal was observed on September 16th, 1991, at St. Catharines, Ontario. A brief ceremony took place at what was Lock One of the historic canal, located at the Port Dalhousie Lake Ontario entrance. The site, which includes the nonoperative 260-foot lock, is now being prepared for public use. It also includes an original lock tender's shanty, restored by Lakeport High School students.

On September 15th, 1881, the American ironclad steamer Don M. Dickenson, towed by the Canadian tug H. Neelon, moved upbound through the new canal. Entrances to the two earlier canals are also located nearby in Port Dalhousie. The first was opened in November 1829.

William Fenwick, St. Catharines Parks and Recreation Director, was chairman of the commemorative plaque unveiling. Other participants were Harley Smith, President of the Welland Canals Foundation, John Burtniak, President of the Canadian Canal Society, and Lou Cahill, Director for Canada of the American Canal Society.

The third Welland Canal was in service until 1932. In that year, the present (fourth) Welland Canal, accommodating vessels up to 730 feet in length, was opened to navigation.

Dear Mike,

Many thanks for your
✓ exemplary
__ splendid
__ useful
__ acceptable
__ negligible
contribution to the recent MONTGOMERY CANAL
__ weekend working party
✓ workcamp
__ bring & buy sale
__ coffee morning
in your role as
✓ working party organiser
__ camp leader
__ assistant camp leader
__ assistant camp leader's girl "helper"
__ Cook
__ bloke who did things with spanners
__ pratt with camera.
As a result of your efforts the canal restoration project is now
__ very materially advanced
✓ progressing well
__ ticking over nicely
__ not too far retarded
__ hopelessly behind schedule
__ abandoned.
You are to be especially congratulated for
✓ your fine leadership qualities
__ letting the others get on with it despite you
__ postponing your nervous breakdown
__ not postponing plant breakdowns
✓ crashing the dumper
✓ remembering that you were twice her age
__ the wet T-shirt competition
✓ your contribution to international relations.
We at the MONTGOMERY CANAL hope that
✓ you will be returning soon
__ we'll see you someday
__ you'll enjoy the Wey & Arun next year
__ you enjoyed this once in a lifetime experience.
To conclude let me say that it was a
✓ privilege
✓ pleasure
✓ experience
✓ education
✓ hassle
__ nightmare
working with you and I trust that
✓ I will be hearing from you soon
__ you will be hearing from our solicitors
✓ you will be hearing from her parents
✓ you will be hearing from the Spanish Consulate

Yours in all sincerity,

G Deamer Canal Field Officer

Please reply to
✓ Bedw Main, Meifod, Powys SY22 6YB
__ The Hung Wah Cantonese Takeaway, Queen Street, Bradford

Just to show you how far advanced the Brits are in canal restoration work, here's a thank-you note which was reprinted in the November 1990 issue of *Navvies,* the newsletter of the Waterway Recovery Group. If you get over to Britain, get in touch with them c/o the Inland Waterways Association, 114 Regent's Park Road, London NW1 8UQ, so you can join a work party for a weekend or two and get your own thank-you letter. For us, it's a reminder that we can have work parties too, all it takes is a few phone calls to your friends! —Trout

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LOCK EXHUMED

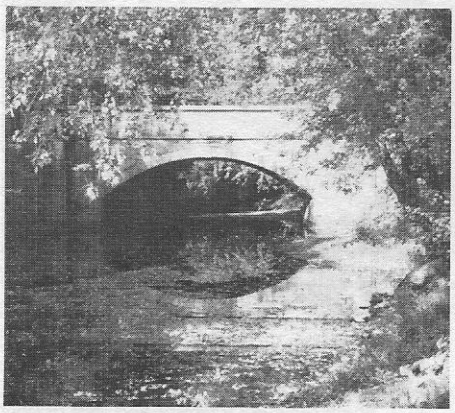
Minthorn Lock, buried in 1914, has now been dug up and removed, through the efforts of the Canal Society of Ohio, the Ohio Department of Natural Resources, and the Licking County Archaeology and Landmarks Society. The lock, a portion of the Ohio and Erie Canal, was adjacent to Buckeye Lake, originally a water supply reservoir for the canal. The lock was buried, following the 1913 floods, in a flood control levee. Further flood control work this summer involved the construction of a spillway at the site of the lock, and this in turn led to its exhumation. The lock was found to be in remarkably good condition, probably because of its burial. It is expected that eventually it will be reassembled and put on display, but plans are still incomplete.

PCS TOURS PAW-PAW TUNNEL

(Concluded from Page One)

regular "level walker." The second evening, after an excellent buffet dinner, P.C.S. President Jim Oliver conducted a business meeting at which new directors were elected for the coming year, and plans for the spring meeting (May 1-2, 1992) along the Schuylkill and Union canals were presented. Following this, "Zip" Zimmerman took over the meeting and ran an interesting series of slides and movies of historic canals in Maryland and Pennsylvania on a large V.C.R. unit set up for this purpose.

Fair skies greeted us Saturday morning for the bus tour, which began at the Fifteen-Mile Creek Aqueduct on the canal. Here we were joined by several C. & O. Canal Park Rangers, including John Frye, a long-time member of P.C.S., who guided us to the various campsites and restored artifacts along the canal towpath.



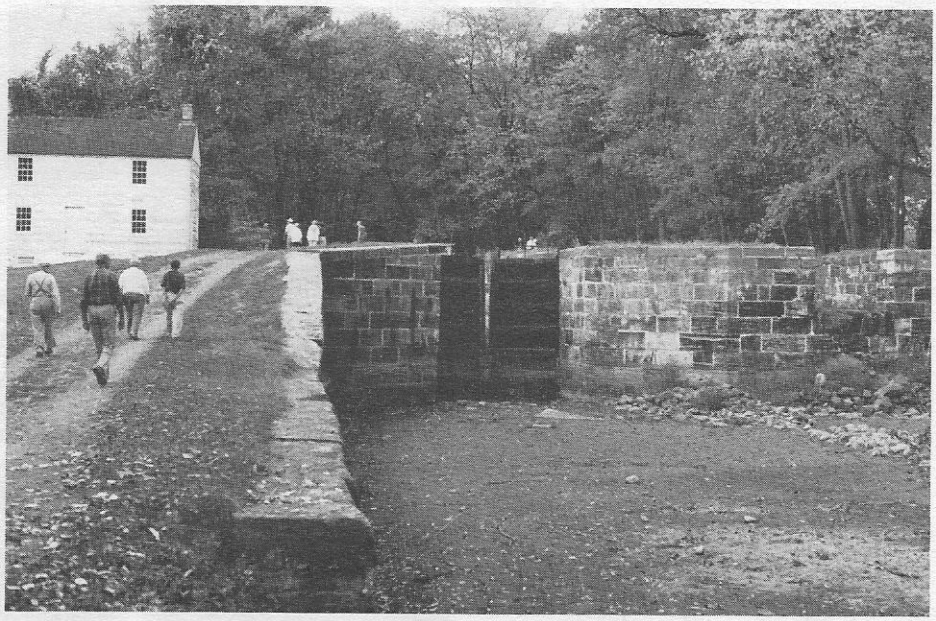
Fifteen-mile Creek Aqueduct, a beautifully preserved masonry structure—the first stop on the tour.

Fifteen-Mile Creek Aqueduct has been maintained in excellent condition by the Park Service. All the masonry has been carefully repointed to restore it virtually to its original condition. The same is true for most of the other C. & O. structures that we visited on the balance of the tour.

Our second stop was at the famous Paw Paw Tunnel. This 3,118-foot, brick-lined canal tunnel was originally planned to be built in two years, at an estimated cost of $33,500. Instead, it took 14 years (1836 to 1850) to build, and cost over $600,000, delaying the use of the full length of the C. & O. Canal until the canal had been almost superseded by the building of the B. & O. Railroad over the same route and beyond.

The walk from the parking area to the west portal of the tunnel was approximately 3/4 of a mile. We encountered a number of bicyclers on the towpath. Most of our group walked the full length of the tunnel, with the promise of a possible visit to several locks at the opposite end. Some hardy souls hiked *over* the mountain, returning through the tunnel. Your reporter was satisfied to investigate the west end of the tunnel, taking note of the burn marks of the towropes on the well-preserved wooden guard rail along the towpath inside. It was almost as though the canal boats had just stopped running a few months earlier.

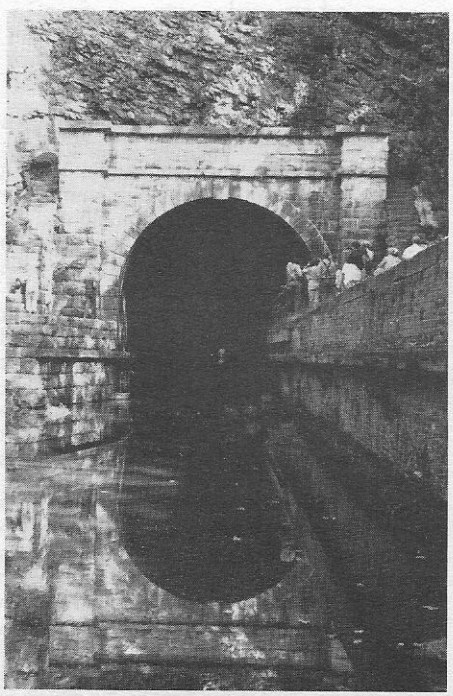
The tunnel being wide enough for only one boat at a time, the canal company assigned watchmen to regulate traffic at both ends. The downstream boat was supposed to have the right-of-way. The story is told of two stubborn canal boat captains who met at the center of the tunnel, both refusing to back out. The tunnel was tied up for two days, until a company official built a roaring cornstalk fire at the upwind end of the tunnel and forced the offenders out! In the heydey of the canal, boats were frequently lined up at both ends waiting for clearance to enter.



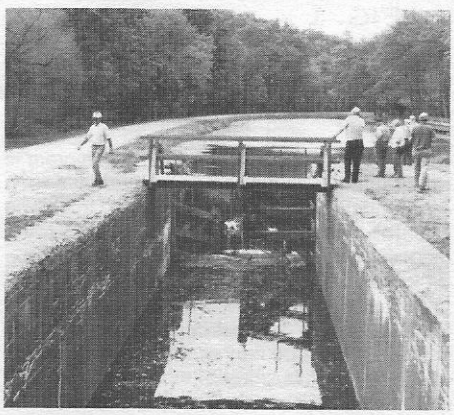
One of the locks at Oldtown, with a log lockhouse at the left. There is no water in the canal at this point, but the rebuilt lock gates are still in good shape. Note the bypass flume to the right.

We ate a satisfying picnic lunch immediately after our tunnel tour, and our bus then took us to several restored locks near Town Creek Aqueduct, where the bus driver got stuck in a deep hole. We had plenty of time to enjoy a walk on a long rewatered section of the canal, until a heavy-duty towtruck arrived and got us going again.

Last stop of the day was at Oldtown, where there are several restored locks, a tollhouse built of logs, and a recently-constructed replica of a C. & O. Canal freight boat. A heavy rain began just as we were leaving, with your reporter catching the boat but almost missing the bus, after a very wet walk along the towpath! Back at the hotel, we all dried out and had good food and a pleasant evening.



The tour group preparing to enter the west portal of the Paw Paw Tunnel. The east end of the tunnel is visible at the center of the photo.



A watered section of the canal near Town Creek Aqueduct. The decrepit lock gates have been supplemented by a weir to hold back the water above the lock.

SOUTH CAROLINA CANAL PARK REOPENS

The Old Santee Canal State Park has reopened, almost two years after Hurricane Hugo forced its closure. The park, located at Moncks Corner, South Carolina, preserves the heritage of the Santee and Cooper Canal, which from 1800 to 1850 was the principal link between Charleston and its rice-producing hinterland. The park reopening coincides with the inauguration of a new Interpretive Center, featuring models of canal construction and operation, as well as an introduction to the natural history of the area.

MULE POWER FORCE ANALYSIS

by William Dzombak

A canal boat moves forward because a force FF, acting on the boat, pulls the boat in the direction shown in Figure 1. That force is applied to the boat by means of a towrope tied to the front end of the boat, as shown in Figure 2; the other end of the rope is attached to the harness of a mule, or horse, that pulls on the rope and so moves the boat through the water.

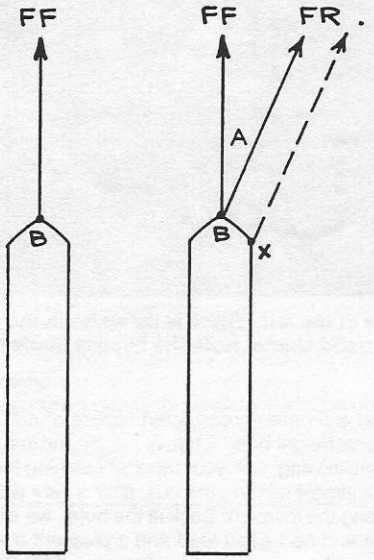


FIG. 1 FIG. 2

FF = force acting to move the boat forward
FR = force exerted on the rope by the mule

Note: Each force on such a force diagram is represented by an arrow. The orientation of each arrow indicates the direction in which that force acts. The length of each arrow is a measure of the magnitude of that force.

The towrope defines an angle (A) away from the line of motion of the boat because the animal(s) pulling on the rope cannot walk on the water in front of the boat, but must be located on a towpath that runs parallel to the canal. To simplify the discussion and illustrations that follow, it is assumed that the towrope is attached as shown in Figure 2, on the centerline of the boat at the bow, and not at a point such as X, which was used on many boats. Later in this article, I will consider why the towrope was attached at point X rather than at point B.

When a horse pulls a wagon, all of the energy expended (work done) by the horse is delivered, without reduction or loss, to the wagon, because the horse walks on the line of motion of the wagon. On the other hand, when a mule, walking a towpath, pulls a boat, the animal and the vehicle (boat) do not move on the same line; the mule "pulls at an angle," so to speak, and therefore pulls the boat sideways, toward the towpath, as well as forward, parallel to the towpath. (See Figure 3.) The single force, FR, actually applied to the rope, could be replaced by two other forces, FF and FS, each acting separately, to achieve the same effects: forward motion of the boat at the same time it is drifting sideways, just as an airplane drifts off course in a crosswind, or if it is fitted with only one propeller.

Dixie and Daisy appear to be simply mules, but they are actually the latent foci of invisible but potent force vectors. [Photo by David T. Boyer for the Canal Museum at Hugh Moore Park.]

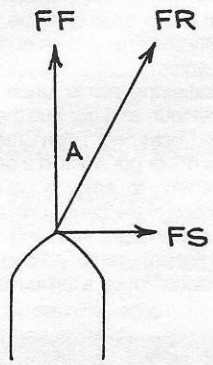


FIG. 3

Because the mule must walk on a line that does not coincide with the line of travel of the boat, the mule exerts two forces (pulls) on the boat: one pull in the direction of motion of the boat, and a second pull sideways, toward the towpath and the bank of the canal. The mule must do more than pull the boat forward; the mule must also do the added and unavoidable but useless work of pulling the boat sideways, which then requires that the boat be fitted with a rudder that can be used to keep the nose of the boat on a line that parallels the towpath. The extra work that the mule must do is therefore required to overcome the resistance to motion, or drag, created by keeping the boat rudder at an angle, and not amidships, on the axis of the boat.

Because the mule must walk on a line that is displaced to one side of the line of motion of the boat, the mule must do more work than would be required to pull a wagon of the same weight, even assuming identifical friction. A simple calculation can be made to discover how much extra work must be done by a mule pulling a canal boat instead of a wagon of the same weight and friction.

The force applied to the boat by the mule has been resolved into two component forces.

FR = force applied to the rope by the mule
FF = force that moves the boat forward
FS = force that tends to move the boat sideways
A = angle between towrope and axis of boat
FF = FR x cosine (A) = forward force
FS = FR x sine (A) = sideways force

The two forces can be obtained as soon as the angle (A) is known. To calculate that angle, it is necessary to make some assumptions regarding the distance between mule and boat and between boat and towpath, as shown in Figure 4.

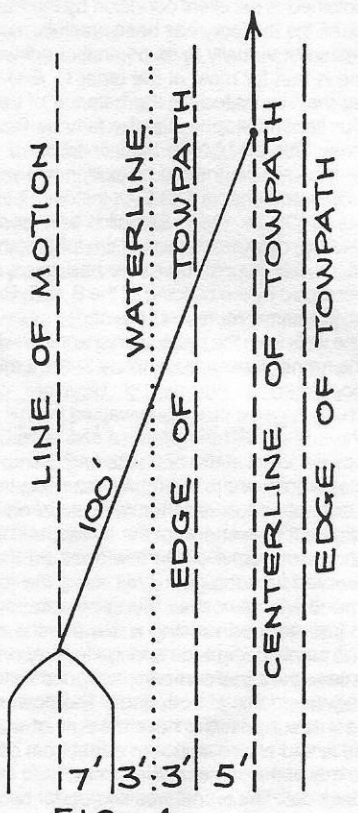


FIG. 4

Assumptions.

width of boat = 14 feet
minimum distance between boat and waterline on bank of canal = 3 feet
horizontal distance between waterline and edge of towpath = 3 feet
width of towpath = 10 feet
length of rope = 100 feet

Given those distances, the two component forces can be calculated by use of the relation, stated earlier, that the length of each arrow on a force diagram is proportional to the magnitude of that force:

FS = FR x sine (A) = FR x 18′/100′ = FR x 0.18

The cosine of that angle can be looked up in a table, or the length of the side of the triangle calculated (see Figure 5), to yield this result:

FF = FR x cosine (A) = FR x 98′/100′ = FR x 0.98

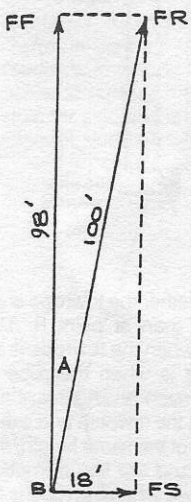


FIG. 5

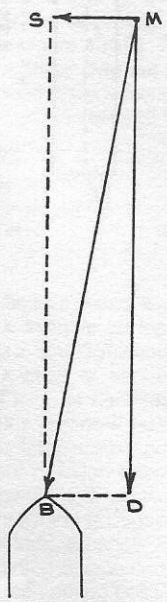


FIG. 6

To illustrate the interpretation of the two results just obtained, let us assume that the mule exerts a pull of 100 pounds on the rope.

FR = 100 lbs.

FS = FR x 0.18 = 100 lbs. x 0.18 = 18 lbs.

FF = FR x 0.98 = 100 lbs. X 0.98 = 98 lbs.

One calculation tells us that a reduction of force of only 2 percent (from 100 lbs. down to 98 lbs.) is the penalty paid by displacing the motive power (mule) off the line of motion of the boat and onto a towpath, the centerline of which is offset 18 feet from the centerline of the boat. The other result tells us that a rather large sideways force (18 lbs.) is unavoidably applied to the boat because the towline force is applied at an angle (A) to the centerline of the boat. The sideways force (FS) would be zero if the angle (A) were zero—that is, if the mule could walk in front of the boat, on the line of travel of the boat.

Having considered the forces involved in moving the boat, let us now examine the forces at work on the mule. As was shown in Figure 3, the mule applies three forces to the boat; the boat, in turn, reacts by applying three forces to the mule:

(1) counter-tension force
(2) toppling force
(3) towpath-tilt force.

In addition, three other forces that affect the mule wil be considered:

(4) immobilizing force
(5) towline-weight force
(6) skidding force.

Each of those forces will now be examined.

Counter-tension force (see Figure 6, MB)

When a mule leans into its harness, the limp towrope snaps taut and the boat begins to move in response to the force applied to the boat by the mule. At the same time, the boat exerts an equally large counter pull upon the mule. The two forces (pulls) are equal in magnitude but oppositely directed.

When the mule pulls on the towrope, the boat is pulled through the water; the pointed bow of the boat merely reduces, but does not entirely eliminate, the resistance to motion associated with pushing aside the water that stands in front of the boat. The drag on the boat, caused by plowing aside the water, produces a counter tension, or drag force, in the rope—the pull exerted by the mule being equal to the drag force generated by movement of the boat through the water.

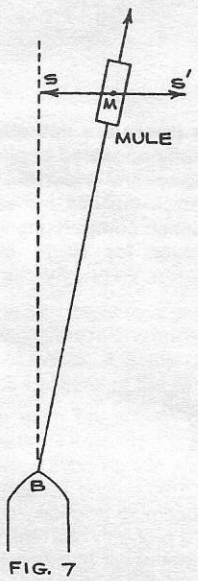


FIG. 7

The effect of that counter-tension force is to cause the mule to push off from its left legs and so to lean the right shoulder into the harness, in that way to exert a force that is in line with (opposed to) the counter tension in the rope associated with the inertia of the boat and the displacement of water by the bow of the boat. The mule quickly aligns himself with that counter tension by "squaring his shoulders" to the line of the rope, a position maintained by turning his body slightly so that he heads in a diagonal direction on the towpath, as indicated in Figure 7, that diagonal heading forming the angle (A) with the line of motion of the boat and the centerline of the towpath.

One of the components of the drag force is the force MS, indicated in Figure 6, and here labeled "toppling force." That toppling force pulls the mule sideways, toward the canal, and tends to topple the mule into the water, as indicated in Figure 8.

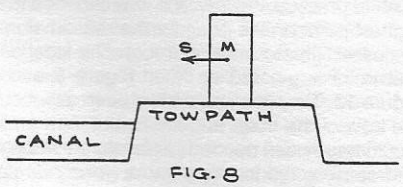


FIG. 8

Toppling force

When the mule applies a sideways force to the boat, the boat rudder is set to apply to the mule an equal but oppositely directed force that cancels the sideward drift of the boat and so keeps it moving parallel to the towpath. That rudder force is transmitted through the towrope to the mule, and acts to pull the mule sideways, toward the canal.

MB = counter-tension (drag force) exerted upon the mule by the boat
MS = sideways component of the drag force that tends to topple the mule from the towpath and into the canal

To counteract that toppling force, the mule changes stride: it leans its right shoulder into the harness and begins to walk diagonally across the towpath (Figure 7) and not on a line parallel to the line of motion of the boat, as had been depicted before (Figure 4). By walking a slightly diagonal path, the mule is able to exert a pull directed along a line that is an extension of the line of the rope; by walking that path, and so directing his pull along the line of the rope, the mule is able to apply a component of force (MS′) that equals and so cancels the force (MS) that tends to topple the mule. A mule walking a diagonal path may lean his right shoulder into the harness, but action of the boat rudder continuously pulls the mule back onto the centerline of the towpath during each stride the mule takes in the diagonal direction. That is, the mule's body leans slightly away from the canal while the mule's hooves tread steadily along the centerline of the towpath.

By thus compensating for the toppling force, the mule is able to distribute the pulling load equally upon all four legs, and not primarily upon the left-side legs. It would not be possible for a mule to walk a line parallel to the line of motion of the boat without leaning away from the canal. If the mule did not lean away from the canal, the uncompensated toppling force would cause the mule to place most of the pulling effort on only two legs, those nearest to the canal. Reflex action immediately compensates for that imbalance. The mule leans his body away from the canal just as we would do if harnessed to a boat.

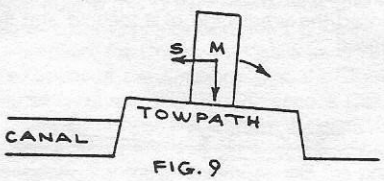


FIG. 9

Towpath-tilt force

The mule would have been assisted, also, if the towpath were inclined slightly, as shown in Figure 9, so that a mule straining to walk a diagonal line would be walking slightly downhill and so secure better purchase for the hooves. Some engineers specified that the towpath be tilted, if only to direct runoff toward a drainage ditch located on the side of the towpath away from the canal. Tilting the towpath would have secured an additional benefit.

If the towpath surface had been tilted slightly, so that it sloped away from the canal, that slope would have forced the mule (and people standing on the towpath) to lean slightly away from the canal. That reflex leaning would subject the mule to the action of the force of gravity, which would tend to topple the mule away from the canal, and so cancel, to some extent, the toppling force (Figure 6, force MS) that tended to topple the mule into the canal.

The center of gravity of the mule (see the plumb line, Figure 9) would still fall within the "base" of the mule—within the rectangle defined by the span of his hind legs and his front legs—so that the mule would always be in a stable posture, though braced to counteract the toppling force. A tilted

(Concluded on Page Six)

MULE POWER FORCE ANALYSIS

(Concluded from Page Five)

towpath would have allowed a mule to walk a diagonal path that would have made it easier for the mule to distribute more of the pulling load onto his front legs, and in that way assist the beast to apply maximum pull, because all four legs would then be equally in contact with the towpath (toepath!) at all times. By walking a diagonal line on a tilted towpath, a mule would be "falling" slightly into the harness at all times, and thus the inert weight of the animal could have been pressed onto the harness to reduce the amount of muscular effort required to pull the boat along.

Speaking of inertia, when a boat at rest was to be started, the mule had to exert maximum effort to set all of that load into motion; after the boat had come up to speed (four miles an hour, say), the mule was able to pull more easily, because then the only work required was that needed to overcome the drag associated with the rudder torque and the parting (displacement) of viscous water by the plowing action of the bow of the boat.

No attempt will be made, here, to calculate the amount of work required to set into motion a canal boat weighing perhaps 30 tons, for that calculation would force us to think about the caloric value of oats, eventually. Practically, when the tow was downbound, the poor mule was often assisted by locktenders who were willing to ignore the regulations and "flash" motionless boats out of the lock by opening the gates before the water in the lock had fallen to the level of the water in the canal below the lock. By riding the surge of water that flooded out of a lock, a boat quickly acquired momentum and so relieved the mule of the most difficult part of his job, which was a tug-of-war between a one-ton mule and a 30-ton boat. The mule exploited the advantage of a toehold and thus prevailed.

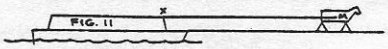
Immobilizing force

Another force that would act on the mule, depending on the inclination of the towrope, is MK in Figure 10.

MB = drag force (counter-tension) exerted by the mule by resistance of water pushed aside by the boat

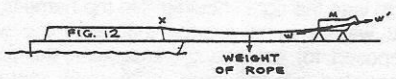
MK = component force exerted on knees of mule

Because the towpath is above the water level in the canal, and because the mule stands upon that elevated plane, the towrope attached to the mule would necessarily be inclined, as shown, and not horizontal. Because the towrope is inclined, there is a component (MK) of the drag force (MB) that acts to pull the body of the mule down closer to the towpath. A heavy stone, slung under the belly of the mule, or a rider astride the mule, would have the same effect—to exert pressure on the mule's knees. The mule would then walk with difficulty—like walking in thick mud that is ankle deep. If that downward force were large enough, the mule would be immobilized—unable to lift his hooves from the towpath.



These mules (there are actually two in the photo, one well concealed behind the other) are illustrating several important principles of mule power force analysis, but seem more interested in human companionship. [Photo by David T. Boyer for Hugh Moore Canal Museum, Easton, Pennsylvania.]

To reduce the magnitude of that downward force, and so relieve the mule of that added burden, it was the practice to attach the towline to the boat at the highest point possible, as shown in Figure 11. That setting brought the towrope closer to the optimum position—horizontal. That consideration is probably one reason why a canal boat towline was never attached to the bow.



Towline-weight force

Another force acting on the mule is MW, Figure 12. The origin of that force is the weight (W) of the rope, which was supported by the two points of attachment, the boat and the mule. The portion of that weight supported by the mule is represented on Figure 12 as the force MW applied to the mule; to counter that rearward force, the mule leaned into the harness and so exerted an equally large force indicated as MW′.

The last item that needs to be addressed is the question of where to attach the towrope to the boat. In practice, the towrope was attached to the highest point on the boat, for the reason already discussed (immobilization force). The location of that point is marked as X on Figure 8 and on Figure 13. The rope could have been attached to the bow of the boat, at point B, but then a mast would have been needed to elevate the fastening and so raise the towrope into a horizontal position. Rather than encumber the design and construction of the boat with an appurtenance that improved performance of mule and boat only slightly, the designers provided for the towrope to be attached to a strong structural element that was already built into the boat—the frame of the fore cabin.

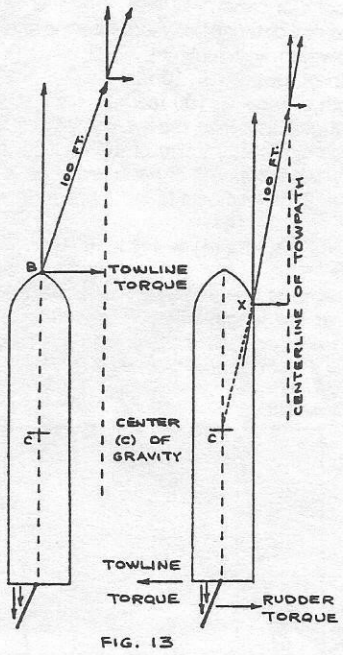
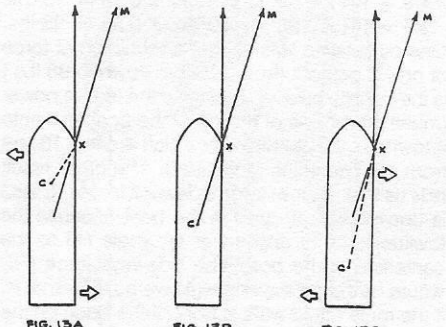


FIG. 13

It makes a difference whether the towrope is attached at point X rather than at point B. The sideways force is smaller when the towrope is attached at point X than it is when the rope is attached at point B. If in each arrangement the mule is on the centerline of the towpath and exerting the same pull on a line of the same length, the angle between the rope and the line of motion parallel to the towpath is less when the rope is attached at point X than when it is attached at point B. Because point X is 7 feet closer to the towpath than point B is, the sideways component of force acting on the boat is less than it is when the rope is attached at B. That is, when the rope is attached at X, the mule is 7 feet closer to the optimum pulling position, which would be directly in front of the boat.



If the rope is attached at X, yet another force (a "skidding force") acts on the boat; to compensate for skidding of the stern (and bow, in the opposite direction), rudder force must be adjusted, and so the load on the mule is changed. The amount of rudder force required to cancel skidding, and so to keep the boat moving parallel to the towpath, depends on where the center of mass of the boat is located—whether forward (Figure 13A), or aft (Figure 13C), or on the line of the rope (Figure 13B). The location of the center of mass

depends on how cargo was distributed when the boat was loaded. The center of mass is the point (C) where all of the weight of the boat can be imagined to be concentrated.

As is shown in Figure 13B, the towrope force acts on line C-X-M and causes the boat to drift toward the towpath—that is, point C (the entire boat) moves on the line C-X-M, the centerline of the boat remaining parallel to the centerline of the towpath all the while. However, if the center of mass is not on the line of the rope, as it is in Figure 13B, then the stern of the boat will skid either toward the towpath, or away from it, because the towrope force is applied to the end of a lever arm (CX).

To visualize how skidding is caused, think of CX as the handle on a pot or skillet, with a pulling string tied to the end of the handle. When the string is pulled, the handle swings on the line of the string; when that happens, the pot must rotate also, just as the boat tends to rotate also until all three points—C, X, and M—are on the same line, as shown in Figure 13AA (or in Figure 13CC). The reader is invited to draw the force diagram required to illustrate the component of force responsible for skidding and, therefore, to estimate the effect of skidding upon the mule.

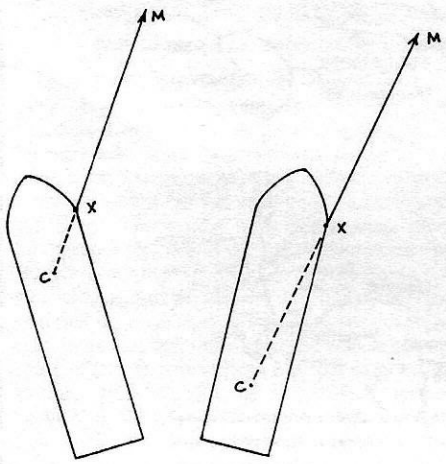


FIG. 13AA FIG. 13CC

We have seen that the towrope applied two forces that caused the boat to rotate about its center of mass: a force exerted sideways upon the front end of the boat, and another force that caused the bow and stern to "skid." A force that causes rotation is called a torque. The tendency to clockwise rotation of the boat, about point C, caused by the sideways force (FS), is counteracted by an equal tendency to counterclockwise rotation of the boat caused by the application of rudder torque. The skidding torque is similarly opposed by application of rudder torque, as required.

For a given towline torque (18 lbs. force, in the example previously used) the effect of that sideways force on the boat is somewhat greater when the rope is attached at point B than when it is attached at point X, because the distance BC is greater than the distance XC—that is, the lever arm or the "cranking arm" is longer in one case, so the application of the 18 lbs. force at the end of that lever transmits a greater rotary moment (force times distance) to the center of mass of the boat. Figure 13 shows the rudder set to apply a counter torque to the stern of the boat, to compensate for the rotation of the stern produced by application of the towline torque to the boat. The rudder torque is applied to the boat at the end of the lever arm RC. The boat pilot holds the tiller (the rudder) in the position shown, and so can feel the amount of rudder force required at any time to keep the boat headed parallel to the towpath. The magnitude of that force depends upon a number of factors that are not the subject of the present inquiry. Note that the rudder had to be kept set in a position such as that shown in Figure 13 even when the boat was gliding parallel to the towpath, because the sideways force (towline torque) was constantly applied to the boat as long as the boat was being pulled—whenever there was tension on the towrope.

The preceding force analysis was not intended to address all of the forces that act on a boat moving through a canal, but only those that affect a mule pulling a boat in a canal. Location of the towpath off the centerline of the boat made a rudder an indispensable part of a canal boat, and also accounts for the unusual point of attachment of towrope to boat. A difference between a barge and a canal boat is the presence of a rudder on every canal boat, a rudder needed because the mule could not walk in front of the boat it was pulling.

PUBLISHER'S COMMENT

Bill Dzombak's Vector-Analysis of the effect of the tow-line pull on the old canal boats is nicely done and explains a great deal about the location of the tow-line anchoring point on the boat. However, it is my guess that our Canal Boat Captains of the Nineteenth Century, unfamiliar with the theory of vector analysis, yet aware of the phenomenon, would look for the "easy way out". What I am suggesting is that these old captains were smart enough not to sit at the stern of their boats constantly pulling sideways on their rudders. Instead they would look for point "X" on their particular boat to attach the towline, where the sideward pull would be fully compensated for, and they could relax at the stern with the rudder parallel to the towpath. Thus the boat could almost steer itself, except in cases where there was a curve to navigate or the boat was cut loose to coast into a lock.

Bill Shank

GRONAUER LOCK UPDATE

In August 1991, we reported on the unearthing of the Wabash and Erie Canal's Gronauer Lock near Fort Wayne, in the course of construction of a highway interchange ("Wabash & Erie Yields Wooden Treasure," by Robert F. and Carolyn Schmidt). Everyone now seems agreed that the lock should be preserved, but disagreement is intense over such questions as where and at whose expense the preservation should be effected. The Indiana Department of Transportation favors removal of the lock to a site accessible to the public but not directly in the path of a public road. The department has offered to fund the removal, to the extent of $100,000, if someone else can be found to take responsibility for the lock thereafter. The Canal Society of Indiana is lobbying vigorously for relocation of the interchange and preservation of the lock in situ. Meanwhile, whatever the outcome, the discovery and the resultant controversy are reported to have produced a healthy awakening of interest among Indianians in their canal heritage, and a healthy increase in membership in the Canal Society of Indiana.

DELAWARE—LEHIGH CANAL CORRIDOR

A Delaware & Lehigh Canal Heritage Corridor Commission (DLCHCC) has been appointed and charged with drawing up a plan for the future management of the area as an educational, economic, and recreational resource. Among the commission members is A.C.S. secretary/treasurer Charles W. Derr.

The commission has already produced a number of attractive publications about the canal corridor. Anyone wishing to be placed on its mailing list is invited to write to 10 E. Church St., Room P-208, Bethlehem, Pennsylvania 18018, or phone 215 861 9345.

BOOK REVIEW

[William H. Shank, ed., *The Canals of New York State* (York, Pa.: American Canal and Transportation Center, 1991).

Reviewed by Jeremy G. Frankel

I'm sure many of you have suffered the same problem, of leafing through all the issues of *American Canals* or thumbing through the four volumes of *The Best from American Canals* to find a particular article, photograph, or map for some research you may be engaged in. That job has now been made a lot easier with the publication of Bill Shank's new book, *The Canals of New York State*.

Included are over 40 articles covering the state that led the way with waterway transportation, including several about what is arguably the most famous (and certainly the most profitable) canal ever built in the United States—the Erie Canal. Other waterways included are: the Oswego, the Champlain, the Chemung, Delaware & Hudson, the Gowanus, the Junction Canal, the Chenango, the Mott-Haven, and the Shinnecock Canal.

As many of these articles have appeared before, any critical comment at this time would be inappropriate. For those unfamiliar with the previous publications (mentioned above) from which some are culled, the choice of articles provides an interesting and contrasting mix of historical accounts, contemporary news items, and modern-day waterway trips and tours. My only quibble concerns the photographs, as reproduction the second time around seems to have made them appear more contrasting. For a student new to waterways, this volume provides a useful and easily readable overview of the most popular canal in America as well as of its lateral connections.

Looking at the map on page 2, one can dream about a second volume covering such waterways as the Black Rock Channel at Buffalo, the Black River Canal near Rome, and the Crooked Lake Canal which, according to an earlier *American Canals* article, is one of the steepest canals in America. And what about the Glens Falls Feeder Canal, without which the Champlain Canal could not function, even today?

As Shank states in his introduction, *The Canals of New York State* is testimony to the enthusiasm, interest, and accuracy of the individuals who have researched and written these articles. As a historian and researcher, I welcome this addition to my library.

The Canals of New York State may be purchased from the American Canal and Transportation Center, 809 Rathton Road, York, PA 17403. The price is $6 plus $1.50 per copy for shipping.

NEW JERSEYANS TOUR IRISH CANALS

by "Captain" Bill McKelvey, Tour Leader

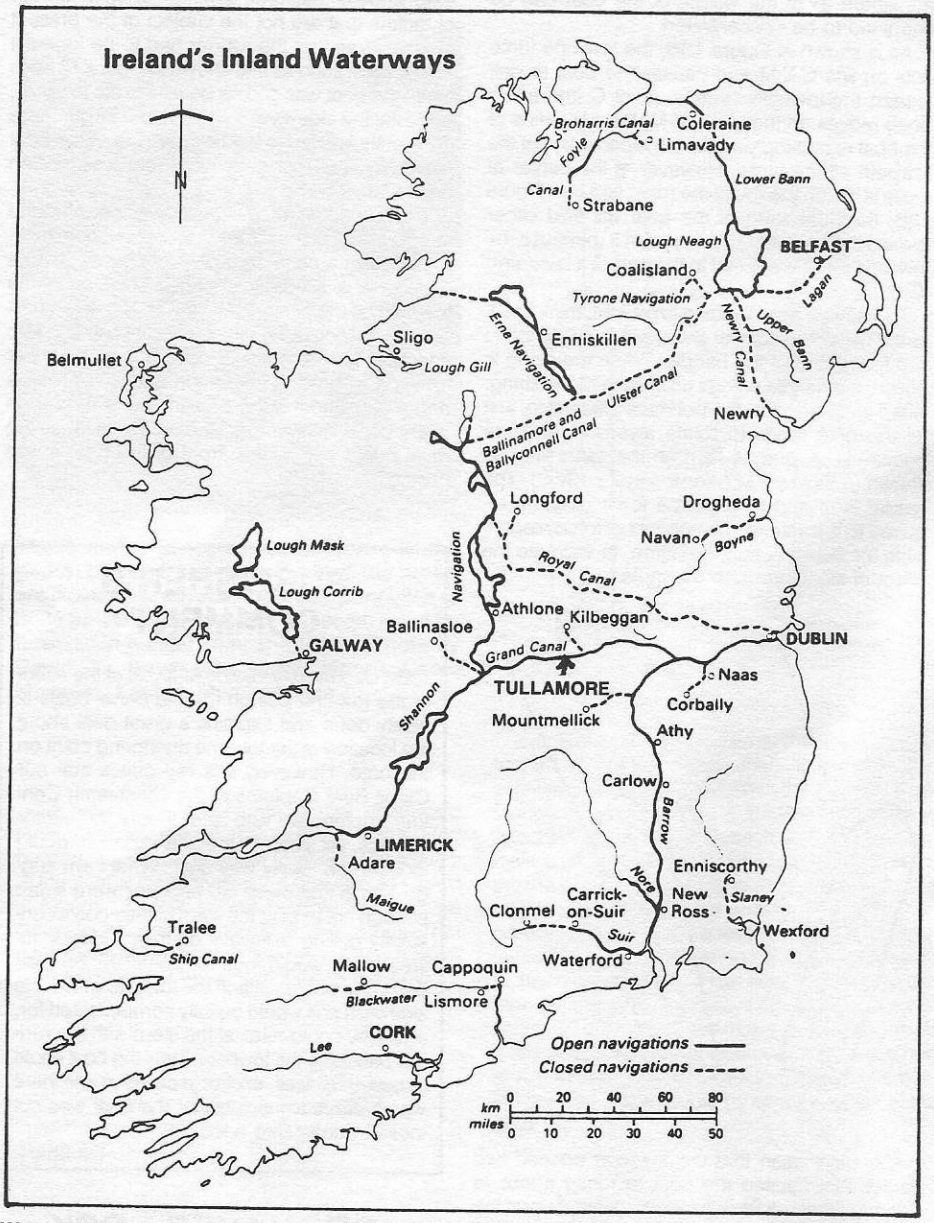
A group of 22 members of the Canal Society of New Jersey arrived in Dublin on 17 May 1991 to begin a two-week study tour concentrating on the Grand Canal. Most of our crew members were experienced, having been on one or more of the five prior trips which the society had organized to the British Isles over the years. We must go over to the "old country" to experience the quaint old canals, as practically none of the original towpath canals in the United States are available for pleasure boating.

From the airport, our coach took us on a sightseeing minitour of Dublin, then on to our first stop—the Guinness Museum and Pub. It provided a fine introduction to the brewing process. We were most intrigued by their Transport Gallery (which included a video on the Guinness links with the Grand Canal) and, last but not least, in sampling a pint or two of their outstanding brew. All had the balance of the day on their own. Some of us took a ride on the Dublin Area Rapid Transit (DART) system and discovered a pleasant fishing village on the north end called Howth. That evening, we were given a lovely reception by the Dublin Branch of the Inland Waterways Association of Ireland (IWAI), along the canal at Portobello. We had gotten our introduction to the famed Irish hospitality—more was to follow.

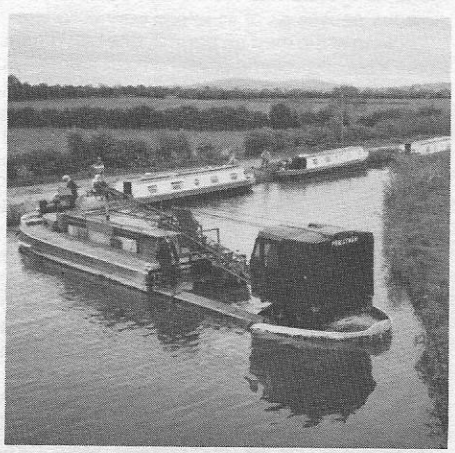
The next morning, Saturday, after seeing that all our people were safely aboard the train for Tullamore, I strolled up to the cab and asked the engineer if I might ride with him. His response: "Why sure, my lad, climb aboard." It was a ride not to be forgotten, for the engineer recited appropriate passages from the works of several Irish poets as we cruised along at 90 miles per hour. One of his favorite passages was, "Be sure, the great God never planned for slumbering slaves a home so grand." He loved his job and his country.

Celtic Canal Cruisers transferred us from the station to their base at Tullamore. Our five boats were ready and we were given a thorough orientation. We were delighted with the roominess and arrangement of the 9-foot-wide boats which we had chartered. Shortly we were on our way east, tying up at Daingean overnight. It was a small town of about 30 buildings, but with 11 pubs.

On Sunday, the 19th, we cruised to Robertstown, through countryside much more rural than we had been used to in the United Kingdom. At this stop, the Kildare Branch of the IWAI presented each of us with a beautiful brass plaque and a map of the Grand Canal system at its peak. It served the ports of Waterford, Limerick, and Dublin, as well as 19 counties. Later that evening, we met with a number of their members at a canalside pub where they arranged to have Patrick J. Kane, a retired canal boatman, on hand for us to chat with. Stores for food supplies and pubs (restaurants) were conveniently located at nearly all of our overnight stops.



We are indebted to Ruth Delany for the above map, which forms the frontispiece for her IRELAND'S INLAND WATERWAYS, published in 1988; an excellent 200-page paperback, covering a 250-year celebration and history of all of Ireland's many canals, past and present. The book was obtained by J. William Shank, the Publisher's son, on a recent visit to Ireland.



Dredge on the Barrow Line canal. (Photo by Robert H. Barth.)

We headed down the Barrow Line canal on Monday morning, passing several old steel boats, once used for freight, tied up at Lowtown, and met the dredge en route to a new job. At first we thought it was sinking, but then discovered it was designed to travel with its forward deck awash. This apparently made it easier to get under bridges. We were impressed with the level of maintenance of the canal prisms—good width and depth throughout. We decided to take a hike up the Milltown Feeder, but discovered to our dismay that we had chosen the wrong bank, as the path became covered with dredged material.

We enjoyed our stops at Rathangan, Monasterevan, and Vicarstown, the latter being our turnaround point. Monasterevan was particularly interesting due to the mainline railroad crossing plus old warehouses, an aqueduct, and a unique lift bridge. There were many photo opportunities! Jim Ridgway of the IWAI Offaly Branch advised us to "travel slowly and stop frequently." We did, and we loved it. Jim was particularly helpful with suggestions, information, and guidance.

Next, we backtracked to Lowtown and headed west on the Grand Canal, stopping for an afternoon in Edenderry Harbour. I decided it would be better sleeping outside the center of town, so my boat cruised east and tied up at the Board na Mona (Irish Peat Board) narrow gauge railway bridge. This allowed us an opportunity to explore the harvesting of turf (also called peat) which is burned as fuel in power plants, and to see the machines, equipment, and railway operations.

New Jerseyans negotiating unidentified lock. (Photo by Robert H. Barth.)

On our return to Tullamore, we tied up in the old harbour where the canal engineering depot is located. An inner basin graveyard contained numerous old steel commercial and maintenance vessels which were mostly sunk, perhaps to retard further deterioration. We were permitted to inspect the shop where new lock gates were being fabricated. The material used was Ekke wood from Burma—very expensive but extremely dense and long lasting in canal service. The quality of repair and maintenance work which we observed in process there and at several locations was, in our opinion, very high. Proof of this was that all locks and bridges were found to be in excellent working order. In contrast to United Kingdom canals, nearly every lock we used was readied for us by a locktender, although we usually helped.

Through the fine hospitality of the IWAI Offaly Branch, a day-long, most interesting itinerary was set up for us on Saturday, the 25th. We boarded a bus and first toured Clara Bog, preserved in its natural state, then on to Locke's Distillery Museum, where we had a three-course lunch. In the afternoon, we toured Kilbeggan Harbour at the end of the disused Kilbeggan Branch. It was good to see the ambitious restoration in process and to learn of their plans to reopen the branch to navigation. It made us envious. Lastly, we visited the Irish Mist Offaly Heritage Center, and were given samples and souvenirs. We were honored to have Paddy Egan as our guide for the most pleasant day.

The next day we resumed our westward trek, passing castles, mills, pretty farms, and more active peat works, which were part of the immense Bog of Allen. One farm had a fording location where the cattle crossed with the canal water up to their necks. At another location, boys were jumping off a railroad bridge into the canal. Another thing which we found quite different from our experiences in the United Kingdom was the near absence of other boaters on the canal. We usually had the canal to ourselves, with no traffic jams at locks. The largest number of boats we saw at one place was at Shannon Harbour. It was a most interesting collection, with many former cargo boats which had been converted to pleasure use. It was sad to see the old canal hotel there in such a deteriorated state. We hope it will be restored.

For the next several days, we adopted a different style of cruising for the placid Shannon River. We saw all kinds of pleasure boats and frequently passed them. Many were hired by vacationers from other countries, usually German. First we headed north and tied up in a channel between an island and the riverbank, just below the town of Shannon Bridge. This town is blessed with the most hospitable, friendly people, and more of them than at any of our other stops. One shopkeeper suggested that the power plant might give us a tour. The next morning, we marched up to the gate in a group to ask if they would let us in. Two employees were dispatched to guide us throughout the entire peat-burning plant. They gave us coffee and cookies, and passed out literature and art prints as we departed. We would like especially to express our thanks to Derry Killeen and Patrick Dooley.

We Take a Train Ride

Later that day, we took a special tour train ride (on the Clonmacnois and West Offaly Railway) through the turf-gathering operation for the Shannon Bridge power station. We all came away from this experience with a thorough knowledge of the process, from the creation of a bog to the disposal of the ash residue. In the afternoon, we continued our cruise up the Shannon to Clonmacnois, the remains of a 1,000-year-old monastery in a most scenic setting. We tied up there overnight.

The next day we continued north to Athlone, a fair-sized city, which we thoroughly explored, and then headed back down the Shannon, tying up again at Clonmacnois. On the following day, we continued south to Banagher, where we tied up at a convenient boat base. So far, the weather had been absolutely delightful. On several days, there was not a cloud in the sky! That evening, we went to a famous, quaint, old pub called "Dirty Nelly's," where we were entertained with traditional Irish music by local performers.

Our most southerly excursion on the Shannon was to Meelick Lock on the next day. None of us had ever seen wood mitre gates this large before, and these were bowed as well as hand operated. On our way back, opposite the entrance channel to the Grand Canal on the east side of the Shannon, we could see the first lock of the Ballinasloe Line, the derelict westward extension of the Grand. Not to worry, this canal is also slated for restoration. And that is not all—it is estimated that the Royal Canal restoration will be completed in five years; the Royal will be linked to the Grand; and the north and south of Ireland will be linked as well. If only we could get such activity going in the United States.

Debris in the Canal

Alas, our tour was coming to an end, and we all had to head back to Tullamore. The water of the Shannon had been clean and clear of debris—not so the canal. Tough plastic bags, sheeting, and baling twine (mostly from farms) seem to be attracted to the canal water. Some of this seems to float half way between the surface and the bottom, just waiting to snag our spinning propellers. We were back to our periodic routine of reaching down into the weed hatch to remove the entangled mass, sometimes more than twice daily. This material simply does not biodegrade! While I am on the subject of needed improvements, there are two more which can be added; better facilities for getting on and off boats below most locks, and posting of identification numbers at each lock and bridge.

On a positive note, we were very pleased with the guides to both the Grand and Royal canals, as well as the Inland Waterways News, all published by the IWAI. Information on their availability can be obtained from Ruth (Delaney) Heard, Stone Cottage, Claremont Road, Killiney, Co. Dublin, Ireland. In addition, a series of Canal Bank Walks guides is available from the County Kildare Sports Advisory Committee, and several books have been published in the past.

By late Friday afternoon, May 31st, all of our boats were back at the Tullamore base. The last item on our agenda was our traditional Canal Society of New Jersey smorgasbord. This one, beside Lock #24, was one of our best ever. Joining us were Paddy Egan, Mike and Heather

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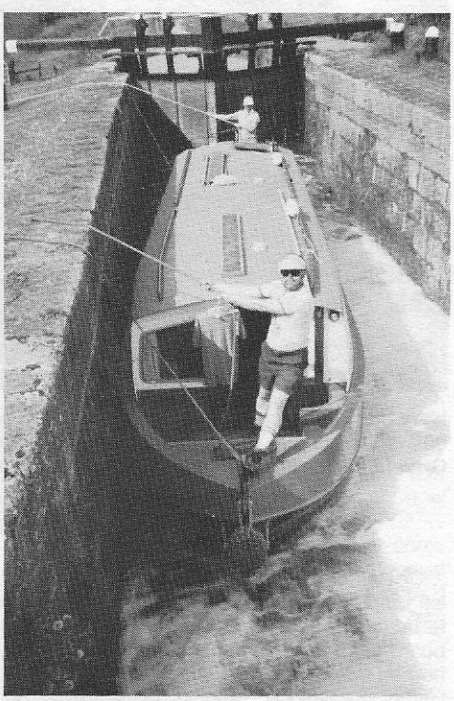


The challenge of upward mobility. (Photo by Dennis Forbush.)

IRISH CANAL TOUR

A narrow-gauge peat-hauling train "navigates" through Kylemore Lock and bridge in the prism of the abandoned Ballinasloe-Shannon Harbor Link of the Grand Canal. Note the remains of the wood mitre gates.

(Concluded from Page Nine)

Thomas (proprietors of Celtic Canal Cruisers), and the locktender. Just as we were finishing, a group of several canoes came through the canal on a fund-raising marathon.

On Saturday morning, we were driven back down to the railroad station for our return trip to Dublin. That afternoon, by prior arrangement, Ruth Heard picked up three of us at the hotel and gave us a delightful tour of the many points of interest along both the Grand and Royal canals in and around Dublin. Who better to lead us than the author of several books on Irish waterways and the editor of the IWAI News? It was most enjoyable.

We were most impressed with the excellent condition of the canals and the work that had been completed toward restoration of navigation. We saw where bridges had been provided over the canal for a new motorway to maintain the canal right of way. This was certainly a change from what we see in the United States, where canals have been covered over for new highway routes.

While waiting for our plane at the airport, we saw the first precipitation since we got on our boats 15 days before. I guess the farmers were happy to see us go, for they really needed the rain. As if having a great time was not enough, participants were delighted with the sizable rebate checks they received after all accounts were settled. The entire trip, including air fare, boat rental, bus trips, two nights in a hotel, and some extras, was executed for just a shade over $1,200 each.

We look forward to the future when the Royal Canal is reopened for through navigation. We will return to do it!

SUPPLEMENTARY NOTE: Peg and Zip Zimmerman stayed on to tour Ireland by rental car for nine days after the conclusion of the tour. Among other things, they discovered a unique bed-and-breakfast establishment at Mullingar on the Royal Canal. Lock 29 is soon to be restored, and the lockhouse is being converted to a bed and breakfast. There are many lock sites where you can tour the lockhouse, but this is surely one of the few where you can sleep in it. For information and reservations: Mrs. Lorraine Hornidge, Lockhouse #29, Mullingar, Co. Westmeath, Ireland (phone 044-73157).

Here the rail line passes through the arch of an old canal bridge. The Irish Peat Board operates 800 miles of such railway to transport the fuel to power plants. Similar lines cross over the Grand Canal main route at several points on moveable bridges.

WEDDING OF THE WATERS REENACTED

On the 26th of October, 1825, the Seneca Chief left Buffalo for New York City on a trip that was to be the official opening of the Erie Canal. On board were two kegs of Lake Erie water, to be poured out into the Atlantic Ocean at New York Harbor in a symbolic "wedding of the waters" being joined together by the new canal.

A few of the details were different, but the essence of the ceremony was reproduced in 1991. The tug Lockport started from Tonawanda on the 12th of October with its shipment of Great Lakes water. At the same time, New York voters were preparing to go to the polls to vote on a proposal to reenact another feature of the original Erie Canal—canal tolls. (The proposal was passed on November 5th, 1991.)

BOOK REVIEW

Harry L. Rinker, *The Schuylkill Navigation: A Photographic History* (Berkeley Heights, N.J.: Canal Captain's Press, 1991).

Reviewed by Albright G. Zimmerman

This reviewer joins the myriad of canal buffs who always view any new offering dealing with canal history and lore with great anticipation. The recent publication of Harry L. Rinker and Bill McKelvey's Canal Captain's Press easily satisfies that anticipation. It is a well-conceived and well-implemented, much-needed pictorial history of the Schuylkill Navigation. There is a wealth of well-selected pictures, and on the whole the texts under the illustrations are adequate. The historical sketch, while brief, is comprehensive and essentially accurate. The inclusion of "Folklore of the Schuylkill Canal," by John Bowman, is a stroke of genius. The bibliography is both extensive and exhaustive. This book should find a place in the library of every serious canal scholar and of every canal buff.

Having thus bestowed lavish and well-deserved praise, I can now take this opportunity to make some general comments about what might be hoped for in canal literature, and at the same time to satisfy one of the seeming obligations of a reviewer, nitpicking at the work being evaluated. First, let's consider what this book is and what it isn't. While it more than adequately fills the need for a pictorial recording of the past of one of our canals, it does not answer another real need, that is, for detailed, researched histories, both popular and scholarly, of our canals, something that begs ever-new commitments, and something that has been better achieved on other canals and in states other than Pennsylvania and New Jersey. It should also be remembered that there are a number of possible thrusts for such works, such as emphases in areas like political, economic, technological, and social history.

The producers of works such as this should subject their data—in this case, their pictures—to a much more rigorous critical evaluation. Rinker, in his acknowledgments, bruised some egos in his critique of the documentation of photography in another well-conceived and important work, yet I must make some suggestions for enhancing the value of the work under review in this same respect. I hope that these will be taken as constructive criticism by Rinker and, further, as a set of goals to be kept in mind by others embarking on similar works. From my own experience, I know what I ask is difficult to implement, in many cases impossible, but every author-editor-compiler and, yes, collector, should attempt to date and otherwise document every picture. Dating does not necessarily have to be chronological, but could be achieved, at least to a degree, by internal critiques of the material in the photo. Rinker drops the first shoe in the process, as in the illustration on page 14, for example, where he notes, without any attempt at dating, that buildings were not yet constructed, and in other cases where he notes that certain structures no longer existed, but fails to make real use of that information. Stereoscopic views, identified by their producers, should be capable of being tagged with greater chronological accuracy.

Greater consistency in the flagging of the pictures would be appreciated. Either Rinker or his editors ignored an occasional legend, for example on pages 12 and 38, and generally there is a lack of consistency. On some pages, each pic-

(Concluded on Page Eleven)

UPPER FOX RIVER AND PORTAGE CANAL HISTORIC SURVEY RESULTS

by Frederica Kleist

On Monday, September 30th, 1991, about 75 people gathered at the community room of the Montello Municipal Building to hear the results of the historic building survey along the upper Fox River system from Portage to Oshkosh. Speaking on behalf of the State Historical Society was Joseph DeRose, historian, while Bill Meindl, preservation planner, spoke for the East Central Wisconsin Regional Planning Commission.

The participants heard the results of the comprehensive year-long survey that identified 1,500 historic structures. Included were houses, stores, factories, resorts, bridges, and the upper Fox lock-dam-canal system. Additional independent surveys will be done in Oshkosh, Berlin, and Portage.

In the slide program, a group from Portage was made aware of the historic downtown of the city. There were several views of the Portage Canal, stressing the importance of this site, which connects the Fox and Wisconsin waterways. A number of Portage residents were involved in the survey.

The Upper Fox River Historical Survey began in 1990, focusing on historic buildings and other structures within a corridor extending 100 yards on both sides of the Fox River and certain adjoining lakes. Areas covered were the Portage Canal, rural properties from Columbia to Winnegago counties, and all or parts of Endeavor, Packwaukee, Montello, Marquette, Princeton, Eureka, Omro, and Butte de Morts.

Results of the survey include:

Identifying 1,500 structures in the survey corridor which are at least 50 years old, and evaluating their history and architecture;

Selecting 275 of these as potentially eligible for listing in the National Register of Historic Places;

Outlining three potential community historic districts—the Main Street Historic District of Omro and separate business and residential districts on and around Water Street in Princeton; and

Identifying 15 lock, dam, and canal properties from Portage to Eureka as potentially eligible for the National Register.

Portage Canal was placed on the National Register August 26, 1977. Other sites eligible are the locks at Montello and Princeton and the locktender's house at Berlin.

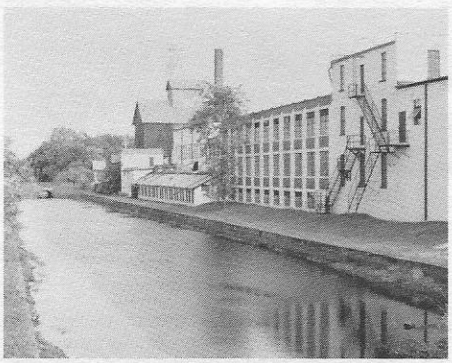
This survey produced a comprehensive 35-page historical summary of the Upper Fox River and Portage Canal lock system. The lock system dates back to 1851, and was closed just 100 years later in 1951.

Funding for the survey came from the East Central Wisconsin Regional Planning Commission and the National Park Service, through a grant administered by the State Historical Society. The survey is intended for use by individuals, groups, and communities to help identify, protect, and revitalize their historic buildings, sites, and commercial areas. It can be used to enhance and promote heritage tourism in communities and rural areas along the river and canal.

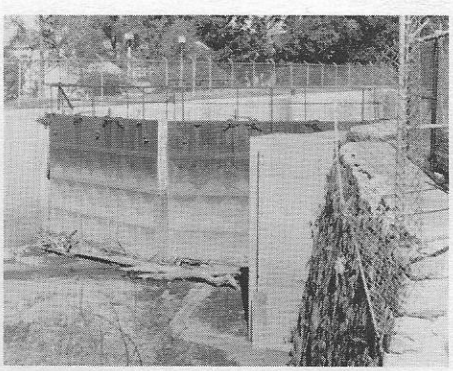
Persons and organizations interested in the promotion and support of local historic preservation projects can obtain information on placing sites on the National Register from the Wisconsin State Historical Society, 608 264 6500.

(Note: All photos are by Bill Meindl for the East Central Wisconsin Regional Planning Commission.)

The Eureka Lock and locktender's house near Oshkosh are the only lock facilities still in use on the Upper Fox River. The lock here was closed in 1951 but reopened in 1958, and is operated seasonally by the Berlin Boat Club. The lock and house are listed in the National Register of Historic Places.



The Portage Canal was built to connect the Fox River with the Wisconsin River, thus providing through water transportation between the Mississippi River and Lake Michigan. Construction began in 1835.



The Portage Lock on the Portage Canal is a concrete lock built in 1927-28 by the U.S. Army Corps of Engineers. Abandoned 1951.

BOOK REVIEW

(Concluded from Page Ten)

ture has a legend under it, while on others the legends are grouped at the foot of the page with "center" and "bottom" identifications, and on still other pages (page 15, for example) only a general statement is found that doesn't necessarily give reality to the photos.

Ed Kutch's maps, even though all except the one on the Union Canal lack a scale of miles, are most effective. If some inconspicuous way could have been found to show existing highway and railroad intersections, possibly with light, dotted lines, their usefulness, particularly for the neophyte embarking on canal exploration, would be greatly enhanced.

The volume might better have led off with the earliest representations of the canal, the concluding Staffordshire illustrations, presumably adapted from Thomas Birch's 1821 painting but with romanticized additions. The original Birch painting might well also have been included, or, better yet, the possibly earliest pictorial representation of the Schuylkill Navigation, an 1824 sketch of the dam at Fairmount showing the first locks on the Schuylkill Canal, found in the 1832 American edition of the *Edinburgh Encyclopedia* and reproduced in the Winter 1985 issue of *Canal Currents.*

Despite the foregoing criticism, which come partly from my prejudices as a professional historian, I shall treasure my copy of the book. I recommend it to all members of the wide fraternity of canal buffs.

The Schuylkill Navigation can be purchased from Canal Captain's Press, 103 Dogwood Lane, Berkeley Heights, N.J. 07922, for $16 plus $2 postage and handling charge.

ROSCOE VILLAGE CALENDAR

This placid scene (in four colors) of the horse-drawn canal boat at Roscoe Village, Ohio, forms an important part of the beautiful 1992 Calendar just released by the Roscoe Village Foundation. Roscoe Village is a completely restored canal town which today looks as it did in 1830 when it became an important port on the Ohio and Erie Canal. The twelve-page, illustrated calendar is available for $5.95, plus shipping and tax, by writing Jerry Musich, Executive Director, The Roscoe Village Foundation, 381 Hill Street, Coshocton, Ohio 43812, or by phoning (614) 622-9310.

TRIALS AND TRIBULATIONS

[This is another in our series of reports on legal cases involving canals, contributed by A.C.S. Vice President McKelvey. This one was heard in the U.S. Circuit Court for the Eastern District of Pennsylvania, 12 November 1842.]

McLELLAND v. the ROBERT MORRIS

The Robert Morris is a large canal boat, decked and rigged as a schooner, employed in carrying lime, &c., from Norristown, on the Schuylkill Canal, down the rivers Schuylkill and Delaware, to Salem, New Jersey, and occasionally through the Chesapeake and Delaware Canal into Maryland, returning with wood or such other cargo as could be procured. In February and March, 1842, she was repaired at the shipyard of the libellant [McLelland], who retained possession of her until she was taken from his custody by the sheriff of the city and county of Philadelphia, under a replevin issued from the state courts. The libellant then filed a libel in the admiralty, and the vessel was attached for the amount of his demand. The claimant moved to have the attachment quashed, for want of jurisdiction in the court, (1) Because neither the vessel nor the contract was of a maritime character, (2) Because by the replevin the state courts had possession of the subject-matter, and therefore exclusive jurisdiction.

[The court ruled that] The repair of a vessel used to navigate tidewater, although used partly on inland navigation, is a maritime contract, and the mechanics and material men may proceed in the courts of the state or of the United States, and they may take a reasonable time to commence their proceedings. And the jurisdiction of the admiralty court cannot be ousted by any proceedings in the state courts by the owners or agents of the vessel.

ERIE CANAL TOLL BILL OKAYED

(The Associated Press)

A new constitutional amendment permitting tolls on the state Barge Canal should promote tourism and boost the economy along the 524-mile waterway, supporters said yesterday.

"We're taking an enormous resource that New York state has and doing something terrific with it," said state Sen. John Sheffer, an Erie County Republican who sponsored the amendment.

The amendment, approved by voters Tuesday, also allows the state to lease its land along the canals for commercial development. The tolls will finance canal maintenance.

The hope is that the flocks of pleasure boaters who navigate the Erie Canal and other canals in the system will spend more time and money in local towns.

By previous action of the legislature, over 100 years ago; the canals of New York State had been made toll-free, due to railroad competition.

(This item from the Nov. 7, 1991 Gannett Suburban Newspaper was sent us by Mary Ann Moore, Somers, N.Y.)

"ELEVATOR-SHAFT" LOCKS ADDENDUM

In our issues of February and May of 1990, there was some discussion of tall, narrow locks under this heading. I had discovered the Walter F. George Lock on the Chattahoochee River, with a width of 82 feet and a lift of 88 feet, and challenged readers to identify other locks which similarly resembled elevator shafts. Several people responded to this challenge, but all of their offerings were either defunct (e.g., Lock 28 on the Ohio and Erie Canal) or foreign (e.g., Summerton Lock on the Oxford Canal). It appeared that no one knew of any working locks in the United States that fit this description except the one on the Chattahoochee.

It is with some mortification that I now report the finding of a second member of this category. The mortification is due to the fact that I live on the Tennessee River, and ought to be somewhat familiar with the characteristics of its locks. Nevertheless, on a recent cruise from my home to Knoxville, I passed through the Ft. Loudon Lock, not for the first time, and realized that it is 60 feet wide and has a lift of 72 feet. My only comfort is that nobody else pointed it out first.

—D.F.R.

CANAL MUSEUM RAIDED

Seven scale models of Chesapeake Bay and Chesapeake and Delaware Canal boats were stolen from the Corps of Engineers museum at the Chesapeake and Delaware Canal. The theft, which occurred August 20th, appeared to have been effected by skilled burglars who knew exactly what they were after. One of the models taken was of the Lord Baltimore, a packet boat pictured on page 189 of A.C.S. vice president William J. McKelvey's *Champlain to Chesapeake.*

The models, ranging in size from 18 to 24 inches, were the work of the late Harold Matson, of Wilmington, Delaware. They were on loan to the museum.

BOOK REVIEW

National Park Service, *Chesapeake and Ohio Canal* (Washington, D.C.: U.S. Government Printing Office, 1991).

Reviewed by William Dzombak

The National Park Service has just issued the official guidebook for the Chesapeake and Ohio Canal. The 6 x 8 inch, 112-page paperback book is full of excellent drawings and photographs, many in color, that illustrate the construction and operational history of this important monument to America's canal era. Colored maps guide visitors to all of the sites of interest; accurate, well-written text sketches the history of the 184-mile linear park. Information is presented regarding all of the recreational and cultural activities associated with the park—everything from canal boat rides to canal day festivals. This useful pamphlet, beautifully done, will be much appreciated by park visitors and by armchair travelers studying the canal. The books cost $4.95, and may be purchased at the park or from the publisher, Washington, D.C. 20402 (stock number 024-005-01076-9).