

# The Indiana Historian

## SPECIFICATION

FOR

## AQUEDUCT MASONRY ON THE WHITE-WATER CANAL.

The face stone will consist of regular courses at least 5 inches thick and of uniform thickness as nearly as may be practicable, throughout their whole length. The stone designed for the outside corners of the abutments and as far as a point 2 feet under the side of the trunk and also for the upper and lower ends of piers to the same point will be selected of the largest and most substantial stone that the quarries will furnish, and will be cut on their beds as well as is required for cut stone locks—the face being left rough as they come from the quarry. The inside corners of the abutments, from the end of the wooden trunk around to their connection with the slope of the canal bank, and from a point 1 foot below bottom of canal to the top of the wall, will be cut perfectly, both beds and face, so as to correspond with the masonry of cut stone locks. The remainder of the abutments and piers, and also the wing walls, will be formed of coursed rubble masonry, the beds of the stone will be well hammer dressed so as to give them a fair bearing. The end joints of the face stone will be dressed for 9 inches back from the face. The stretchers will be from 2½ to 5 feet long, and not less than 15 inches wide throughout their whole length. Headers not less than 4 feet long and 18 inches wide throughout their whole length will be placed in each course not more than 6 feet apart in the clear, the headers in every course being placed over the middle of the space between headers in the course next beneath.

The backing will be prepared of similar stone and laid in the same manner as is required in the specification for the backing of cut stone locks. The face stone will be laid in mortar and the backing perfectly grouted as specified for lock masonry. The wings and parapets will be furnished with steps and coping 2½ feet wide, as much as 6 inches thick, and in pieces at least 4 feet long, dressed and put on in a neat and workmanlike manner.

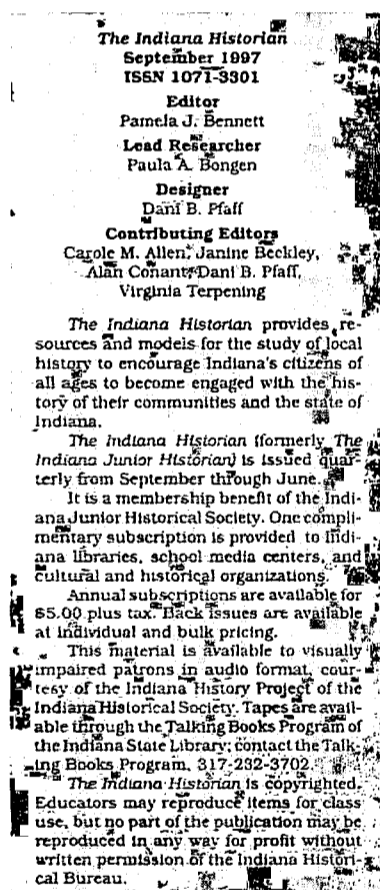
J. L. WILLIAMS, *Prin. Eng.*

*Connersville, July 24, 1838.*

## *Canal Construction in Indiana*

# Focus

Cover Illustration: Specification for Aqueduct Masonry on the White-Water Canal is typical of many requirements that contractors on canals had to fulfill. The broadside is in the collection of the Indiana State Library, Indiana Division.



The June 1997 issue of *The Indiana Historian—Canal Mania in Indiana*—focused on the economic effects of canals and what it was like to travel on a canal. This issue focuses on the people and processes which enabled canals to be constructed.

On page 3, there is an overview of the broader context for canal building.

The issue then proceeds to introduce steps in the construction process. Each part uses words and documents generated by participants in those activities in Indiana.

Surveying, on pages 4-5, is represented by John Peter Paul, a surveyor on the Wabash and Erie Canal.

The role of the engineer, on pages 6-7, is demonstrated by Myron S. Webb, an assistant engineer on the Whitewater Canal.

To carry out engineers' plans, contractors were hired. Contractors in turn hired the many labor-

ers who performed the work. On pages 8-9, primary sources are used to indicate the complex elements of this process.

The reminiscence of John T. Campbell on page 10 provides some insight into the working conditions for common laborers.

On pages 11-13, elements of the actual construction of canals are defined and illustrated. The Whitewater Canal is the example for this discussion. Included are definitions from an 1840 book by H. S. Tanner.

On page 14, "Behind the scenes" considers the sources available for this issue and reemphasizes the need for a comprehensive study of canals in Indiana.

"Selected resources" on page 15 provides the usual bibliography and other sources for readers, and some special thank-yous.

The issue closes with a salute to the North Bend tunnel of the Cincinnati and Whitewater Canal.

## You be the historian

- Canals were public works, generally supported by governments. What public works have been built in your local area? Who paid for them? When were they constructed? Are new public works being constructed?
- Many of the jobs covered in this issue are reflected in today's workforce. After reading through the issue, determine which jobs still exist and how they have changed. For example,
  - ask someone at the county or city surveyor's office to explain the work surveyors do;
  - ask a civil engineer to explain how engineering has changed—and is the same;
  - Ask a local contractor about the process of bidding on government construction today; compare the information about nineteenth-century Indiana bidding in this issue.
- How have the tools of construction changed? Have some remained basically the same?
- Diaries, letters, and reminiscences have been an important source for historians in learning about how people lived in the past.
  - Try to locate such items in your area and investigate how people lived at various times. Be sure to look in published county histories and newspapers. Do not forget that people in the community may be able to provide valuable sources.
  - Write a description of your daily life for future historians.

# "sparking change"

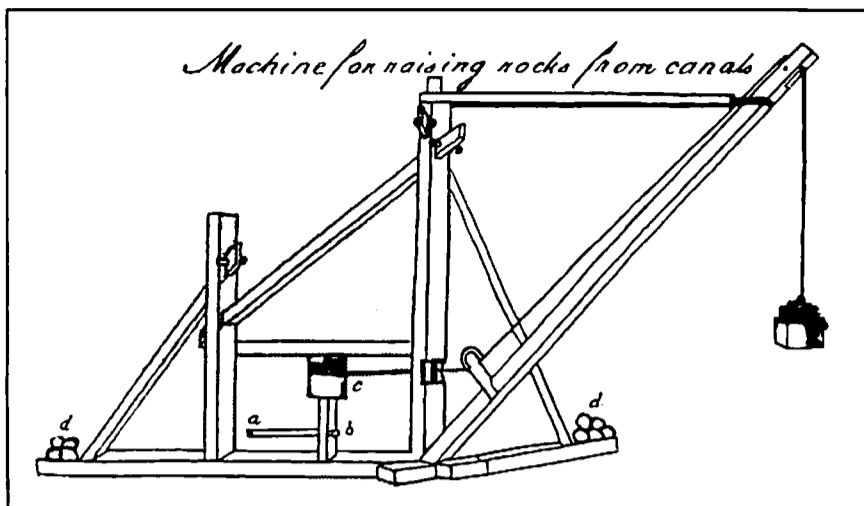
Historian Ronald E. Shaw calls "American canals . . . audacious achievements of engineering and construction, often in nearly impossible terrain" (ix). He goes on to assert that "it was in Indiana that the new canal technology was applied most dramatically to frontier conditions" (134). The Wabash and Erie Canal—468 miles long—was the longest of the Canal Era; the Whitewater Canal was built in a steep and narrow valley (see p. 11 of this issue).

Shaw and historian Peter Way both provide much evidence for the importance of the Canal Era in causing change in engineering, technology, business, and labor in the U.S.

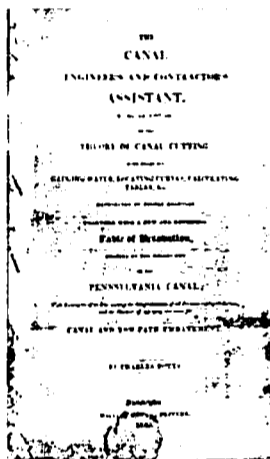
According to Shaw "The canal engineers were the first professional engineers in America" (161). New York's Erie Canal was the major training ground. Engineers learned by working on canals and moved west as canal building expanded into Pennsylvania, Ohio, Indiana, and Illinois (Shaw, 162-64). As the canal era progressed, instructional books on engineering and canals were published.

Canal technology had been most highly developed in England and Europe, but American canals were longer and often crossed terrain—including mountains—that required inventiveness. Such devices as stump pullers, tree fellers, and special ploughs helped to ease the construction work. Important and lasting advances in construction and engineering also were made—such as the perfection of a widely used underwater cement (Shaw, 162).

Contracting with independent builders as a means of helping to finance these large new public



As part of his published article, Increase Allen Lapham supplied this diagram of a "Machine for raising rocks from canals." He described how it worked: "The horse is hitched to the lever at a. the capstan passes through the drum c. which is held by a latch (omitted in the figure) so that the bar can be let down without turning the capstan. dd piles of stone to prevent the machine from overturning." "Map and Geological Profile of the Louisville and Portland Canal," *The American Journal of Science and Arts*, 14: 1 (1828). Increase was seventeen at this time. He worked as a rodman and draftsman on the Louisville canal. His father, Seneca, and brother, Darius, were canal contractors and engineers. Thomas and Conner, *Journals*, 7, *passim*.



Charles Potts. *The Canal Engineer's and Contractor's Assistant, being an Epitome of the Theory of Canal Cutting; with Rules for gauging Water, locating Curves, calculating Tables, &c., illustrated by proper Examples. Together with a new and extensive Table of Excavation, adapted to the Dimensions of the Pennsylvania Canal; with Examples of its Use, suiting the Comprehension of all Persons employed thereon, and the Manner of applying the same for Canal and Tow-Path Embankment.* Philadelphia, 1829.

works became the widespread standard for canals and for later public works.

Labor practices also changed with the influx of immigrant labor to work on the canals. Way documents the formation of a large class of unskilled, common laborers whose lives were at the mercy of contractors for canals and later for railroads.

Way emphasizes the role of canal construction in America's transformation to a modern industrial state: "canals were . . . a temporary stage in the technology of transportation and eventually yielded to railroads" but "they played [a key role] in sparking change" (4).

Sources: Shaw, *Canals*, 160-75; Way, 4-13.

# Surveyors lead the way

Surveying possible routes for a canal was often the first step in deciding whether a canal could be built. Some surveys never resulted in canals, generally because of a lack of funding. The map on page 3 of the June issue of *The Indiana Historian* provides some examples of proposed canals.

Before any construction could begin, however, the route for a canal had to be precisely determined by surveying. Indiana's canals followed the course of rivers, which provided the needed source of water. Survey teams lived in tents, moving their camps as they methodically made their way down the river. Conditions for canal survey work in the early 1800s could be primitive at best. Much of Indiana was wilderness.

The diary of John Peter Paul excerpted here documents his work surveying for Indiana's Wabash and Erie Canal in 1827. His experience is probably typical of the men who helped to make canals a reality.

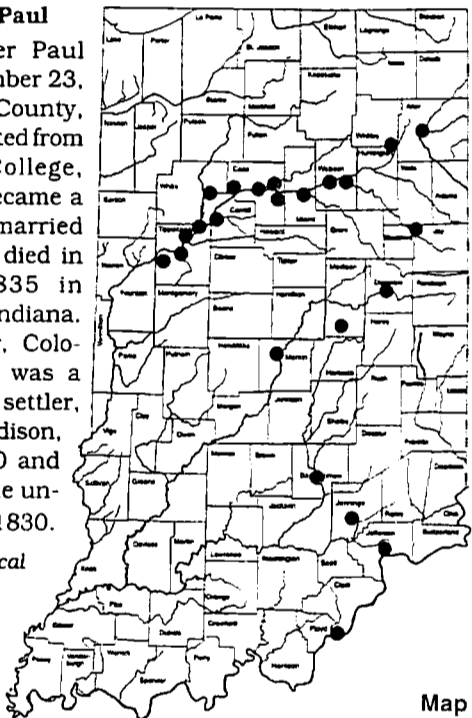
## John Peter Paul

John Peter Paul was born December 23, 1800 in Greene County, Ohio. He graduated from Washington College, Virginia, and became a surveyor. He married Eliza Meek. He died in September 1835 in Clark County, Indiana.

His father, Colonel John Paul, was a prominent early settler, who founded Madison, Indiana in 1810 and made it his home until his death in 1830.

Source: *Biographical and Historical Souvenir for the counties of Clark, Crawford, Harrison, Floyd, Jefferson,*

*Jennings, Scott and Washington, Indiana* (Chicago: John M. Gresham & Company, 1889), 203-6.



Map

This map shows John Peter Paul's travels in Indiana recorded in his diary, May 31-October 22, 1827. He went from and back to Fort Wayne on both routes during this time.

## The surveying process

Pre-1855 surveying techniques are fairly similar to modern practices. Modern instruments are far more precise. The

object is the same—to determine by measurement the boundaries of a particular piece of land or the course of a transportation route.

Early surveyors' instruments included four basic pieces as indicated in the drawings.

The surveyor's compass (1) was used to tell direction and locate a straight line between two points. The compass was mounted on a tripod (2) to steady it. Levels (1a) on the compass assured it was level on the tripod.

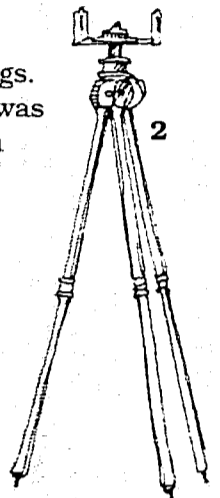
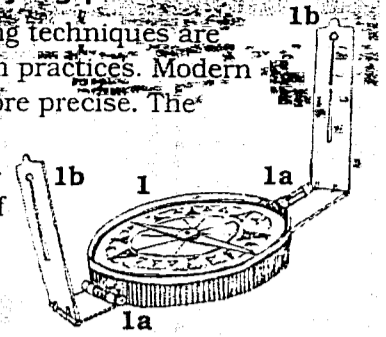
The surveyor's assistant, called a rodman or poleman, used a pole (3) about ten feet in length, held upright at a distant point from the surveyor and his compass. The surveyor then looked through the sights (1b) of the compass to the tip of the pole to establish a straight line.

A Gunter's chain (4), named after its inventor, English mathematician Edmund Gunter, was used to measure distances. The chain was made up of 100 iron or steel links. When uneven ground prevented accurate measurement, the surveyor used geometry to correct his measurements.

### Common measures used by surveyors

- 1 link = 7.92 inches
- 100 links = 1 chain
- 1 chain = 66 feet
- 1 rod = 16.5 feet
- 80 chains = 1 mile

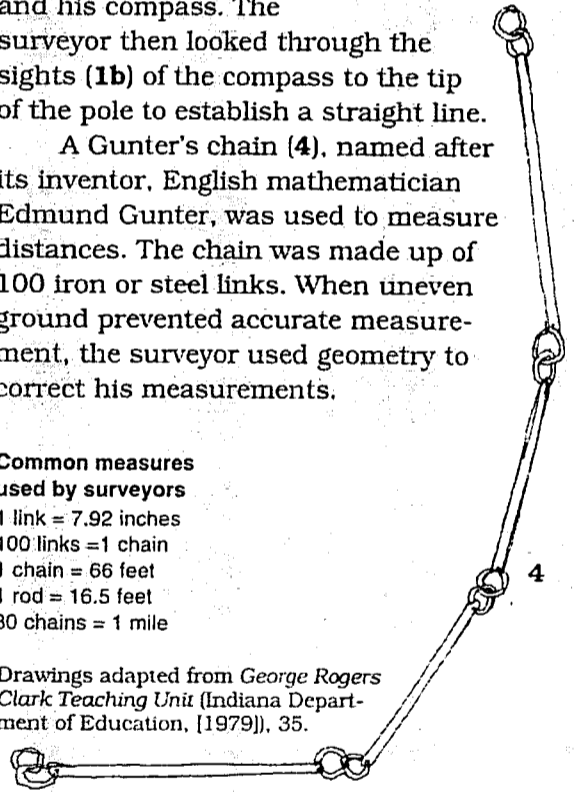
Drawings adapted from *George Rogers Clark Teaching Unit* (Indiana Department of Education, [1979]), 35.



3



4



# The 1827 Diary of John Peter Paul

[May] 31st, Thursday. . . . arrived at Ft. Wayne<sup>1</sup> about 5 o'clock, quite fatigued. . . .

[June] 2nd, Saturday, was spent in erecting tents and arranging for comfort. . . .

6th, Wednesday. Had a party at camp. Fine bevy of ladies.

7th, Thursday. . . . took up the line of march and encamped . . . 2 miles West of Summit.<sup>2</sup>

8th, Friday, moved nine miles and encamped at Croix Creek. . . .

11th, Monday. Commenced work at the forks. Run an experimental feeder line<sup>3</sup> up the Wabash nearly two miles. . . .

15th, Friday. Continued canal line. Moved encampment 6 miles to Camp Black Loon down Northeast side of the Wabash to the bluffs. On

16th, Saturday, took dam section, gauged stream and propelled to a short distance below Jane's Spring. The water very fine. . . .

18th, Monday, progressed with the canal line a short distance below camp but discontinued as the instrument<sup>4</sup> was not in proper adjustment. Had to run the line over again on

19th, Tuesday. . . . Camp life thus far very pleasant, feel no disposition to enter a more pleasant business in as much as I can not conceive of any that has advantages over it. . . .

22nd, Saturday, run an ordinate and then made a resurvey of an experimental line. Shortened the distance, straightened the line and got better ground. . . .

27th, Wednesday, run an experimental line down around the hills and found it impracticable.

28th, Thursday. Resumed the old line and progressed about three miles with the line. Moved the encampment three miles, run below the Treaty Ground<sup>5</sup> to a fine Spring. Had the cold bath in its highest perfection. The health of all tolerably good, my own as good as usual. . . .

[July] 2nd, Monday . . . moschetos extremely troublesome. . . . Returned to camp after wading the River twice. Water deep; no fun in wading and, after, walking—

3rd, Tuesday. . . . Severe rain in the evening. All got wet and not altogether dry on the 4th. . . .

4th . . . Mirth and music close the evening . . . .

9th . . . moved camp about seven miles below the Mississineway. Running today in a very beautiful prairie 6 or 7 miles in extent. Fine springs in it, high ground on the North. Left off work and waded through swamps to the River, got into camp about 10 o'clock, all in a bad humor. . . .

11th, Wednesday. Morning, rainy and unpleasant, spent making out returns to the Department.<sup>6</sup> All remained in camp. Had a slight chill, followed by high fever afterwards, sweated freely and now feel quite well. Take Ague Powders tonight, go to bed and sweat freely. . . .

18th, Wednesday. . . . in the meantime killed 7 large rattlesnakes. . . .

21st, Saturday. Packed our things and saw them loaded into the wagons. Went on the line, run two miles and seventy chains, chained to the River. . . . Walked down the River, passed along the edge of a very pleasant prairie . . . .

Came to the mouth of Eel River, found the stream rapid and wide affording, apparently, almost as much water as the Wabash at their junction. . . .

27th, Friday, saw everything in a state of forwardness for a remove. Went on the line, run a short distance, came to a small stream and were induced by the roaring of the waters to a short distance in the direction of the noise where, to our utter astonishment, we beheld a scene grand beyond my feeble powers for description. . . .<sup>7</sup>

We walked down the River with the expectation of finding the tents pitched . . . when, to our consternation, we met the Col.<sup>8</sup> and his party in the perogue and learned that the wagons had missed their way and were about two miles and a half from where we had expected to encamp. The sun was down, Mr. Morris and myself started in search, were bewildered in our course and were overtaken in the dense woods by darkness. Groped our way through the brush and woods until we fortunately found a road and with the utmost difficulty kept it until, contrary to our expectations, we found the wagons. We got some refreshments and concluded to remain there for the night, got our beds and slept soundly until daylight.

[August] 12th, Sunday. Finished the survey of the River around the prairie. We walked down the trace to the Tippecanoe, the baggage was carried down in perogues. . . .

16th, Thursday, left camp . . . for Lafayette. . . .

18th, Saturday. . . . completed the survey of Tippecanoe. . . .

27th, Monday, arrived at Fort Wayne. . . .<sup>9</sup>

[September] 2nd [sic], Monday, took the whole day to ride 21 miles during which time I was much distressed with fever. No water to be had but in puddles and that sickening to the taste. . . .

20th, Friday, arrived at encampment No. 1 on Maumee. Found the Col. and several others quite sick . . . no progress has been made in the surveys . . . .

Editorial Note: This is a small part of the diary of John Peter Paul, an Indiana surveyor on the Wabash and Erie Canal in 1827. The original manuscript is in the possession of the Indiana State Library.

The manuscript was published in a limited edition of 100 copies in 1933 as *"We Run The Canal Line" being the Diary of John Peter Paul, a member of the party engaged in the preliminary survey of the Wabash and Erie Canal in the year 1827* (Crawfordsville, IN: R.E. Banta).

<sup>1</sup> Paul left Hamilton, Ohio on May 23; his diary documents his travels north through Dayton to Fort Wayne (Paul, 1-2).

<sup>2</sup> The summit was the highest point on the canal line; all planning started from this point.

<sup>3</sup> A feeder line was used to provide a steady supply of water for a canal.

<sup>4</sup> The instrument was probably the compass and levels.

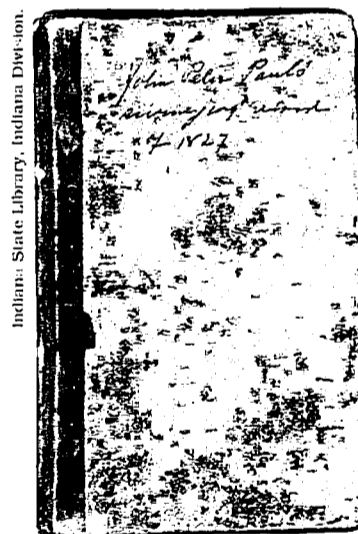
<sup>5</sup> Site of the present city of Wabash (Paul, i).

<sup>6</sup> The engineers, working for the U. S. Army Corps of Engineers, were under the authority of the Engineer Department, U.S. War Department.

<sup>7</sup> Fitch's Glen, north of the Wabash River at Logansport (Paul, ii).

<sup>8</sup> This group of engineers was under the command of Colonel Asa Moore.

<sup>9</sup> Paul left Fort Wayne on August 30, 1827. He traveled south through present Muncie, Indianapolis, Columbus, and Lexington to Madison, where he was medicated for his fever. He then went to Jeffersonville and returned to Madison by steamboat. He left Madison on September 14 on horseback and reached Fort Wayne on September 19. His diary documents these travels (Paul, 18-19).



The cover of John Peter Paul's surveying journal.



# Myron S. Webb's Journal, June 1839

**Saturday 1** Went down to breach<sup>1</sup> on 58 afternoon political Meeting G. H. Dunn & Mr Smith Speechified in C. House<sup>2</sup>  
**[Sunday] 2** Went to church with M.A.G. Afternoon tete a tete with M. H. [unreadable word] Had a sing with Hale Evening in office.  
**Mond 3** Gave levels for lock walls on 63. aft. T. P. Bridges  
**Tuesd 4** Went down to Elizabeth.<sup>3</sup> at Mrs Mills. Fanny sick very sunny Had pleasant visit  
**Wednes 5** Went to Lawrenceburgh Laid out work for ww C lock This afternoon the water ran into the basin for the first time. Cannons fired.  
**Thursd 6** To day Gen Longs<sup>4</sup> [boat?] floated being the first that has floated on [unreadable word] Came to Harrison Went down to Sarah Godbys in Evenig  
**Frid 7** Came up to Brook.  
**Sat 8** In office. In Eving Gen Longs boat arrived amid the firing of Cannon and shouts of the populace  
**[Sunday] 9** Went to church heard [profesor?] Scott. Went to sabbath school Went to Mr. Goodwins. Went boat ride with 2 L verry pleasant  
**Mond 10** Boats started down & I went up to take Estimates. Rode up to Judge Mounts. late home  
**Tuesd 11** Came down to Brook heat quite opprissive  
**Wednes 12** in office making out Estimates  
**Thursd 13** Making out Estimates letter from James. & Holman  
**Friday 14** Do Do<sup>5</sup>  
**Saturd 15** Do Do Reid & Kelly<sup>6</sup> comenced laying stone in Lock—  
**[Sunday] 16** No church nothing [interesting] spent the day in doing no good to myself nor any body else  
**Mond 17** Went up line. Stoped Jud Mts.<sup>7</sup> at Laurel. Went up Wm. [Crk?] Suped at Mr Reeces. Staid over night at Connersville  
**Tuesd 18** Engaged in office at C getting ready for Est. Walking about town making observations  
**Wednesd 19** Engaged in office Do—Rode up line with C. H. W Connersville quite a pretty place  
**Thursd 20** Est log. Hubble bubble. Settled Sects 9.16.17.56.57.62.73. Paid heavy Est of about \$80.000<sup>8</sup>  
**Frid 21** Came down line. Stoped at Laurel. Dined at Mr Murrys— home tired  
**Saturd 22** Went up to 74 and back again twice Farquhar and Young at Brook [unreadable word] meting in [unreadable word]  
**[Sunday] 23** At church heard Conwell & Jones Considerable of an excitement— Saw good many fine ladies  
**Mond 24** About town and in office. Eving went up to church Saw a lady in a fit  
**Tuesd 25** Went up to 67 Laid out Bridge Emb.<sup>9</sup>  
**Wednesd 26** Went down line. Staid at Sara Godbys Pleasant time Left notice<sup>10</sup> for letting tumble & mill race Sect 26.  
**Thursd 27** Was at Dr C. Afternoon hired a wagon went to Lawrenceburgh Made out contracts for State boats<sup>11</sup> Spent eve at N.N. Johns  
**Frid 28** Laid out work at termination of canal.<sup>12</sup> Eve came to Betsy town Staid at Elysian. Was enchanted by the scenery  
**Saturd 29** Work on 23. Came to Harrison thence to Brook. Introduced to Mifs E. Hoffman pleasant evenings visit among the Exquisites  
**[Sunday]** Went to church heard brother Wiley. T.G.R. here Nothing in particular Eving went to Mr Goodwins. [3 unreadable words]

**Editorial Note:** This is a preliminary transcription of one month of Myron S. Webb's journal as he worked on the Whitewater Canal. A photograph of the journal pages on which this material appears is on page 6. The annotations in the notes have been derived from newspapers, official reports, documents, and county histories. The journal and the letter quoted below are located in the Indiana State Archives. Square brackets have been used to indicate additions by *TIH* editors.

<sup>1</sup> *Webb's journal indicates rain the night of May 26, a 90-foot break in section 58 on May 27, and hiring workers to fix the break on May 29.*

<sup>2</sup> *George Dunn and Thomas Smith were opponents in the August 1839 election for U.S. Congress.*

<sup>3</sup> *Elizabethtown, Ohio.*

<sup>4</sup> *General Elisha Long, an acting commissioner of the Indiana Board of Internal Improvement until March 1839, co-owned the Ben Franklin, the first canal boat to arrive at Brookville.*

<sup>5</sup> *Ditto, Ditto.*

<sup>6</sup> *Canal contractors Reed and Kelly on January 23, 1840 were paid \$218 for work on section 61 and \$9,272.46 for work on section 63.*

<sup>7</sup> *Judge David Mount was a prominent landowner and businessman who lived near Metamora.*

<sup>8</sup> *Money paid to contractors.*

<sup>9</sup> *Embankment.*

<sup>10</sup> *Webb issued a public notice asking for bids to build a tumble and millrace.*

<sup>11</sup> *The state contracted for boats to use in repairing and maintaining the canal.*

<sup>12</sup> *The termination of the canal had been changed in 1839 to the bank of the Ohio River so that shipments could be unloaded directly on to river boats.*

In December 1836, Webb wrote to his parents that he had moved "to take charge of ten miles of the White water canal." He included some interesting comments about his job:

... In the first place it is not a very laborious business. In the second place it affords a great opportunity for improving the mind in the arts and sciences. And thirdly it affords a greater pecuniary benefit than I have received before since I have ben in this country. I am not under the necessity of being out in stormy weather and it is frequently the case that I do not have to be occupied out of the Office more than two or three

days in a week. And if I go away on a visit or on business for three or fo[u]r days at a time my pay still goes on and no dedu[ction is] made. . . . I have free access to a Library of sc[tear in paper] and considerable time to study and read.

I ha[tear in paper]nced two degrees in the business of Engineering and have for my pay forty-seven dollars p[e]r month whether I have any work to do or not. I have for my companions men of talents and respectability who are like me, far away from their native homes and kindred friends. But we pass away the time virry pleasantly and I hope profitably.

# Contractors complete the job

Building canals was a huge undertaking for state government or private canal companies. Independent building contractors became the solution.

Contractors put up initial capital, mobilized and provided for their workforce, and were contractually bound to complete their "section" of the line to specifications laid down by the engineer (Way, 9).

In Indiana, as elsewhere, early contractors were local farmers or merchants. Farmers, in particular, were used to the type of work required for canal building—handling animal teams, clearing and draining land, etc.

The opportunity to earn extra money, however, took second place to their main occupation—farming (Way, 62). As with John T. Campbell's boss on page 10 of this issue, many of America's first professional contractors immigrated from Ireland; they worked on the eastern canals and moved west (Way, 63).

Contractors worked under the supervision of engineers employed by the state or private canal company. Newspaper advertisements were generally used to request bids from contractors for specific projects. After a bid was

accepted, the contractor signed a contract with the state or company. Contractors were responsible for an agreed completion time and the quality of work. Many factors—such as underestimating a bid, lack of money, bad weather, and labor shortages—could keep a contractor from completing the work. Faced with financial ruin, it was not uncommon for a contractor to "skip town," or declare bankruptcy, abandoning laborers without any pay for their hard work (Way, 60, 61, 69, 70-73).

*Bill of Timber for towing path bridge East Fork*

12	Sticks for uprights	381.87	23	12X14	13X15
1	Boaps	158.40	13	12X14	13X15
9	Ties	152.24	12	12X14	13X15
22	Braces	446.87	27	12X14	13X15
6	Head Sills Sycamore or White Oak 305.447			12X13	
1	Head sill	39	36	12X13	
2	Sticks for uprights	46.04	17	12X14	13X15
2	Braces	51.40	19	12X14	13X15

State Archives, Indiana  
Commission on Public Records

This document was prepared by an engineer specifying the timber required for the towing path bridge on the East Fork of the Whitewater River near Brookville. It would have been made available to contractors for bidding purposes. It is recorded in a ledger book. The broadside on the front cover of this issue is typical of specifications issued by engineers to assure the quality of work on the canals by contractors.

This notice is typical of those published by Indiana Canal Commissioners seeking bids on canal work. Note in paragraph two that contractors will have access to plans and specifications before submitting bids. In paragraph three there is a call for workers also. Notices generally, as in paragraph four, used the availability of land as an incentive for men to come to northern Indiana to work—and possibly stay.

**WABASH & ERIE CANAL**

**NOTICE TO CONTRACTORS**

SEALED Proposals will be received by the subscribers on the 15th May next either at their office in Fort Wayne or at the town of Huntington on the line of canal, for the construction of 25 or 30 sections of the Middle Division of the Wabash & Erie Canal amounting to about 14 or 15 miles. The work to be let is situated in the counties of Allen and Huntington, in the state of Indiana, extending as far westwardly as the junction of Little river with the Wabash, and embraces 4 locks to be built of timber, 3 or 4 aqueducts with timber trunks resting on stone abutments, and a number of culverts together with several high embankments and other heavy work.

The commissioners or engineer will attend on the line for five days immediately preceding the letting, in order to give the necessary information in regard to the particular work to be let, the plans of the various structures, the manner of performing the work, the conditions of the contracts, &c.

Nineteen miles of this canal are now under contract, which together with that to be let in May next, will give employ to 1000 or 1500 men for about two years, at liberal cash wages. As the country is healthy, and as a variety of new lands of a good quality immediately on the canal route are offered for sale with a long credit for a part of the purchase money, an excellent opportunity is offered for enterprise and industry, which must be an object to settlers, labourers, and canal contractors.

D. BURR,  
SAM'L LEWIS,  
JOHN SCOTT, } Com'rs. of the  
Wabash & E.  
rie Canal.

Fort Wayne, March 6, 1833. 39

Indianapolis Indiana Journal, April 27, 1833.

**THIS AGREEMENT**, made and concluded this 16<sup>th</sup> day of September in the year 1836 between Jesse Beard of the State of Michigan and David Perrine of the State of Indiana party of the first part, and the Board of INTERNAL IMPROVEMENT OF THE STATE OF INDIANA, by Elisha Long acting Commissioner, for and on behalf of said state, of the second part, **WITNESSETH**; That the said party of the first part contracts and agrees to construct, in a good, substantial, and workmanlike manner, all that part of the line of the White Water Canal which is included in section No. Four (A)

This is the opening section of a September 16, 1836 contract between Jesse Beard, Michigan, and David Perrin, Indiana, with the Board of Internal Improvement of the State of Indiana for construction work on the Whitewater Canal, Section Four. The contract calls for two locks with seven- and eight-foot lifts. The completion date required is June 1, 1838.

The contract is extremely detailed. For example, the first paragraph describes the "grubbing" process, including, "all the trees, saplings, bushes and stumps shall be cut down close to the ground, so that no part of any of them shall be left more than one foot in height above the natural surface of the earth."

The contract includes the rates or prices agreed upon

between the state and the contractors. Here are some examples:

- "For the grubbing and clearing, per chain of four poles in length"—\$2.00
- "For excavation of all solid rock . . . per cubic yard"—\$2.00
- "For each cubic yard of full embankment [both sides] necessarily made"—16 cents
- "For excavation of lock pit, per cubic yard"—20 cents
- "For puddling around lock, aqueduct, or culvert, per cubic yard"—27 cents
- "For square timber in aqueduct or culvert, per cubic foot"—18 cents
- "For the bridge, framed, raised and floored"—\$250.00
- "For lock gates and miter sills, complete, with all necessary fixtures"—\$675.00

**The 1850 Annual Report of the Trustees of the Wabash and Erie Canal, to the General Assembly of the State of Indiana** made very clear the effect of health concerns on the building of canals: "cholera . . . again visited the line during the months of May, June, and July . . . We regret to say that the epidemic proved quite fatal, and that about 150 of the laborers fell victims to it. The terror produced by this disease scattered the forces on the line, suspending most of the sections under contract, and retarding the work very seriously. Such was the alarm created, that many of the contractors found it difficult to re-organize any considerable force until late in the fall" (146-47).

**EXHIBIT** of the average force employed on the several lines of improvement during the past year.

	Average effective force in men, including the teams reduced to men.	Average number of men exclusive of the teams.	Probable number of Europeans.	Number of citizens of Indiana.	Average rate of wages for common laborers exclusive of boarding
W. & E. Canal from Huntington to Lafayette	1105	830	580	250	\$21 00
White Water Canal	975	630	325	225	18 00
Central Canal Indianapolis Div.	750	680	80	600	18 00
Central Canal Southern Division.	180	160	53	107	19 00
Cross Cut Canal	296	260	5	255	19 00
Madison & Lafayette Rail Road	1400	1200	1030	170	20 00
New Albany & Vincennes Road	1115	906	362	544	18 00
<b>Total</b>	<b>5821</b>	<b>4666</b>	<b>2435</b>	<b>2251</b>	

This chart was provided to the Indiana General Assembly as part of the 1837 report of the Board of Internal Improvement. In his general remarks, Jesse L. Williams, Principal Engineer, makes clear the impact of too few workers and resulting high wages on existing contracts for construction:

"For the first nine or twelve months after contracts were made, laborers were scarce, and their wages soon became unusually high.—Not only was the progress of the work retarded . . . but . . . many of the contractors abandoned their jobs, which were subsequently let out at higher rates, increasing in proportion the cost of the improvements" (237).

Williams notes that many German and Irish workers have come to the state in the last six months. That is expected to lower wages to "ordinary rates."

# Laborers on the canal

Thousands of men worked on the construction of Indiana canals. Locks, bridges, aqueducts, and culverts required skilled artisans. Chopping of trees, grubbing, and shoveling was done by common laborers. In Indiana, as elsewhere, the work was

powered by human and beast using traditional tools, shovels, picks, wheelbarrows and carts. Canallers laboured twelve to fifteen hours a day in all kinds of weather. They were exposed to many health-threatening illnesses, including malaria . . . and cholera (Way, 10).

There are few records by canal laborers, because they were generally illiterate. An exception is the reminiscence of John TenBrook Campbell (approximately sixty years later) about his experiences on the Wabash and Erie Canal circa 1848, at the age of 15. It was published in the *Indianapolis Star*, July 26, 1907. The excerpt here provides some interesting insights.

Source: Way, 10-12.

## John T. Campbell's Reminiscence

. . . Hugh Stuard, an educated Irishman, was the contractor thru Parke county. . . . All the dirt was moved in carts and wheelbarrows. Each teamster led two horses, one at a time, from the shovel pit to the dump, or tow path, where a dump boss directed to "haw tee and back." . . . The boss would throw his weight on the back end of the cartbed when it would tip down and shoot the dirt out backward and down the embankment . . . Then drives (or leader, more properly) would lead the horse and cart back to the shovel pit and turn and back the cart to the pit and lead the other horse and cart to the bank. While one horse was being led to the bank or tow path, six to eight shovelers would be filling the other cart. I led two horses for Tom Burns, an Irishman, and son-in-law of one McCandry, who had a mile of the work . . . just about due west of the O. P. Brown house, some two or two and a half miles north of Montezuma.

I was to work a "dry month" for seven dollars in "canal script." When I had worked four and a half weeks with only one rain that stopped the work for an hour (there was some night rains) I asked Burns if my month was up. He stormed out with boy-scaring oaths—"that time is not up yet." . . . Near the end of the seventh week . . . he drove me off without any pay at all. I was the only Hoosier among 150 Irish. Every day at noon I had to allow two Irish boys . . . to whip me for the amusement of the men. I could whip either of them, but they often doubled on me, and if I showed energy and was about to get in some work, some Irishman from behind would hit me about the ear and send me to grass. . . . I found it better to pretend to be doing my best and let the fight go against me, as I got less hurt and it was sooner over with.

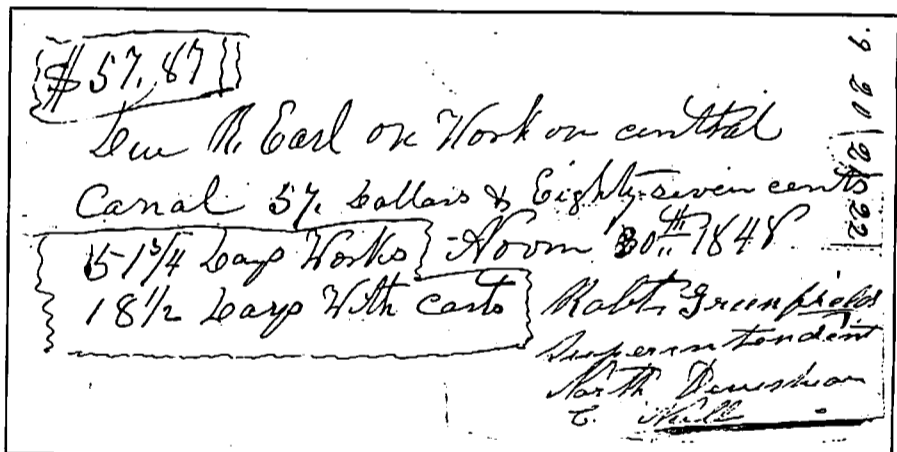
Burns . . . had a double or long cabin, with a partition. The horses were stabled in the east part and the family in the west. An Irishman and I slept in the lower bunk next to the horses, and the hired girl and two children in the bunk above us. Burns and his wife slept in a bunk at the south side.

My uncle boarded some 20 or 30 choppers and teamsters. These were all Hoosiers and Suckers. The teams were two to three yoke of oxen. No horses were used in the log and timber hauling. The haulers went up the ridges north of the creek and came back with long round logs full length of the trees, and also hewed timber for the feeder dam across Sugar creek. They dragged their loads close by our door yard. The cracking of ox whips and swearing at the oxen sounded like skirmish firing at the opening of a battle.

### John TenBrook Campbell

John TenBrook Campbell was born in Montezuma, Indiana in 1833.

Campbell served in the Civil War. In addition to other governmental positions, he was treasurer of Parke County for two terms and was county surveyor for ten years. He was a respected civil engineer. He wrote many newspaper articles, which he gathered in extensive scrapbooks, now located in the Indiana Division, Indiana State Library. He died in the Soldiers' Home in Lafayette, Tippecanoe County in 1911.



This voucher is one of many in the State Archives, documenting the wages paid on Indiana canals. This one is for the Central Canal in Indianapolis.

# Building a canal

## WHITE-WATER CANAL.

### List of Mechanical Work to be put under contract at Brookville, on the White-Water Canal, September 13th, 1836.

- Ser. No. 1. One culvert 8 ft. chord. One Road Bridge.  
 " " 4. Locks No. 1 and 2, seven and eight ft. lift.  
 " " 5. One road Bridge.  
 " " 6. One do. do. and one culvert 8 ft. chord. For stone see T. Guard's quarry up Elk run 1 mile from culvert.  
 " " 7. One culvert 8 ft. chord. One Waste Wier. For stone see as above.  
 " " 9. One culvert 24 ft. chord. For stone see Double Lick creek. One road bridge.  
 " " 12. Two road bridges. One culvert 10 ft. chord. For stone see Major M'Henry's quarry.  
 " " 13. One culvert 16 feet chord. For stone see as above, and up Sand Run  
 " " 15. One road bridge.  
 " " 16. Lock No. 3, nine ft. lift. One culvert 8 ft. chord. For stone see Mr. Bond's quarry.  
 " " 17. One culvert 10 ft chord. For stone see as above.  
 " " 18. One Waste Wier.  
 " " 21. Lock No. 4, ten ft lift.  
 " " 22. One culvert, 7 feet chord. One Waste Wier. For stone see Mr. White's quarry  
 " " 23. One Culvert 16 ft. Chord. For stone see as above.  
 " " 25. Dam No. 1 and Guard Lock No. 1. For stone see J. Godfrey's quarry, west side of river.  
 " " 26. Locks No. 5 and 6. Each six ft. lift. For stone see B. F. Loper's quarry.  
 " " 27. One Road Bridge. One Culvert 6 ft. chord. For stone see as above.  
 " " 28. One Culvert 10 ft. chord. For stone see as above.  
 " " 30. One do. 26 ft. do. Lock No. 7, eleven feet lift. For stone see R. Garner's quarry up Johnson's Fork, and W. Tebb's quarry on the west side of the river.  
 " " 31. One road bridge.  
 " " 32. One culvert 6 ft chord. For stone see W. P. Marshall's quarry.  
 " " 33. Lock No. 8, eight feet lift. For stone see as above.  
 " " 34. One road bridge.  
 " " 35. One waste Wier.  
 " " 36. Lock No. 9, seven ft lift. For stone see as above.  
 " " 37. One Wooden culvert, 10 ft span, 11 ft high.  
 " " 38. One Waste Wier.  
 " " 39. One culvert 6 ft chord. Lock No. 10, nine feet lift. For stone see J. Barber's quarry, on the West side of the River.  
 " " 41. One road bridge.  
 " " 42. One culvert 10 ft chord. One Waste Wier.  
 " " 44. One road bridge. One culvert 12 ft chord, and one 8 ft chord. Lock No. 11, ten feet lift. For stone see Barwise's and Butcher's quarry up Elkhorn.  
 " " 46. One Waste Wier.  
 " " 47. Lock No. 12, eight ft lift  
 " " 48. do. 13, nine ft lift } For stone see J. Bennett's quarry.  
 " " 49. One road bridge. One culvert 8 ft chord. For stone see as above.  
 " " 50. One road bridge. One culvert 10 ft chord. Lock No. 14, eight feet lift. For stone see Backhouse's and M'Clure's quarries.  
 " " 51. One aqueduct, 2 spans of 34 feet each. For stone see as above.  
 " " 53. One culvert 10 feet chord. For stone see Garner's and M'Carthy's quarries.  
 " " 55. Dam No. 2, and guard lock No. 2. For stone see as above.  
 " " 57. Locks No. 15 and 16, each eight feet lift. For stone see quarry above S. Wiley's  
 " " 58. One road bridge.  
 " " 59. Lock No. 17, eleven feet lift. For stone see bluff below the lock.  
 " " 61. Dam No. 3. Guard Lock No. 3. Lock No. 18, seven feet lift, and one road bridge. For stone see Buller's quarry and up the East Fork.

### List of River or Bluff Sections.

- Ser. No. 38 Above Mr. Horniday's  
 " " 43 Below Mr. Barwise's.  
 " " 45 Above do.  
 " " 48 do Major Bennett's  
 " " 53 do Mr. Cooley's  
 " " 56 Opposite Farr. M'Carthy, (Slack Water.)  
 " " 58 Above Mr. Wiley's.

NOTE.—The sections and Locks are numbered from the Ohio river upwards. The Sections not mentioned in the above list are to be let, but they have no mechanical work on them. Bidders for the mechanical work are expected to make particular examinations of the stone quarries from which the stone are to be procured, and judge for themselves as to the cost of quarrying, hauling, &c. The above named quarries are merely referred to in order to aid the bidders in their investigations, but should they prove insufficient, that circumstance will not furnish any ground to claim an extra allowance.

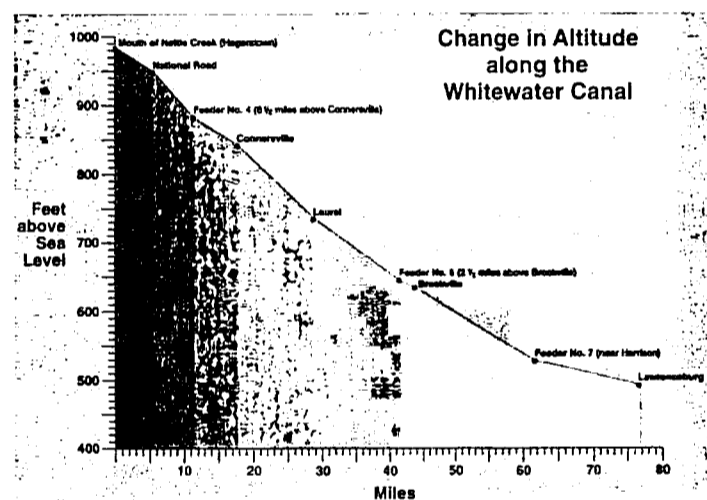
This broadside demonstrates the complexity of canal construction. Contractors bid on sections of approximately one-half mile. Engineers had prepared specifications for contractors (as illustrated elsewhere in this issue) for each part of the canal to be bid.

Following years of preparation by surveyors, engineers, and commissioners, actual construction of a canal could begin. The start of construction was a time of great celebration for communities. It was also the beginning of a long and expensive process.

Regardless of what type of specific construction was needed, there were four basic steps in building a canal: digging the canal, providing means for the canal to cross rivers and streams, overcoming changes of altitude in the route of the canal, and getting water into—and keeping it in—the canal.

The next two pages provide a brief description of the processes and structures in canal building. Words in boldface type are defined in the Definitions columns using an 1840 source; look up words in a modern dictionary to see if changes in meaning have occurred.

Sources: Way, 134-41; definitions are from Tanner, 235-64.



The Whitewater Canal was an extraordinary engineering feat. This chart shows the change in altitude from Hagerstown to Lawrenceburg. Over the seventy-six miles of the canal, the descent was 491 feet, requiring fifty-six locks. By comparison, the Wabash and Erie Canal at 468 miles was the longest U.S. canal. From its Fort Wayne summit to Evansville, it descended 450 feet; from Fort Wayne to Junction, Ohio, it descended 55 feet. Only seventy-three locks served the entire canal. Shaw, *Canals*, 143; Castaldi, 11; *Annual Reports of the Geological Survey of Indiana, 1876-1878* (Indianapolis, 1879), 240-41, 252.

# 1) Digging the canal

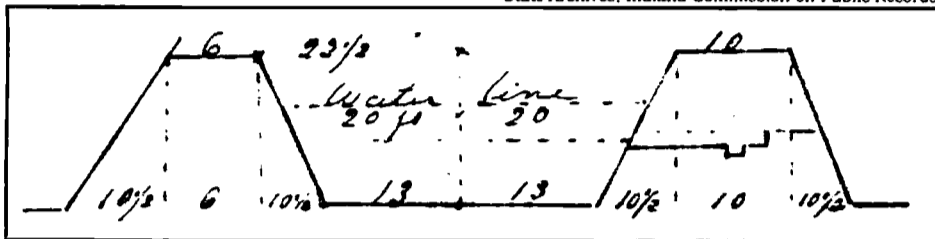
Draining and grubbing the land along a canal line usually preceded excavation. Laborers used shovels and carts to move the earth. Machines such as scrapers, dredges, and cranes were also used.

The amount of excavation to build the correct embankment was figured and charted by the engineers. On level ground 2.75 feet of excavation was needed to raise the banks enough to permit the required water depth of four feet (Tanner, 240-41).

If the bottom of the canal was sandy and did not hold water, puddle was added to the sides and bottom of the canal. Men and oxen were used to press the puddle into place.

The drawing below by Myron S. Webb (see p. 6 of this issue) shows some dimensions of the Whitewater Canal: twenty-six feet wide at the bottom; forty feet wide at the water line; ten-foot-wide towpath; six-foot-wide berm bank. The water was four feet deep.

State Archives, Indiana Commission on Public Records.



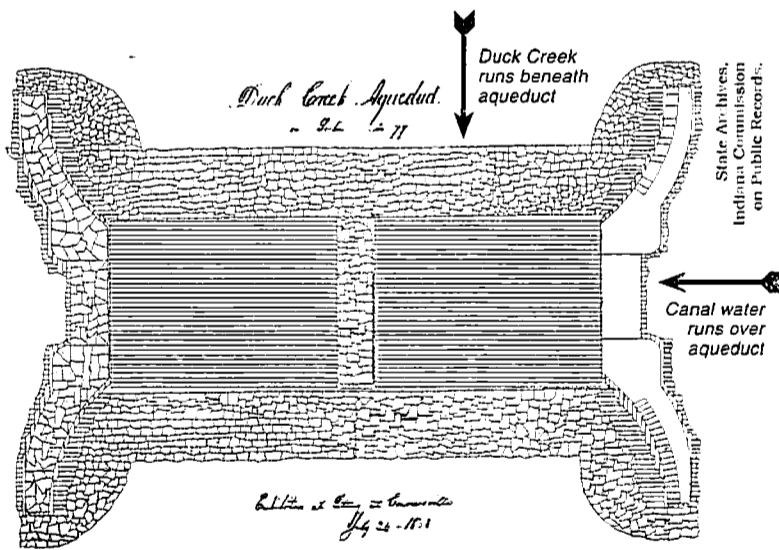
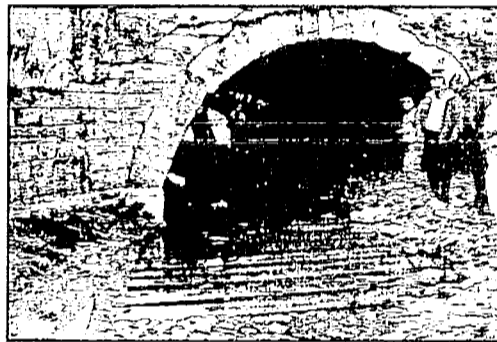
# 2) Crossing rivers and streams

Along the course of a canal, culverts and aqueducts carried canal water—and canal boats—over streams and rivers. Floods often damaged or washed away these structures.

The illustration below is adapted from an engineer's foundation plan drawing (bird's-eye view) of the Duck Creek Aqueduct at Metamora, Indiana. This drawing along with written bills of materials were exhibited for contractors by Whitewater Canal engineers at

Connersville on July 24, 1838. This aqueduct exists today as a covered bridge aqueduct (Shaw, Canals, 143).

A culvert on the Whitewater Canal is shown in a 1995 photograph. Notice the arch of stone and the timber-lined bed of the stream.



State Archives, Indiana Commission on Public Records.

### Definitions

**Aqueduct**, a leader of water, built of stone or timber, to preserve its level, and to convey it from one place to another. It is applied either to a bridge over a valley, a road, or to a tunnel, when intended for the passage of water.

**Arch**, a portion of the circumference of a circle; a circular arrangement of overlapping stones or bricks, with radiating beds, commencing from fixed points or abutments, and meeting in the centre. Arches are of various shapes: semi-circular, segmental, elliptical, or pointed.

**Berm**, is that bank or side of a canal which is opposite to the tow path.

**Cement**, a composition of certain mineral substances, capable of uniting and keeping things together in close cohesion.

**Composite Locks**, canal locks built with stone faced with timber.

**Crane**, a machine used for raising and lowering heavy weights.

**Culvert**, a passage or archway for water, under a canal, or rail-road.

**Dam**, a bank to confine or regulate the flow of water.

**Draining**, the process of clearing wet and boggy lands from their superfluous moisture.

**Dredge**, a machine for clearing out canals, deepening rivers, &c.

**Embankment**, a mound of earth thrown up to maintain the grade of a canal, rail-road, &c.

**Excavation**, the act of cutting or digging into hollows; removal of earth.

**Feeder**, side cuts which lead from streams or reservoirs, into and supply canals with water. A "navigable feeder" is one of sufficient capacity to admit of the passage of boats.

**Grubbing**, clearing the ground from trees, rocks and other impediments, preparatory to the commencement of a canal, rail-road, &c.

### 3) Changes in altitude of the canal

**Lift Locks**, are those sections of a canal inclosed between two gates, which, on being filled with water or emptied, elevate or depress the boat, and thus allow it to pass from one level to another. When a boat is to pass from a higher to a lower level, it is floated into the lock and the gates closed; the water is then allowed to escape from the lock chamber to the lower level, which is effected either by paddles formed in the gates or by side culverts; the boat being thus sunk to the lower level, the lower gates are opened, when it passes through. Boats are passed up by the same process, reversed.

**Lockage**, means the rise or fall effected by a lock or series of locks.

**Machine**, signifies any thing used to augment or regulate moving forces or powers; or it is any instrument employed to produce motion in order to save either time or force.

**Planking**, the act of covering and lining the sides and bottom of a canal, &c. with wood.

**Puddle**, a mixture of clay rendered impervious to water, and used for the purpose of excluding water from any works.

**Reservoir**, an enclosure of water, artificially made in order to collect and retain it for the use of canals, mills and other purposes.

**Scraper**, a machine drawn by horses or oxen, for excavating trenches, for canals, rail-roads, &c.

**Slackwater navigation**, is effected by means of dams which back the water and form pools of the required height. These occur more or less frequently according to the inclination of the bed of the stream. The pools thus created are connected by means of lift locks and short canals, by which the boats pass from one to another.

**Tow path**, a narrow road, travelled by horses in dragging boats along a canal.

A canal can be described as a connected series of level channels. To move a canal boat from one level to another level, a connecting **lift lock** was necessary. The amount of **lockage** required for a canal because of the terrain it crossed affected its cost. Lockage—which required more time for boats—also made a canal less efficient to operate and travel.

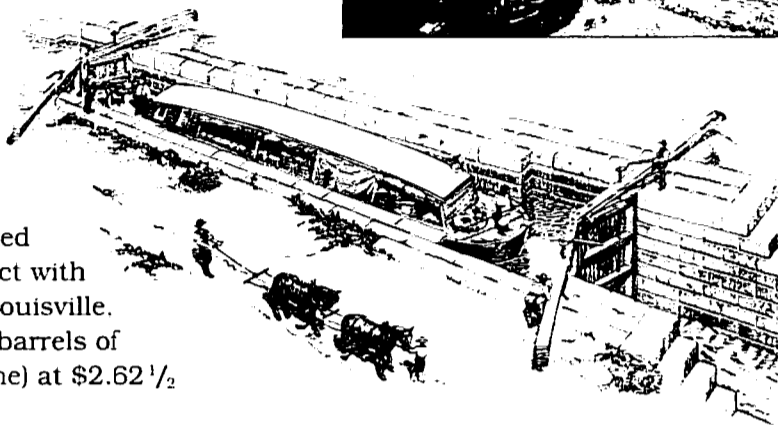
Locks were built of timber or stone depending on the availability of materials nearby. **Composite locks** were also built. Cut stone locks with water-proof **cement** were the most durable. In 1839, the Indiana Board of Internal Improvement report (48) noted approval of a contract with a manufacturer in Louisville, Kentucky for 2,000 barrels of cement (or water-lime) at \$2.62 1/2

each. This purchase was for locks being built on the Whitewater Canal.

The 1995 photograph shows the remains of a lock on the Whitewater Canal.



Martha Wright.



Tunis, 1891.

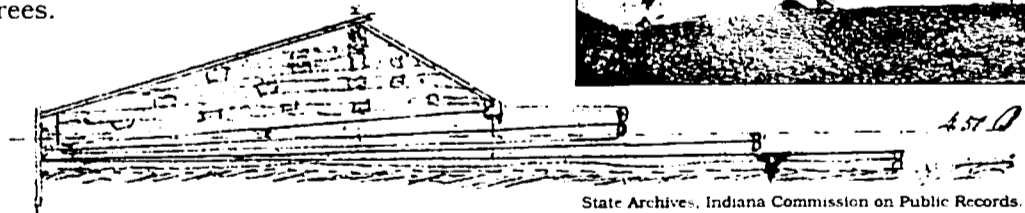
### 4) Getting and holding water in the canal

One of the major tasks of surveyors locating a canal route was to determine if sufficient water was available in nearby rivers to keep canal boats floating—even in the driest weather. Sometimes, **reservoirs** had to be built. **Dams** were built to control water levels and to provide pools for **slackwater navigation**. **Feeders** were dug to get water to the canal.

The drawing below is a portion of Myron S. Webb's (see p. 6 of this issue) diagram for a dam. The drawing depicts a crib of timber filled with stone and covered with **planking**, resting on a foundation of brush and unhewn trees.

The foundation (or base) specifications in an 1836 ledger book for a dam on the Whitewater River at Brookville call for 1,160 unhewn trees from eight to ten inches wide and forty-five to sixty feet long with as much brush attached as possible.

The 1995 photograph shows the feeder dam on the Whitewater River near Laurel, Franklin County.



State Archives, Indiana Commission on Public Records.



Martha Wright.

# Behind the Scenes

"Behind the Scenes" presents some aspect of how the Bureau staff produces each issue of the magazine. The focus may be, for example, the research process, an interpretation problem, etc. It also enables us to thank our partners and demonstrate that research is a collaboration with often unexpected twists and turns.

As the Historical Bureau staff worked on the June issue *Canal Mania in Indiana*, it became clear that one issue was not enough on Indiana canals. The more one reads—especially of modern interpreters such as Ronald E. Shaw and Peter Way—the more intriguing the story becomes.

Writing about Indiana's canal story has generally focused on the financial failures of the canal system. Several works cited in the June 1997 issue emphasize the important economic factors related to canals. Shaw notes the importance of Indiana's canals in applying canal technology (*Canals*, 134).

The most complete story possible of Indiana's canal era has apparently not yet been written. The Historical Bureau wants to encourage progress in achieving that complete story. One step is to continue to identify resources.

The Canal Society of Indiana and its members have continued to gather and present valuable resources. They—and others—are working to pre-

serve the physical remains of the canal era. The Indiana State Archives and the Indiana State Library have significant state resources on canals. The Indiana Historical Society has materials. Published works have cited resources located throughout the state.

What else exists? As with John T. Campbell, did reminiscences of men and women associated with the canals later appear in newspapers? Are there papers of engineers, contractors, or others as yet untapped in private or government repositories? Are there papers still in private hands?

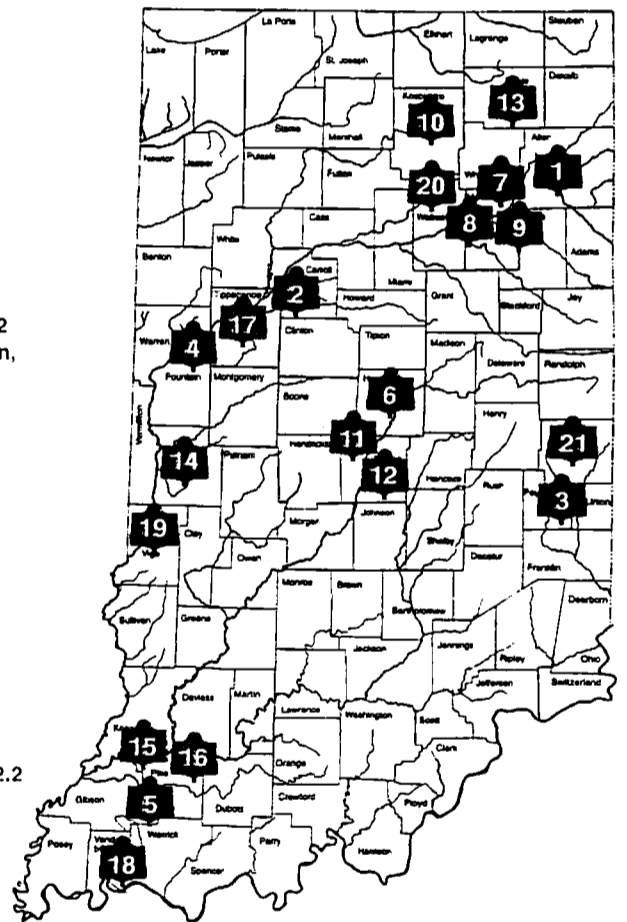
The Historical Bureau encourages individuals and repositories to be aware of the Indiana canal story. The Bureau agrees to receive reports of materials in repositories or private hands, and, as appropriate, to compile that information for use by others.

Working together, perhaps Indiana's canal story can be more completely told. We look forward to hearing from you!

This map indicates one way Indiana's canal history is being preserved and made available to the public—through state format historical markers. There are additional canal markers throughout the state placed by communities and organizations.

The list of state markers on the map is keyed by the initial number; the name, county, and Historical Bureau identification number follow. The Historical Bureau's marker database is available at <http://www.statelib.lib.in.us/www/ihb/ihb.html> on the internet.

- |   |   |
|---|---|
| 1 Wabash and Erie Canal Groundbreaking, Allen, 02.1992.2                        | 10 Papakeechee's Reserve, Kosciusko, 43.1962.1      |
| 2 Wabash and Erie Canal, Carroll, 08.1992.1                                     | 11 Central Canal, Marion, 49.1966.2                 |
| 3 The Whitewater Canal, Fayette, 21.1966.1                                      | 12 Site of the Central Canal, Marion, 49.1992.5     |
| 4 Attica & Covington Canal Skirmish, Fountain, 23.1997.1                        | 13 Sylvan Lake, Noble, 57.1992.1                    |
| 5 Wabash and Erie Canal Completed 1853, Gibson, 26.1976.1                       | 14 Wabash & Erie Canal, Parke, 61.1966.1            |
| 6 The Central Canal, Hamilton, 29.1994.1  | 15 Wabash and Erie Canal, Pike, 63.1966.2           |
| 7 Forks of Wabash, Huntington, 35.1972.1  | 16 Wabash and Erie Canal, Pike, 63.1992.1           |
| 8 Canal Landing on Washington Street/Jefferson Park Mall, Huntington, 35.1973.1 | 17 The Wabash River, Tippecanoe, 79.1973.1          |
| 9 Wabash & Erie Canal Lock 4, Huntington, 35.1997.1                             | 18 Wabash and Erie Canal, Vanderburgh, 82.1947.1    |
|   | 19 Terre Haute, Vigo, 84.1947.3                     |
|   | 20 Paradise Spring Treaty Ground, Wabash, 85.1992.1 |
|   | 21 Cambridge City, Wayne, 89.1992.2                 |



# Selected Resources

**Note:** Please refer to additional resources in the June 1997 issue.

## Bibliography

- Castaldi, Thomas E. *Wabash & Erie Canal Notebook: Allen County and Huntington County, Indiana*. Fort Wayne, IN: Thomas E. Castaldi, 1995.

Makes available 1990 (revised) and 1992 articles; illustrations.

- *Log Book and Ancestry of Myron Safford Webb, 1840*. Sarasota, FL: Aceto Bookmen, 1985.

The 1840 log book documents Webb's departure from Indiana and his return to Vermont often via canals; provided biographical material.

- Paul, John Peter. "We Run the Canal Line" being the Diary of John Peter Paul, a member of the party engaged in the preliminary survey of the Wabash & Erie Canal in the year 1827. Crawfordsville, IN: R. E. Banta, 1933.

A useful first person account of a canal surveyor. See pp. 4-5 of this issue.

- Shaw, Ronald E. *Canals for a Nation: The Canal Era in the United States, 1790-1860*. Lexington, KY: The University Press of Kentucky, 1990.

Has a very useful section on the canals of the Old Northwest.

- Tanner, H. S. *A Description of the Canals and Rail Roads of the United States, Comprehending Notices of All the Works of Internal Improvement throughout the Several States*. New York: T. R. Tanner & J. Disturnell, 1840.

Contains a very useful and extensive glossary.

- Thomas, Samuel W., and Eugene H. Conner, eds. *The Journals of Increase Allen Lapham for 1827-1830*. Louisville, KY: G. R. Clark Press, Inc., 1973.

Journals of a young man who worked on the Kentucky canal at the Falls of the Ohio.

- Tunis, Edwin. *Frontier Living*.

Cleveland: The World Publishing Company, 1961.

A good, general source on pioneer life; good illustrations.

- Way, Peter. *Common Labor: Workers and the Digging of North American Canals, 1780-1860*. Baltimore: The Johns Hopkins University Press, 1993.

A very useful and thorough study demonstrating the importance of canals and canal workers in labor and transportation history.

## Additional Resources

- *Chesapeake and Ohio Canal: A Guide to Chesapeake and Ohio Canal National Historical Park . . .* Washington, D.C.: National Park Service, U.S. Department of the Interior, 1991.

Contains useful and interesting information and illustrations.

- Gieck, Jack. *A Photo Album of Ohio's Canal Era, 1825-1913*. Kent, OH: Kent State University Press, 1988.

Excellent source with wonderful early photographs of Ohio canals.

- Harlow, Alvin F. *Old Towpaths: The Story of the American Canal Era*. New York: D. Appleton and Company, 1926.

A good, general overview of canals in the U.S.

- Shank, William H. *Towpaths to Tugboats: A History of American Canal Engineering*. York, PA: The American Canal and Transportation Center, 1982.

Informative and interesting overview of canals.

- Shaw, Ronald E. *Erie Water West: A History of the Erie Canal, 1792-1854*. Lexington, KY: University of Kentucky Press, 1966.

Excellent history of the Erie Canal.

- Spangenburg, Ray, and Diane K. Moser. *The Story of America's Canals*. New York: Facts on File, 1992.

Informative overview of early to modern canals.

- Wilcox, Frank. *The Ohio Canals*. Kent, OH: Kent State University

Press, 1969.

Contains beautiful sketches and paintings of Ohio's early canals, canal boats, and canal people.

## Suggested student resources

- Harness, Cheryl. *The Amazing Impossible Erie Canal*. New York: Macmillan Books for Young Readers, 1995.

Colorful drawings illustrate this history of the building of the Erie Canal and its effects on the developing nation; for elementary and middle school readers.

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## Indiana Historical Bureau

140 North Senate Avenue ■ Room 408 ■ Indianapolis, Indiana ■ 46204-2296 ■ 317-232-2535 ■ TDD 317-232-7763

### Going through the North Bend tunnel

In January 1850, a young man named John Towner headed west from Brookville, Indiana to the gold fields of California. The first leg of the journey was by boat on the Whitewater Canal to Cincinnati. The following excerpt from his journal provides a vivid description of the North Bend tunnel.

... we soon arrived at the entrance of the tunnel. This subterranean passage is, to the best of my belief, about a quarter of a mile in length, being dug through a large hill. It is a damp and gloomy place and is not calculated to produce very pleasant sensations; in many places the water drips through from above to such an extent as to resemble a shower of rain. There were ropes fastened overhead, by which means boats were pulled through. I remained on deck during our entire passage through this gloomy place having determined to see everything which was to be seen.

Source: Journal of John Towner, Indiana State Library, Indiana Division.



Martha Wright

A 1995 photograph of the North Bend Tunnel near Cleves, Ohio showing it partially filled with soil. The tunnel, designed by Darius Lapham, was part of the Cincinnati-Whitewater Canal, built between 1838 and 1843 and connecting the Whitewater Canal at West Harrison, Indiana to downtown Cincinnati. "The tunnel, over 1600 feet in length, was 24 feet wide at the water line and the center of the arch was 15 1/2 feet above the water." To get through the tunnel, "horses were unhitched and led around . . . the hill. The canal boats were pulled . . . by hand to hand pull on a rope fastened at each end of the tunnel." Marjorie Byrnside Burress, *It Happened 'round North Bend: A History of Miami Township and Its Borders* ([Cincinnati], 1970).