

POCKET EDITION  
OF  
LISTS OF  
SPIRIT LEVELS  
AND  
BENCH MARKS  
ALONG  
NEW YORK STATE CANALS.

---

FROM ANNUAL REPORT FOR 1901 OF  
EDWARD A. BOND, STATE ENGINEER AND SURVEYOR.

r626  
N532sp

stack

**Rochester Public Library**  
**Reference Book**  
**Not For Circulation**

Stack

C 3

*Philip F. Stephens.*

STACKS

---

REPORT  
ON THE  
SPIRIT LEVELS  
OF THE  
NEW YORK STATE  
BARGE CANAL SURVEY  
OF  
1900 and 1901,

EDWARD A. BOND, State Engineer and Surveyor.

*New York (State) State Engineer  
" " " " & Surveyor*

BY

WM. B. LANDRETH, Resident Engineer, Eastern Division N. Y. Canals.

---

ALBANY, N. Y., *January 25, 1902.*

HONORABLE EDWARD A. BOND, *State Engineer and Surveyor,*  
*Albany, N. Y.:*

SIR.—The following report on the spirit leveling done during the year 1901 on the Barge Canal survey, under chapter 411 of the Laws of 1900 is respectfully submitted.

WM. B. LANDRETH,  
*Resident Engineer.*

2626  
7532 sp

### HISTORICAL.

The Barge Canal survey of 1900 covered the Erie Canal between Herkimer and one and one-half miles west of New London and between Clyde and Buffalo, and lines of "Y" levels were run on existing canal bench marks between those points. Between New London and Clyde the deep waterway line of levels to Phoenix was used, and a new line run from Phoenix along the Seneca River to Clyde.

From Albany to Phoenix the deep waterway benches were in many instances several miles from the Erie Canal and often many feet below the Erie Canal level, having been placed at convenient points along the proposed line of the deep waterway.

Lines of levels have been run across the State at different times by the State Engineer's Department and (in 1875-1876) by the U. S. Lake survey, and several lists of benches have been published in the reports of the State Engineer. In many instances the older structures have been rebuilt, and the record of the new location and elevation of the benches thereon is open to doubt.

The levels along the Erie Canal on the Eastern, Middle and Western Divisions were not based upon the same datum in the later reports, and on some portions of the line were known to be inaccurate. To obtain a continuous line of accurate levels between Albany and Buffalo for use in future canal improvement I was instructed by you to run a line of "Y" levels over those portions of the Erie Canal that were not covered by the survey of 1900, and on the Champlain Canal from Watervliet to Whitehall.

Work in the field was begun at the old grist mill bench mark at Greenbush March 1, 1901, and completed to Herkimer June 20th. Check lines between the Barge Canal benches on the Seneca River and the old benches on the Erie Canal were run at Syracuse, Peru, Weedsport and Montezuma between June 20th and July 7th. From July 7th to August 17th a portion of the party was employed in

the Albany office working up the results of the field work. A single line of levels was run on the Champlain Canal from Water-vliet to Whitehall between August 17th and September 14th, and duplicate lines from New London to Clyde along the Erie Canal between September 16th and December 10th, after which date two of the party took the elevations of the mitre sills of all locks between Herkimer and the Hudson River.

The party was constituted as follows: recorder, instrument-man, two rodmen, and a bubble tender. The chief of the party acted as recorder, or, instrument-man as the necessities of the case required.

Prior to June 20th I was with the field party, afterward spending a day with them from time to time as required. Mr. B. E. Failing was instrument-man to July 7th and in charge of the field party from June 20th to July 17th. Mr. Clark Brown was in charge of the party in the field after August 17th. The remainder of the party at various times has been as follows: Greenbush to Herkimer: rodmen, D. B. La Du and F. L. Fonda; bubble tender, Frank Lutz; Champlain Canal and Erie Canal from New London to Clyde: recorder, D. B. La Du; rodmen, F. L. Fonda and E. B. Hollenbeck; bubble tender, E. G. Hollenbeck.

### INSTRUMENT, RODS AND APPLIANCES.

The instrument used was a Gurley "Y" level, purchased in 1900 for the Barge Canal survey. The dimensions of the instrument were:

Focal length.....	16½ inches.
Clear aperture of objective.....	1¼ inches.
Magnifying power.....	35 diameters.
Value of one division of level bubble (measured).....	7.04 seconds.
Value of one division of level bubble as given by makers.....	10 seconds.

### DETERMINATION OF ONE DIVISION OF THE LEVEL TUBE.

The value of one division of the level-vial scale has been made by this survey following the methods recommended by Prof. J. B. Johnson<sup>1</sup> as follows:

(1) See Johnson's Surveying, 8th edition, p. 572-3.

Let  $E_1$  = mean of all the eye-end readings of the bubble when it was run to the eye-end of its tube;

Let  $E_2$  = same for bubble at object-end of tube;

Let  $O_1$  = mean of all the object-end readings when bubble was at eye-end of tube.

Let  $O_2$  = same for bubble at object-end of tube;

Let  $R_1$  = mean reading of rod for bubble at eye-end in feet;

Let  $R_2$  = same for bubble at object-end in feet;

Let  $D$  = distance from instrument to rod in feet;

Let  $V$  = value of one division of the bubble (sine of the angle) at a unit's distance.

Then in seconds of arc we would have:

$$V \text{ (in seconds)} = \frac{R_2 - R_1}{D \sin 1'' \left( \frac{E_1 - O_1}{2} - \frac{E_2 - O_2}{2} \right)}$$

Using the data given by the following observations:

DISTANCE FROM INSTRUMENT TO ROD 100.00 FEET.

SETS.	DIVISION OF SCALE.		Rod reading.
	Object-end.	Eye-end.	
Number 1, bubble eye-end.....	0	E	3.851
bubble object-end.....	15	21	3.873
Number 2, bubble eye-end.....	21	15 $\frac{1}{4}$	3.850
bubble object-end.....	14	22 $\frac{1}{4}$	3.878
Number 3, bubble eye-end.....	22 $\frac{1}{4}$	14	3.847
bubble object-end.....	14	23	3.879
bubble object-end.....	23	14	3.879

We have

$$E_1 = \frac{21 + 22\frac{1}{4} + 23}{3} = 22.08$$

$$E_2 = \frac{15\frac{1}{4} + 14 + 14}{3} = 14.42$$

$$O_1 = \frac{15 + 14 + 14}{3} = 14.33$$

$$O_2 = \frac{21 + 22\frac{1}{4} + 23}{3} = 22.17$$

$$R_1 = \frac{3.851 + 3.850 + 3.847}{3} = 3.8493$$

$$R_2 = \frac{3.873 + 3.878 + 3.879}{3} = 3.8766$$

$$D = 100.00$$

$$\sin 1'' = .000005$$



Making the proper substitutions in the above formula we have

$$V = \frac{3.8766 - 3.8493}{100.00 \times .000005 \left( \frac{22.08 - 14.33}{2} - \frac{14.42 - 22.17}{2} \right)}$$

and solving

$$\begin{aligned} V &= .0005 \times \left( \frac{.0273}{\frac{7.75}{2} - \frac{-7.75}{2}} \right) \\ &= \frac{.0273}{.0005 \times \frac{15.50}{2}} = \frac{.0273}{.003875} = 7.04 \text{ seconds.} \end{aligned}$$

Namely 1 division of the bubble = 7.04 seconds of arc.

The rods used were improved Gurley New York rods having a special target and folding disc plumbing level. The face of the target had a black background with a narrow white band along its median horizontal line. The white bands were one-fourth of an inch wide at the outer edges of the target, narrowing down to one-thirty-second of an inch at the center of the face, and allowed a closer setting of the target than the older form of targets.

The rods were divided into feet, tenths and hundredths, and were read to thousandths by a vernier on the target. The foot of the rod was a bronze casting terminating in a truncated pyramid one-half an inch square.

On the levels of 1900 and 1901 nine different rods have been used. Five of these rods have been tested by the U. S. Bureau of Standards, Washington, D. C., two in August, 1901, and three in January, 1902. The two rods, Nos. 1A and 2, used from Albany to Herkimer, from Albany to Whitehall, and from New London to Clyde, were tested in August, 1901, and reported longer than the U. S. Standard, the excessive length, however, being not greater than the changes in length that invariably take place from time to time in a rod of the highest class.

The other three rods tested were used on the Middle Division of the Barge Canal levels in 1900, as follows, No. 1 and No. 2, from Herkimer to the Oneida county line, and No. 3 and No. 4 from the Herkimer county line to New London and from Phoenix to Clyde.

The results of tests are given in table No. 1, and show rods 1, 3 and 4 to be short.

TABLE No. 1.

*Corrections to Leveling Rods, Nos. 1A and 2, submitted by State Engineer and Surveyor of New York. Rod No. 1A, at 30° Fahr. Values of spaces reckoned from zero end of rod.*

0 to 0.5 feet	=+ .00017 feet.
0 to 1.5 feet	=+ .00067 feet.
0 to 2.5 feet	=+ .00126 feet.
0 to 3.5 feet	=+ .00174 feet.
0 to 4.5 feet	=+ .00225 feet.
0 to 5.5 feet	=+ .00291 feet.
0 to 6.5 feet	=+ .00350 feet.
0 to 7.5 feet	=+ .00417 feet.
0 to 8.5 feet	=+ .00425 feet.
0 to 9.5 feet	=+ .00459 feet.
0 to 10.5 feet	=+ .00517 feet.
0 to 11.5 feet	=+ .00567 feet.
0 to 12.0 feet	=+ .00600 feet.

*Rod No. 2, at 30° Fahr.*

0 to 0.5 feet	=+ .00133 feet.
0 to 1.5 feet	=+ .00175 feet.
0 to 2.5 feet	=+ .00217 feet.
0 to 3.5 feet	=+ .00250 feet.
0 to 4.5 feet	=+ .00308 feet.
0 to 5.5 feet	=+ .00341 feet.
0 to 6.5 feet	=+ .00383 feet.
0 to 7.5 feet	=+ .00450 feet.
0 to 8.5 feet	=+ .00467 feet.
0 to 9.5 feet	=+ .00508 feet.
0 to 10.5 feet	=+ .00610 feet.
0 to 11.5 feet	=+ .00642 feet.
0 to 12.0 feet	=+ .00667 feet.

WASHINGTON, D. C., August 2, 1901.

*Corrections to Leveling Rods 1, 3 and 4 submitted by the State Engineer and Surveyor, New York. Length at 70° Fahrenheit.*

*Rod 1.*

End of rod to 1 foot = -0.00017 feet.

End of rod to 4 feet = -0.00075 feet.

End of rod to 6 feet = -0.00142 feet.

Extended rod, end of rod to 6.5 feet = -0.00125 feet.

Extended rod, end of rod to 7 feet = -0.00142 feet.

Extended rod, end of rod to 9 feet = -0.00192 feet.

Extended rod, end of rod to 12 feet = -0.00200 feet.

*Rod 3.*

End of rod to 1 foot = -0.00017 feet.

End of rod to 4 feet = -0.00033 feet.

End of rod to 6 feet = -0.00092 feet.

End of rod to 6.5 feet = -0.00108 feet.

Extended rod, end of rod to 7 feet = -0.00117 feet.

Extended rod, end of rod to 9 feet = -0.00142 feet.

Extended rod, end of rod to 12 feet = -0.00142 feet.

*Rod 4.*

End of rod to 1 foot = +0.00042 feet.

End of rod to 4 feet = +0.00008 feet.

End of rod to 6 feet = -0.00025 feet.

End of rod to 6.5 feet = -0.00000 feet.

End of rod to 7 feet = -0.00017 feet.

End of rod to 9 feet = -0.00033 feet.

End of rod to 12 feet = -0.00042 feet.

WASHINGTON, D. C., *January 24, 1902.*

The rods used on the Western Division in the levels of 1900 have not been tested at Washington, but have been compared with the tested rods as explained below. The rods used between Clyde and Rochester are marked "W. D. 1" and "W. D. 2," respectively. The rods used from Charlotte to Buffalo are marked "W. D. 3" and "W. D. 4," respectively.

Rod No. 2, tested in August, 1901, has been compared with rod No. 4, tested in January, 1902, by W. and L. E. Gurley, of Troy,

the makers of the rods, and with a standardized tape, and pronounced by them accurate for ten feet length of rod within such small limits as to be observable only by the aid of a magnifying glass.

Both of the rods tested in August, 1901 (Nos. 1A and 2), have been compared with rod No. 4, tested January, 1902, and with a standardized tape by Prof. Lewis Boss, director of the Dudley Observatory at Albany, and Superintendent of Weights and Measures, State of New York, and pronounced by him short at 10 feet, as follows: No. 1, 0.0014 ft., No. 2, 0.001 ft., No. 3, 0.001 ft.

All of the five rods tested in Washington, and the four untested rods, which were used in 1900 on the Western Division of the Barge Canal survey, have been compared one with another by this office force. As careful a comparison as could be made without a testing machine shows all nine of the rods to be very nearly of the same length at this time, the variations in length appearing not to exceed .001 foot in 10 feet in any case.

The differences in the rods when compared one with another at this time, or, the errors when compared with a standardized tape, do not exceed the differences observed under ordinary conditions between two successive settings of the target at three hundred feet from the instrument. It is practically impossible to determine the actual mean length of the rods when used out of doors for a long period of time under varying conditions of temperature and moisture, and we have no means of determining the lengths of the rods at the particular times when marked changes in altitude were measured, as at Cohoes, Little Falls, Waterford and other places where the locks are close together. Therefore, in view of all the above facts, we have decided to adopt the rods as being correct, and the differences determined in the field have been used without adjustment or change in computing the elevations given in this report.

Steel pins, twelve inches long, one inch square at the top, tapering to a point and having a shoulder three inches long carrying a hardened steel cone were used for turning points. The pin was driven securely in the ground with a mallet, striking on the head, and the rod was held on the hardened steel cone, care being taken not to disturb the pins in any way until all readings were taken. The level was shaded at all times by an umbrella when set up, and

a cloth bag when moving from point to point. A canvas wind breaker, ten feet long and five feet high, was stretched between one and one-half inch gas pipes driven firmly into the ground.

A view of the instrument, rods and other appliances is given in the accompanying photograph taken after the close of the field work.

### INSTRUCTIONS.

The instructions for field parties, based on those used for the Barge Canal survey for 1900, but with a smaller error limit, were as follows:

#### INSTRUCTIONS FOR LEVELING.

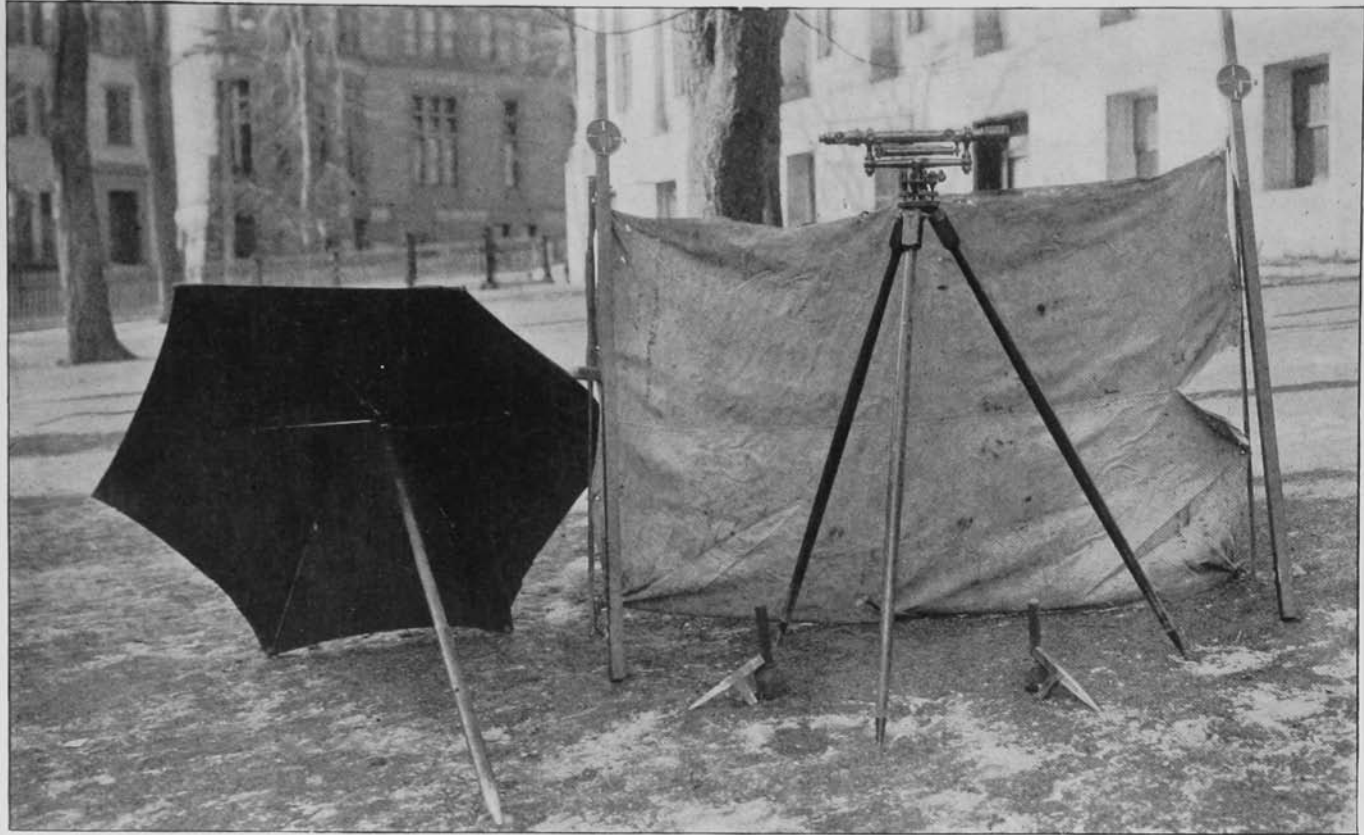
1. All lines both forward and backward shall be run with two rodmen.

2. Each rodman shall keep separate notes of rod readings on all turning points and bench marks he holds on and compute the elevations of the same when furnished with the height of instrument by the recorder. Each rodman, when he receives the signal "all right" from the instrument-man, shall at once read the rod and record the reading in the book provided. The recorder shall always read the rod after the rodman, make the necessary calculations and compare the results with the rodman. If the results differ, each shall again read the rod before comparing results, and if the readings of the rod differ, another setting of the target shall be made by the instrument-man.

3. Work must not be attempted during high wind nor when the air is "boiling" badly. During very hot weather an effort should be made to begin work very early and remain out late rather than to work during midday.

4. Foresights and backsights should be of equal length, and no sights over 300 feet shall be taken unless unavoidable circumstances necessitate the same, as in the case of crossing rivers or deep ravines. In such cases extra precautions must be taken and the average of repeated readings at changed positions of rod and instrument taken.

5. If it be impracticable to take equal fore and back sights, as soon as the steep slope or river crossing is passed enough unequal sights shall be taken to make each set balance.



Instrument, rods, umbrella, wind breaker and steel pins used 1900-1901.

## LEVELS ALONG TRANSIT LINES.

The Barge Canal levels of 1900 were run along transit lines, and side elevations were taken on transit hubs, while the Barge Canal lines of 1901 were between turning points only, and it is reasonable to suppose that the latter lines would show smaller closures.

## TABLES OF COMPARISON.

Tables 9 to 12 show the comparisons between the Barge Canal surveys and those of the U. S. D. W. and U. S. L. S. on the Erie and the Champlain Canals.

## COMPARISON OF FINAL RESULTS.

The elevation of the bench mark on the light-house at Buffalo as determined by the N. Y. State Surveys of 1900 and 1901, referred to Greenbush (14.73) is 591.21.

The elevation of this bench mark as determined by the U. S. Lake Survey (1875) and revised and corrected where errors are known to exist is as follows:

Mean elevation of Lake Erie as determined by the Lake Survey, 572.86. Difference in elevation between mean lake surface and the light-house bench mark is given (1) by Major T. W. Symons, corps of engineers, U. S. A., in letter of March 10, 1902, as "about 17.20;" (2) by a previous determination as published in the report of the U. S. Deep Waterways Commission of 1896, 16.95. The correctness of either of these values still remains in doubt and further investigation is in progress. The former value is used in this report. At Oswego the U. S. Deep Waterways report (1900) shows an error in the Lake Survey line of 0.89. This is corroborated by the work of the Canal Surveys of 1900 and 1901. The corrected value of the bench mark at Buffalo (referred to Greenbush 14.73) as made by a combination of the Deep Waterways and the Lake Survey lines therefore becomes

$$572.86 + 17.20 + 0.89 = 590.95$$

The elevation of the light-house bench mark as made by the N. Y. State Survey of 1876 cannot be determined directly, as no determination was made at that time, but can be obtained as follows:

Elevation of B. M. No. 221 on Black Rock guard lock, about six miles from Buffalo, as made in 1876, is 575.68. To reduce this to Greenbush (14.73) add 1.25 as shown previously in this report.

6. Distances along railroads may be taken by counting rails; at other times stadia or pacing may be used.

7. The instrument must always be leveled exactly before setting the target. After setting it and before giving the signal "all right" the level bubble must be examined. One rod, No. 1 or No. 2, should always be read first, so that one rod is used as foresight first at one set-up and as backsight first at the next set-up. The bubble tender shall always stand on the same side of the level tube when the reading is made, moving around the tripod as the level tube is reversed.

8. The level must be examined daily or oftener, if necessary, for adjustment, the especially important adjustments being the line of collimation and the level bubble.

9. The steel pegs as furnished must be used as turning points in all cases. These shall be firmly driven in the ground, and the backsight peg shall not be removed until the foresight reading is completed and the recorder and rodman have compared results on the backsight.

10. Plumbing levels must always be used and kept in adjustment.

11. Bench marks or turning points left at the termination of work at night, or for rain or other causes, must be selected with great care and located in such a manner that there will be no danger of their being disturbed or tampered with in order that the rod may again be held on the exact spot.

12. Permanent bench marks shall be clearly described, not only with reference to the nearest base line station but also to existing and easily identified features of the ground. A sketch shall be made showing the location of the bench mark and the reference marks referred to.

13. All circuit closures or checks by duplicate lines shall be distinctly noted and a reference made to the check levels.

Duplicate lines of levels shall be run forward and backward and the error of closure of the two runnings shall fall within .020 feet\*  $\sqrt{\text{distance in miles between benches}}$  or the lines shall be re-run. Bench marks shall be established at intervals of one-half to one mile.

\* After the levels had been run from Albany to Herkimer the results were so good that the limit of error was reduced to  $.016 \sqrt{\text{distance in miles between benches}}$ .



On the Champlain Canal a single line shall be run from the Erie Canal to Whitehall. The error of closure with the U. S. D. W., shall fall within .050 feet  $\sqrt{\text{distance in miles}}$  between the benches, or the lines shall be re-run in the opposite direction.

The number of men in each party shall consist of five: an instrument man, a recorder, two rodmen and an umbrella-man. The instrument must always be shaded from the sun both during the set-ups and in moving from point to point.

### PROCEDURE OF WORK.

Starting from a bench or turning point, the instrumentman paced along the towpath from 200 to 250 feet and set up the level, protecting it by the umbrella and wind shield as occasion required.

Rodman No. 1 remained at the bench and rodman No. 2, starting at the same bench, paced to and beyond the instrument till he reached a point as many paces beyond the instrument as the instrument was from rod No. 1, at which point he drove the steel pin.

Having carefully leveled the instrument, the leveler set the target on rod No. 1 as a backsight, and then, avoiding both haste and delay, turned the telescope to rod No. 2 and set the target as a foresight. The bubble tender kept the bubble constantly in the middle of the tube by slight pressure of the fingers on the leveling plate of the instrument. To balance errors due to defective vision of the bubble tender or differences in the light on the bubble, the bubble tender moved around the tripod when the telescope was turned.

The recorder remained with rodman No. 1 until both he and the rodman had read, recorded and checked the rod reading, when he walked rapidly to pin No. 2, checking the paced distances on the way. The recorder then read, recorded and checked the reading of target No. 2 and signaled "all right" to the instrumentman, who repeated the signal to rodman No. 1, when they both moved forward. Rodman No. 1, going to rod No. 2, read, recorded, computed and compared results with rodman No. 2 and the recorder, the leveler having at the same time paced up to point No. 2 to check the pacing and then paced past point No. 2 the proper distance and set up the



Grist Mill Bench-Mark, Greenbush (now Rensselaer) Opposite Albany, N. Y., Photographed 1901

instrument. Rodman No. 1 paced up to the instrument from point No. 2 and then an equal distance beyond it and drove steel pin and set target. Thus this alternation occurred: First set up, rod No. 1 on backsight is set first and rod No. 2 on foresight is set last; on second set up, rod No. 1 on foresight is set first and rod No. 2 on backsight is set last.

### BENCH MARKS.

The initial bench-mark of the survey is that known as the "Grist Mill" bench at Greenbush (now Rensselaer), N. Y. This bench-mark was established by the U. S. Coast and Geodetic Survey in 1857, and is a cross cut in the face of the cellar wall of an old Grist Mill at Greenbush, opposite Albany. Owing to the dilapidated condition of the building and its probable demolition in a few years it was considered advisable to transfer the elevation of the bench to some more permanent point, and this was done by a duplicate line of levels between the Grist Mill bench and the U. S. government bench on the water-table of the Post Office building in Albany. No settlement of the masonry on which the bench is marked seems to have taken place up to this time.

Benches were established on all locks and other permanent canal structures, and wherever possible former benches used by this department, by the U. S. Deep Waterway or by the Coast and the Geodetic Surveys were located, identified and checked upon. Photographs were taken of all benches used between Greenbush and Herkimer, mainly for the purpose of identifying the old benches. A photograph of the Grist Mill bench is reproduced herewith.

The length of line run each day depended almost entirely on the wind and the condition of the atmosphere, and work was stopped when it was found that three or more readings were necessary in order to obtain two readings within two-thousandths foot of each other. The best results were obtained by sights of from 200 to 225 feet. The progress records for the various portions of the survey are given in Table No. 2.

TABLE NO. 2.

Progress Sheet.

DATE.	Days in field.	Miles of single line.	Miles of duplicate line.	Average miles, single line, per day in field.	Cost per mile of double line, fieldwork only.
ERIE CANAL.					
1901. <i>Greenbush to Herkimer.</i>					
March 1st to June 20th.....	77	243.03	95.43	3.16	\$27.70
<i>Grove Spring Road Bridge to Culvert No. 5, East of Clyde.</i>					
September 16th to December 10th..	57	199.18	74.93	3.49	80.90
<i>Tie Lines Between Barge Canal 1900 and Old Canal Benches.</i>					
June 27th to July 5th.....	4	12.50	5.75	3.12	28.00
OSWEGO CANAL.					
<i>Weigh Lock, Syracuse, to Barge Canal B. M. 60, Seneca River.</i>					
June 21st to June 26th.....	5	16.60	8.00	3.32	19.38
CHAMPLAIN CANAL.					
<i>From Lock No. 3, Erie Canal, to Lake Champlain at Whitehall.</i>					
August 20th to September 14th ...	19 <sup>†</sup>	73.26	*65.10	3.8	†11.12

On the Barge Canal survey of 1900 the average cost per mile in the Middle Division was \$25.70 for finished line.

### FORMER LINES OF LEVELS.

During the past thirty years several lines of levels have been run across the State and from Albany to Whitehall, by the State and Federal authorities. In 1876 a resurvey of the benches on the several canals was ordered by the State Engineer, and was made under the direction of the Division Engineer on each division. Ordinary "Y" levels were used, but great care was taken in the execution of the work.

The descriptions and elevations of the benches as determined by the 1876 survey have been published in various reports of the State Engineer since the completion of the survey, and as a matter of record an index to those reports is given in table No. 3.

\*Finished line.

†Single line.

TABLE NO. 3.

*Index to Lists of Bench Marks in Reports of State Engineer.*

	PAGE
Champlain Canal, Report 1877.....	115
Champlain Canal, Report 1884.....	70
Champlain Canal, Report 1888.....	116
Champlain Canal, Report 1898.....	135
Glens Falls Feeder, Report 1898.....	139
Erie Canal, Eastern Division, Report 1877.....	108
Erie Canal, Eastern Division, Report 1880.....	35
Erie Canal, Eastern Division, Report 1884.....	72
Erie Canal, Eastern Division, Report 1888.....	97
Erie Canal, Eastern Division, Report 1898.....	122
Erie Canal, Middle Division, Report 1877.....	155
Erie Canal, Middle Division, Report 1889.....	201
Erie Canal, Middle Division, Report 1890.....	250
Erie Canal, Middle Division, Report 1891.....	342
Erie Canal, Middle Division, Report 1892.....	224
Erie Canal, Western Division, Report 1877.....	237
Erie Canal, Western Division, Report 1888.....	254
Erie Canal, Western Division, Report 1898.....	269
Oswego Canal, Report 1891.....	348
Cayuga Canal, Report 1891.....	353
Cayuga Canal, Report 1892.....	230
Seneca River, between Cayuga Lake and Cross Lake, Report 1891.....	356
Benches along Hudson River, Report 1890.....	300
Benches along Hudson River, Report 1892.....	270
Black River Canal, description but no elevations, Report 1891.....	357
Mean tides along Hudson River, Report 1890.....	303
Mean tides along Hudson River, Report 1892.....	272
Barge Canal Report 1901.....	383

Since the survey of 1876 many of the structures upon which the bench marks of that survey were located have been rebuilt, and the action of the frost and other disturbing influences have caused movements in those now existing, making the old elevations unreliable. In future work the former lists of elevations should not be used, but the results of the Barge Canal survey of 1900 and 1901 (given later in this report), being based on recent and more accurate surveys, should replace them.

In 1875 the U. S. Lake Survey ran a duplicate line of levels between the Grist-Mill bench at Greenbush and Oswego, establishing a permanent bench on the cut-stone masonry of the old stone pier by following the Erie Canal from Albany to Higginsville and the Oswego Canal from Phoenix to Oswego. The levels were run by two parties using "Y" levels with sensitive bubbles.

Both parties ran west, the second party following the first and checking on the benches established by them. Whenever the difference between the elevations by the two parties on the same

bench exceeded 0.10 feet  $\sqrt{\text{miles}}$  between benches, the lines were re-run.<sup>1</sup>

From Oswego the U. S. Lake Survey levels were carried by the water level of Lake Ontario to Port Dalhousie at the foot of the Welland Canal, based on gauges at Oswego, Charlotte and Port Dalhousie.

From Port Dalhousie, double lines of spirit levels were run to Port Colbourne on Lake Erie, thus completing a line of levels from the Hudson River to Lake Erie.

The difference at Oswego between the two lines of the 1875 levels of the U. S. Lake Survey was .953 feet, and the later reports of the U. S. Coast and Geodetic Survey contain new elevations for the benches of that survey corrected by later lines of levels.<sup>2</sup>

The U. S. Geological Survey<sup>3</sup> in 1898 connected the water level of Lake Erie with the Erie Canal and the 1875 U. S. Lake Survey benches near Cohoes by a line of precise levels following the Erie railroad from Dunkirk to Binghamton, the Delaware and Hudson Canal Co.'s railroad to South Schenectady, and highways and the Erie Canal to lock No. 15 near Cohoes. This line of levels was connected with the Greenbush bench mark by means of the U. S. Lake Survey published elevations between those points.

The U. S. Board of Engineers on Deep Waterways (1898-9) ran duplicate lines of "Y" levels between the Greenbush bench and Oswego, and between West Troy and Whitehall along the Champlain Canal. This survey followed the Erie Canal from Albany to near Rome, then across country to Phoenix and down the Oswego River to Oswego. The Deep Waterway surveys were very carefully made, and furnish a recent line between the Hudson River and Lake Ontario.

The Barge Canal surveys, made under your direction in 1900 and 1901, completes a new line of levels between the Hudson River and Lake Erie, and furnishes another determination of the differences of elevation between the Hudson River and Lake Erie and Lake Champlain.

Elevations of common points of the various surveys are given in Table No. 4 for comparison, and the routes followed by the various surveys are shown on the accompanying map.

<sup>1</sup> See Professional Papers U. S. Corps of Engineers No. 24, p. 526, § 3.

<sup>2</sup> See Appendix No. 3 U. S. Coast and Geodetic Survey 1898-9, p. 540.

<sup>3</sup> See Appendix 20th Rep. U. S. G. S., p. 310.

TABLE NO. 4.

## Original Unadjusted Data for Comparisons.

REFERENCE.	Bench mark.	Elevation.	Bench mark.	Elevation.	Difference.
<i>By Canal Survey of 1900 and 1901.</i>					
No. of line in this table.					
1	B. M. No. 0	Greenbush .....	Lock No. 15 .....	0.000	+145.901
1 $\frac{1}{2}$	B. M. No. 0	Greenbush .....	Lock No. 1, coping .....	0.000	+2.929
2	B. M. No. 26	Lock No. 15 .....	Lock No. 36 .....	145.901	+183.487
3	B. M. No. 169	Lock No. 36 .....	Herkimer (No. 187) .....	329.388	+45.093
4	B. M. No. 244	Grove Spring Bridge .....	Syracuse Weigh Lock (B. M. No. 300) ..	415.586	-26.452
5	B. M. No. 300	Syracuse Weigh Lock .....	Pittlock's Bridge (B. M. No. 369) .....	389.154	-5.783
6	B. M. No. 369	Pittlock's Bridge .....	Culvert No. 5, Clyde (B. M. No. 372) ..	383.371	-7.155
7	B. M. No. 187	Herkimer .....	Frankfort (B. M. 203) .....	374.481	+30.140
8	B. M. No. 203	Frankfort .....	Grove Spring Bridge (B. M. 244) .....	401.621	+10.965
9	B. M. No. 53	Phoenix .....	Culvert No. 5, Clyde (B. M. No. 372) ..	344.329	+31.887
10	B. M. No. 372	Culvert No. 5, Clyde .....	Four-Mile Grocery .....	376.216	+124.307
11	B. M. No. 459	Four-Mile Grocery .....	Charlotte (B. M. 555) .....	500.522	-231.248
12	B. M. No. 459	Four-Mile Grocery .....	Black Rock Guard Lock (B. M. 547) .....	500.522	+62.318
12 $\frac{1}{2}$	B. M. No. 4A	Lock No. 1 .....	Black Rock Guard Lock (B. M. 547) .....	2.929	+559.911

## Miles from Greenbush.

## By U. S. D. W. Survey.

13	0.00	Greenbush .....	Lock No. 15 .....	0.000	146.000	+146.000
14	10.76	Lock No. 15 .....	Lock No. 36 .....	146.000	329.570	+183.570
15	82.51	Lock No. 36 .....	Herkimer .....	329.570	374.680	+45.110
16	96.39	Herkimer .....	Frankfort .....	374.680	404.850	+30.170
17	101.66	Frankfort .....	Phoenix .....	404.850	344.260	-60.590
18	173.34	Phoenix .....	Oswego (194.92) .....	344.260	338.120	-106.140

## Page.

## By U. S. L. S.—(levels of 1875).

19	Prof. Pa. No. 24	610	Greenbush .....	14.730	Lock No. 15 (8A) .....	160.492	+145.762
20	"	610	Lock No. 15 (8A) .....	160.492	Lock No. 36 (B. M. 37) .....	343.967	+183.475
21	"	613	Lock No. 36 (B. M. 37) .....	343.967	Frankfort (B. M. 41) .....	419.242	+75.275
22	"	618	Frankfort (B. M. 41) .....	419.242	Oswego ("A") page 209 .....	251.960	-167.282
23	"	614	Oswego ("A") .....	251.960	L. Ontario (mean surface) .....	246.610	-5.350
24	"	609	L. Ontario (mean surface) .....	246.610	Charlotte (B. M. No. 1) .....	383.230	+36.620
25	"	609	L. Ontario (mean surface) .....	246.610	Port Colborne .....	584.640	+338.030
26	"	609	Port Colborne (B. M. Custom House) .....	584.640	L. Erie (mean surface) .....	572.860	-11.780

TABLE NO. 4—(Concluded).

REFERENCE.		Bench mark.	Elevation.	Bench mark.	Elevation.	Difference.
No. of line in this table.		<i>By U. S. Geological Survey.</i>				
20th Appendix.						
27	page 310	Lock No. 15 .....	159.501	Dunkirk B. M. ....	588.450	+428.949
28	page 299	Dunkirk B. M. ....	588.450	Lake Erie .....	572.420	- 16.030
Report 1877.		<i>Canal Levels 1876.</i>				
29	page 108	Lock No. 15 .....	159.380	Lock No. 36 .....	343.244	+183.864
30	page 108	Lock No. 36 .....	343.244	Syracuse Weigh Lock .....	402.708	+ 59.464
31	page 156	Syracuse Weigh Lock .....	402.708	Pittlock's Bridge (page 237) .....	396.939	- 5.769
32	page 244	Black Rock Guard Lock .....	575.677	Lake Erie (water surface page 208) .....	571.680	- 3.997
33	page 108	Lock No. 1 .....	16.115	Black Rock Guard Lock .....	575.677	+559.562
34	page 108	Lock No. 1 .....	16.115	Lake Erie .....	571.630	+555.515



## DATUM PLANE OF CANAL SURVEY OF 1876.

The datum of the 1876 canal levels was mean low tide in the Hudson River at Albany, and its elevation above mean tide at Sandy Hook has been given different values by the various federal departments.

In 1875 the U. S. Engineers<sup>2</sup> determined the difference as 1.18 feet, but in 1896 the U. S. Deep Waterway Commission<sup>1</sup> deduced a value of 1.30 feet therefor. The U. S. Geological Survey<sup>3</sup> has accepted the value of 1.18 feet, and used it in deducing the elevations of their benches.

The State Engineer in 1888<sup>3</sup> accepted the datum of the 1876 canal surveys as being 7.443 feet above the lower miter sill of Erie Canal lock No. 1, or, in other words, the lower miter sill was taken as 7.443 below mean low tide at Albany. The elevation of the lower miter sill of lock No. 1, as determined by the survey of 1901 by duplicate lines from the Greenbush bench, is 6.198 below mean tide at Sandy Hook, making the difference of datum between the canal survey of 1876 and this survey,  $7.443 - 6.198 = 1.245$  feet, which may be taken as 1.25 feet for convenience.

To reduce elevations of this (1901) survey to the datum of the 1876 canal survey subtract 1.25 feet from those of this survey.

## DATUM OF SURVEYS OF 1900 AND 1901.

As all of the government surveys in the vicinity of Albany have taken elevations on the Greenbush bench mark, and to enable comparisons to be made readily between the different surveys, all of the field elevations in the 1901 survey were taken with the Greenbush bench mark as the zero of their datum plane.

In reducing the elevations to sea level at Governor's Island, it becomes necessary to adopt a value above that level for the Greenbush bench, as nearly every former survey gave a different value therefor.

Several lines of levels have been run from various tidal gauges

<sup>1</sup> Rep U. S. D. W. Commission, 1896, p. 72.

<sup>2</sup> Appendix to the 19th Annual Report U. S. G. S., p. 203.

<sup>3</sup> Report of State Engineer for 1888, p. 97.

to the Greenbush bench, and they are described in many published reports to which reference only need be made.

A discussion of the results of the various lines run to the Greenbush bench is given in the report of the U. S. Deep Waterway Commission, 1896 (p. 70), from which the following table of elevations of that bench has been taken and to which has been added data from later reports, bringing the record up to date:

TABLE NO. 5.  
*Elevations of Greenbush Bench.*

Date.	AUTHORITY.	Location of gauge.	Elevation, feet.
1857-8	Mr. J. B. Vose, U. S. Coast and Geodetic Survey.	Governor's Island .....	15.37
1875	Lieut. J. B. Willard, U. S. Engineers .....	Governor's Island .....	15.37±0.50
1877	Mr. O. H. Tittman, Coast and Geodetic Survey ...	Governor's Island .....	14.728
1889	Deduced from West Shore R. E. levels .....	Weehawken .....	16.01
1894	Coast and Geo. Survey (mean of the two following lines).....	.....	13.64
1893-5	U. S. Coast and Geo. Survey from Boston .....	Boston .....	14.07
1893-5	U. S. Coast and Geo. Survey from Sandy Hook .....	Sandy Hook .....	13.22
1898-9	U. S. Coast and Geo. Survey, Appendix No. 8, p. 414 <sup>1</sup> .....	From an adjusted net ..	13.732
1898-9	U. S. Coast and Geo. Survey, Appendix No. 8, p. 540 <sup>1</sup> .....	From an adjusted net..	13.577

<sup>1</sup> Appendix 8, U. S. Coast and Geodetic Survey, report 1898-9.

The value 14.73 feet above mean tide at Governor's Island has been adopted as the elevation of the Greenbush bench in this survey for the following reasons:

This elevation was used by the U. S. Lake Survey in determining the elevations of the Great Lakes, and all of its published elevations are based thereon.

This elevation was used by the U. S. Coast and Geodetic Survey in determining the elevation of Lake Champlain, and all of its published elevations prior to 1900 are based thereon.

The U. S. Deep Waterway surveys and the 1900 Barge Canal surveys are based on this elevation, and as any future improvement in water transportation between Lake Erie and the Hudson River is likely to make use of those surveys, it is thought that less confusion will occur by retaining this elevation than by using a later one.

Future determinations of the elevation of the initial bench will undoubtedly fix its true value, when, if desired, the elevations given by this survey can be readily reduced to their true value by making the proper reductions.

## BENCH MARKS.

The following tables (Nos. 13-18) contain the descriptions, distance from initial point of survey, elevations above Greenbush and above mean tide at Governor's Island, of the bench marks established by the Barge Canal surveys of 1900 and 1901.

The list of benches between Herkimer and New London and between Clyde and Buffalo are republished from the report of the State Engineer on the Barge Canal of February, 1901, so that all of the Barge Canal benches along the Erie and Champlain Canals may appear in one volume for future use. A list of benches along the Oswego Canal is published based on the levels of 1901, 1900 and the U. S. D. W. Survey.

To the republished list have been added columns giving the elevations based on the survey of 1901, the 1900 values having been based on the U. S. Deep Waterway survey from Greenbush to Herkimer and Phoenix.

## ACCURACY OF THE WORK.

Table No. 8 has been prepared to show the differences between the east and west lines of this survey. In that table column 1 gives the serial number of the bench mark; column 2 the distance of the second bench noted in column 1, in miles from Greenbush; columns 3, 4 and 5 the difference between the bench marks as given by the west line, the east line and the mean thereof; column 6 shows the partial excesses obtained by subtracting the difference of elevations as determined by the west line from those determined by the east line; column 7 shows the total excess up to that bench mark, the total excess being the algebraic sum of all of the preceding partial excesses. In columns 6 and 7 the plus sign denotes that the east line is above the west line, and the minus sign the reverse. Columns 8 and 9 give the value of "C" in the equation  $\text{error} = C\sqrt{\text{miles between benches}}$ , between successive benches and from the Greenbush bench respectively.

Dividing the line from Greenbush to Buffalo into circuits according to the individual surveys and taking the values of "C" from column 8, as calculated between successive bench marks, as

being the severest test of the accuracy of the work, we have the following table :

TABLE No. 6.

Circuit number.	Length in miles.	LOCATION.	Person in charge.	Allowable value of "C".	Max. "C".	Times zero occurs.
1	95.42	Greenbush to Herkimer.....	W. B. Landreth..	.020	.016	43
2	12.56	Herkimer—East line Oneida county.	E. A. Lamb.....	.050	.016	2
3	25.74	East line Oneida county to Grove Springs.....	P. A. Meyer.....	.050	.045	0*
4	74.93	Grove Spring to culvert east of Clyde.	Clark Brown.....	.016	.016	10
5	58.7	Culvert east of Clyde to Rochester..	C. W. Trumbull..	.050	.049	6
6	94.19	Rochester to Buffalo.....	Clark Brown.....	.050	.038	11

\* Min. = 0.001.

### TOTAL DIVERGENCE OF LINES.

Column 7 of table No. 8 gives the total divergence of the east and west lines of the Barge Canal surveys as follows:

#### GREENBUSH TO HERKIMER :

The lines cross at miles 0.75, 10.6, 11.0, 11.20, 11.60, 13.20, 15.20, 22.60, 24.70, 29.50, 29.90, 38.50, 51.20, 54.30, and 54.50. From miles 54.50 to Herkimer, at mile 95.42, the east line is above the west with a maximum divergence of .067 at B. M. 136 and .060 at Herkimer.

#### HERKIMER TO BUFFALO :

From Herkimer to Buffalo the east line is constantly above the west one with maximum values of .290 at B. M. 413; .289 at B. M. 549; minimum values of .032 at B. M. 371; .120 at B. M. 463, and a final divergence of .267 at the Buffalo light house.

Taking the separate circuits given in Table No. 8 by themselves and comparing their east and west lines we have the following table of their divergence :

TABLE No. 7.

*Divergence of Lines of Circuits.*

CIRCUIT.	Maximum divergence.	Times zero occurs.
1.....	+.067	15
2.....	+.014	4
3.....	+.050	4
4.....	+.063	4
5.....	+.193	2
6.....	+.135	9

## LINES RE-RUN.

The length of the lines re-run varied somewhat on the various surveys, owing mainly to their having been run in different seasons of the year, and during the work of 1901 the amounts re-run were: Between Greenbush and Herkimer, 26 per cent; between Grove Spring and Clyde, 30 per cent of the total length of east and west accepted lines.

## PROBABLE ERROR.

A generally accepted formula for determining the probable error of a direct and reverse line of levels is

$$\text{Probable error (R)} = \pm 0.674 V$$

Where R = probable error

$$V = \frac{\text{difference between lines}}{2}$$

$$\text{Difference at Buffalo} = .267$$

$$V = \frac{.267}{2} = .134$$

$$R = .674 \times .134 = .0903$$

## RODS AND INSTRUMENTS OF SURVEYS USED IN COMPARISON OF RESULTS.

The rods and instruments for the various lines used in the comparisons are described in the reports of these different surveys.

The rods used by the U. S. Geological Survey between Cohoes (Lock 15) and Dunkirk were made by the same makers as the rods used by this survey.

The rods used for the first twenty miles from the Greenbush bench mark on the U. S. D. W. Survey were the ordinary Philadelphia rods, and the results given by them differ by 0.10 in 10.76 miles from the results of this survey, which were carefully checked and re-run because of such disagreements. At the end of about 20 miles the U. S. D. W. survey discarded the Philadelphia rods and adopted new rods which gave results agreeing very closely with those of this survey. The greatest divergence (0.295) occurs near Utica. The difference at the last common B. M. near Phoenix is .069 feet.

## LEVELS ALONG TRANSIT LINES.

The Barge Canal levels of 1900 were run along transit lines, and side elevations were taken on transit hubs, while the Barge Canal lines of 1901 were between turning points only, and it is reasonable to suppose that the latter lines would show smaller closures.

## TABLES OF COMPARISON.

Tables 9 to 12 show the comparisons between the Barge Canal surveys and those of the U. S. D. W. and U. S. L. S. on the Erie and the Champlain Canals.

## COMPARISON OF FINAL RESULTS.

The elevation of the bench mark on the light-house at Buffalo as determined by the N. Y. State Surveys of 1900 and 1901, referred to Greenbush (14.73) is 591.21.

The elevation of this bench mark as determined by the U. S. Lake Survey (1875) and revised and corrected where errors are known to exist is as follows:

Mean elevation of Lake Erie as determined by the Lake Survey, 572.86. Difference in elevation between mean lake surface and the light-house bench mark is given (1) by Major T. W. Symons, corps of engineers, U. S. A., in letter of March 10, 1902, as "about 17.20;" (2) by a previous determination as published in the report of the U. S. Deep Waterways Commission of 1896, 16.95. The correctness of either of these values still remains in doubt and further investigation is in progress. The former value is used in this report. At Oswego the U. S. Deep Waterways report (1900) shows an error in the Lake Survey line of 0.89. This is corroborated by the work of the Canal Surveys of 1900 and 1901. The corrected value of the bench mark at Buffalo (referred to Greenbush 14.73) as made by a combination of the Deep Waterways and the Lake Survey lines therefore becomes

$$572.86 + 17.20 + 0.89 = 590.95$$

The elevation of the light-house bench mark as made by the N. Y. State Survey of 1876 cannot be determined directly, as no determination was made at that time, but can be obtained as follows:

Elevation of B. M. No. 221 on Black Rock guard lock, about six miles from Buffalo, as made in 1876, is 575.68. To reduce this to Greenbush (14.73) add 1.25 as shown previously in this report.

The difference of elevation between the bench at the guard lock and the light-house bench as determined by the Canal Survey of 1900, is 13.64. The corrected value of the light-house bench-mark as determined by the State Survey of 1876 therefore becomes:  $575.68 + 1.25 + 13.64 = 590.57$ .

The U. S. Geological Survey determination can be compared with the new determined elevation of the light-house bench mark. On account of this line forming part of an adjusted net the following result may be subject to revision, depending on the exact results of the original lines. The elevation of the bench mark on the Nelson block, Dunkirk, as published in the 20th Annual Report of the Geological Survey is 588.235. To obtain the elevation of the light-house bench the following corrections are necessary:

+0.215 to remove the adjustment.

--16.03 to obtain mean elevation of Lake Erie.

+17.20 difference between mean water surface and light-house bench.

+1.38 to reduce to Greenbush (14.73) determined as follows: Elevation of B. M. on Crescent aqueduct by U. S. D. W. is 195.55; by Canal Survey, 1901, is 195.58; average, say, 195.57. Elevation as made by U. S. Geological Survey is 194.15. Difference 1.38.

The value of the light-house bench mark, as determined by the U. S. Geological Survey, therefore becomes

$$588.235 + .215 - 16.03 + 17.20 + 1.38 = 591.00.$$

### RESULT.

To sum up we have, then, the following values of the bench mark on the light-house at Buffalo all referred to the same datum, viz., Greenbush (14.73):

N. Y. State Canal Surveys of 1900 and 1901.....	591.21
U. S. Lake and Deep Waterways Surveys, combined .....	590.95
N. Y. State Canal Survey of 1876.....	590.57
U. S. Geological Survey.....	591.00

### CONCLUSION.

The men employed on the Barge Canal lines were taken from the State Civil Service list and had no special training in accu-

rate leveling, though the men employed in 1901 nearly all had experience in similar work in 1900.

The instruments used were the regular engineer's levels with sensitive bubbles, but could in no sense be called "precise levels," as the term is used in the government reports. See plate No. 1.

The results are those obtained by men of average ability and carefulness working under rigid instructions with instruments such as may be obtained from any reputable maker, and it should be distinctly understood that no claim is made that the lines run are "precise levels" in the technical sense of the term.

The methods of work were almost identical with the later methods of the U. S. Coast Survey and of the U. S. Geological Survey, but the levels used were inferior to the precise levels used by the latter in the optical power of the telescope, in weight and solidity and of a much lower cost. The results are those obtained with an average leveling party working at a good rate.

Experience gained on the Barge Canal surveys shows the necessity of certain precautions to secure a uniform degree of accuracy. Among them may be cited the following:

1. Before testing the instrument adjustments it should be set in the shade and allowed to remain a few moments, in order to allow all of its parts to come to the same temperature.
2. During bright sunlight the line of sight should not be near the ground, or a fence, stone wall or building, to avoid the action of the heat radiated from them.
3. After the target is set and clamped another careful observation should be made of the contact of the rod with the turning point, the plumbing of the rod and the centering of the instrument bubble before the final acceptance of the target setting.
4. During windy weather the instrument should not be set up in dry sand or dust, as the vibration of the tripod legs causes the fine particles to settle under them, raising the instrument.
5. After the instrument is leveled the observer and bubble tender should stand near it as little as possible, owing to the effect of the heat of their bodies in changing the temperature of parts of the instrument. They should, as far as possible, place their bodies so that their breath will not be blown upon the instrument.



The essentials for obtaining good results are: A good instrument with a sensitive bubble, kept in perfect adjustment; equal back sights and fore sights; protection of the instrument from the direct rays of the sun at all times; cessation of work when bad air or wind do not allow two settings of the target on the same point within .002 of a foot. The chief of the party should be a careful, patient man, who should early learn when to stop work, and his guide should be accuracy first, speed second.

I desire to heartily thank the men associated with me in the surveys for the prompt and efficient manner in which their work has been done, and especially Clark Brown, D. B. La Du and F. L. Fonda for their valuable assistance in the reduction of the field notes and preparation of data given in this report.

TABLE No. 8.

## Results of Levels Between Greenbush and Buffalo, N. Y., Erie Canal.

(1) Bench marks.	(2) Distance from Green- bush.	(3) Difference of Elevation.			(5) Mean.	(6) Partial excess = e.	(7) Total excess = E.	(8) Value of "c" in e = $c\sqrt{\text{miles.}}$ Col. 6.	(9) Value of "C" in E = $C\sqrt{\text{miles.}}$ Col. 7.
		Line west.	Line east.						
0- 1	0.76	-1.042	-1.045	-1.043	-.003	-.003	.003	.003	
1- 2	0.76	+5.613	+5.613	+5.613	.000	-.003	.000	.003	
2- 4	1.44	-8.340	-8.339	-8.339	+.001	-.002	.001	.002	
4- 5	2.68	+16.087	+16.095	+16.091	+.008	+.006	.007	.004	
5- 5A	3.18	-1.184	-1.188	-1.186	-.004	+.002	.006	.001	
5A- 6	3.75	+5.024	+5.031	+5.027	+.007	+.009	.009	.005	
6- 7	5.03	-4.299	-4.299	-4.299	.000	+.009	.000	.004	
7- 8	5.53	+6.431	+6.434	+6.432	+.003	+.012	.004	.005	
8- 9	6.18	-5.985	-5.983	-5.984	+.002	+.014	.002	.006	
9- 10	6.48	+2.877	+2.878	+2.877	+.001	+.015	.002	.006	
10- 11	7.18	-0.659	-0.663	-0.661	-.004	+.011	.005	.004	
11- 12	7.30	-7.218	-7.218	-7.218	.000	+.011	.000	.004	
11- 13	7.38	-1.553	-1.550	-1.551	+.003	+.014	.007	.006	
13- 14	7.93	+10.858	+10.846	+10.852	-.012	+.002	.016	.001	
14- 15	8.26	+11.154	+11.158	+11.156	+.004	+.006	.007	.002	
15- 16	8.52	+10.781	+10.776	+10.778	-.005	+.001	.010	.000	
16- 17	8.73	+10.002	+10.005	+10.003	+.003	+.004	.007	.001	
17- 18	8.86	+9.646	+9.647	+9.646	+.001	+.005	.003	.002	
18- 19	9.02	+10.260	+10.260	+10.260	.000	+.005	.000	.002	
19- 20	9.26	+10.129	+10.135	+10.132	+.006	+.011	.011	.003	
20- 21	9.53	+9.948	+9.941	+9.944	-.007	+.004	.002	.001	
21- 22	9.69	+10.010	+10.011	+10.010	+.001	+.005	.002	.001	
22- 23	9.84	+10.087	+10.090	+10.088	+.003	+.008	.008	.003	
23- 24	10.04	+9.896	+9.898	+9.897	+.002	+.010	.004	.003	
24- 25	10.26	+9.940	+9.937	+9.938	-.003	+.007	.002	.002	
25- 26	10.53	+10.230	+10.223	+10.226	-.007	.000	.013	.000	
26- 27	10.53	-0.100	-0.100	-0.100	.000	.000	.000	.000	
27- 28	10.72	+9.943	+9.940	+9.941	-.003	-.003	.007	.001	
28- 29	11.04	+10.137	+10.141	+10.139	+.004	+.001	.007	.000	
29- 30	11.23	+10.284	+10.280	+10.282	-.004	-.003	.009	.001	
30- 31	11.50	+0.246	+0.245	+0.245	-.001	-.004	.002	.001	
31- 32	11.97	+1.737	+1.746	+1.741	+.009	+.005	.013	.001	
32- 33	12.07	-31.412	-31.408	-31.410	+.004	+.009	.012	.003	
32- 35	13.34	+0.225	+0.219	+0.222	-.006	-.001	.005	.000	
35- 36	13.98	+2.304	+2.300	+2.302	-.004	-.005	.005	.001	
36- 37	14.20	-0.092	-0.094	-0.093	-.002	-.007	.004	.002	
37- 38	15.47	-3.082	-3.074	-3.078	+.008	+.001	.007	.000	
38- 39	15.87	+1.563	+1.563	+1.563	.000	+.001	.000	.000	
39- 41	16.62	-1.813	-1.813	-1.813	.000	+.001	.000	.000	
41- 42	17.62	+1.092	+1.104	+1.098	+.012	+.013	.012	.003	
42- 43	18.00	-0.089	-0.090	-0.089	-.001	+.012	.002	.003	
43- 44	18.31	+0.034	+0.020	+0.027	-.014	-.002	.025	.000	
44- 45	18.69	-1.491	-1.485	-1.488	+.006	+.004	.010	.001	
45- 46	19.44	+0.148	+0.155	+0.151	+.007	+.011	.008	.002	
46- 47	19.86	+2.149	+2.140	+2.144	-.009	+.002	.014	.000	
47- 48	20.09	+5.483	+5.487	+5.485	+.004	+.006	.008	.001	
48- 49	20.96	+4.768	+4.766	+4.767	-.002	+.004	.002	.001	
49- 50	22.83	+5.132	+5.127	+5.129	-.005	-.001	.004	.000	
50- 51	24.18	+4.272	+4.269	+4.270	-.003	-.004	.008	.001	
51- 52	26.05	+8.814	+8.826	+8.819	+.011	+.007	.008	.001	
52- 53	26.23	+9.904	+9.906	+9.906	+.002	+.009	.005	.002	
53- 54	26.31	+0.903	+0.905	+0.904	+.002	+.011	.002	.002	
54- 55	26.43	+3.678	+3.676	+3.677	-.002	+.009	.006	.002	
55- 56	26.53	-0.187	-0.187	-0.187	.000	+.009	.000	.002	
56- 57	26.60	+34.673	+34.673	+34.673	.000	+.009	.000	.002	
56- 59	26.00	-4.520	-4.521	-4.520	-.001	+.008	.000	.002	
59- 60	28.22	+1.871	+1.870	+1.870	-.001	+.007	.002	.001	
60- 61	28.36	+1.718	+1.717	+1.717	-.001	+.006	.001	.001	
61- 62	29.10	-1.874	-1.874	-1.874	.000	+.006	.000	.001	
62- 63	29.52	+1.504	+1.500	+1.502	-.004	+.002	.005	.000	
63- 64	29.77	+0.593	+0.588	+0.590	-.005	-.003	.010	.001	
64- 65	30.11	+5.209	+5.214	+5.211	+.006	+.002	.009	.000	
64- 66	30.07	-2.186	-2.179	-2.182	+.007	+.004	.013	.001	
66- 67	30.67	+0.007	+0.007	+0.007	.000	+.004	.000	.001	
67- 68	30.77	+1.320	+1.319	+1.319	-.001	+.003	.002	.001	
68- 69	31.33	-11.042	-11.042	-11.042	.000	+.003	.000	.001	
69- 70	32.47	+8.714	+8.716	+8.715	+.002	+.005	.002	.001	
70- 71	32.47	+3.081	+3.081	+3.081	.000	+.005	.000	.001	
71- 72	32.15	+4.536	+4.541	+4.538	+.005	+.010	.006	.002	
72- 73	33.26	+0.660	+0.660	+0.660	.000	+.010	.000	.002	
73- 74	33.94	+7.766	+7.760	+7.763	-.006	+.004	.003	.001	
74- 75	34.56	+2.572	+2.574	+2.573	+.002	+.006	.003	.001	
75- 76	35.18	-1.429	-1.433	-1.431	-.004	+.002	.005	.000	
76- 77	35.35	+2.838	+2.839	+2.838	+.001	+.008	.002	.001	

## SPIRIT LEVELS OF THE BARGE CANAL SURVEY.

645

TABLE NO. 8—(Continued).

(1) Bench marks.	(2) Distance from Green- bush.	(3) Difference of Elevation.			(5) Mean.	(6) Partial excess = e.	(7) Total excess = E.	(8) Value of "c" in e = c/miles. Col. 6.	(9) Value of "C" in E = C/miles. Col. 7.
		Line west.	Line east.						
77-78	36.20	-1.435	-1.434	-1.434	+0.001	+0.004	.001	.001	
78-79	36.66	-1.161	-1.164	-1.162	-0.003	+0.001	.004	.000	
79-80	37.61	-1.274	-1.270	-1.272	+0.004	+0.005	.004	.001	
80-82	37.74	+7.736	+7.738	+7.737	+0.002	+0.007	.006	.001	
82-83	38.24	+2.405	+2.401	+2.403	-0.004	+0.003	.006	.000	
83-84	38.66	+0.881	+0.877	+0.879	-0.004	-0.001	.006	.000	
84-85	39.21	-0.648	-0.653	-0.650	-0.005	-0.006	.007	.001	
85-86	39.87	+0.892	+0.892	+0.892	.000	-0.006	.000	.001	
86-87	42.07	-4.523	-4.520	-4.521	+0.003	-0.003	.002	.000	
87-88	43.48	+3.640	+3.626	+3.633	-0.014	-0.017	.012	.003	
88-89	44.12	+5.173	+5.169	+5.171	-0.004	-0.021	.005	.003	
89-90	44.12	+0.062	+0.062	+0.062	.000	-0.021	.000	.003	
90-91	44.32	+7.943	+7.943	+7.943	.000	-0.021	.000	.003	
91-92	46.37	+0.341	+0.351	+0.346	+0.010	-0.011	.007	.002	
92-93	46.86	+7.402	+7.403	+7.402	+0.001	-0.010	.001	.001	
93-94	47.13	-16.772	-16.772	-16.772	.000	-0.010	.000	.001	
94-95	49.54	+16.282	+16.283	+16.282	+0.001	-0.009	.000	.001	
95-96	51.26	+2.513	+2.522	+2.517	+0.009	.000	.007	.000	
96-97	51.26	+0.010	+0.009	+0.009	-0.001	-0.001	.000	.000	
97-98	51.51	+4.795	+4.798	+4.796	+0.003	+0.002	.006	.000	
98-99	51.88	+3.203	+3.203	+3.203	.000	+0.002	.000	.000	
99-100	52.14	+7.441	+7.445	+7.443	+0.004	+0.006	.008	.001	
100-101	52.37	+1.068	+1.068	+1.068	.000	+0.006	.000	.001	
101-102	52.80	+3.317	+3.322	+3.319	+0.005	+0.011	.007	.001	
102-104	53.68	-0.153	-0.156	-0.154	-0.003	+0.008	.003	.001	
104-105	54.04	-1.586	-1.586	-1.586	.000	+0.008	.000	.001	
105-106	54.04	+2.238	+2.236	+2.237	-0.002	+0.006	.....	.001	
106-107	54.40	-2.685	-2.682	-2.688	-0.007	-0.001	.012	.000	
107-109	55.30	+0.192	+0.199	+0.195	+0.007	+0.006	.007	.001	
109-110	55.64	+0.605	+0.605	+0.605	.000	+0.006	.000	.001	
110-111	55.96	+0.971	+0.970	+0.970	-0.001	+0.005	.002	.001	
111-112	55.96	-3.402	-3.403	-3.402	-0.001	+0.004	.....	.001	
112-113	56.45	+2.124	+2.131	+2.127	+0.007	+0.011	.010	.001	
113-114	57.31	+1.437	+1.443	+1.440	+0.006	+0.017	.006	.002	
114-115	57.43	-2.097	-2.097	-2.097	.000	+0.017	.000	.002	
115-116	58.17	+1.569	+1.563	+1.561	+0.004	+0.021	.004	.003	
116-117	58.87	-1.575	-1.568	-1.571	+0.007	+0.028	.008	.004	
117-118	59.79	-0.566	-0.566	-0.561	+0.010	+0.038	.010	.005	
118-119	59.79	+1.525	+1.526	+1.525	+0.001	+0.039	.....	.006	
119-120	60.44	-3.874	-3.870	-3.872	+0.004	+0.043	.005	.006	
120-121	61.34	+2.710	+2.711	+2.710	+0.001	+0.044	.001	.006	
121-122	62.30	-0.174	-0.166	-0.170	+0.008	+0.052	.008	.007	
122-123	62.71	-2.368	-2.367	-2.367	+0.001	+0.053	.002	.007	
123-124	62.71	+0.047	+0.047	+0.047	.000	+0.053	.000	.007	
124-125	63.82	-0.028	-0.021	-0.024	+0.007	+0.060	.007	.007	
125-126	64.72	+2.358	+2.359	+2.358	+0.001	+0.061	.001	.008	
126-127	65.62	-0.700	-0.695	-0.697	+0.005	+0.066	.005	.008	
127-128	66.00	+4.915	+4.911	+4.913	-0.004	+0.062	.006	.008	
128-129	66.22	+1.503	+1.506	+1.504	+0.003	+0.065	.005	.008	
129-130	66.62	+0.837	+0.837	+0.837	.000	+0.065	.000	.008	
130-131	67.04	-2.626	-2.627	-2.626	-0.002	+0.063	.003	.008	
131-132	67.04	+1.151	+1.150	+1.150	-0.001	+0.062	.000	.008	
132-133	67.79	-0.978	-0.977	-0.977	+0.001	+0.063	.001	.008	
133-134	68.59	+0.916	+0.912	+0.914	-0.004	+0.059	.004	.007	
134-135	69.17	+3.508	+3.510	+3.509	+0.002	+0.061	.003	.007	
135-136	69.55	-1.688	-1.682	-1.685	+0.006	+0.067	.010	.008	
136-137	69.93	+0.929	+0.927	+0.928	-0.002	+0.065	.003	.008	
137-138	70.63	-1.202	-1.203	-1.202	-0.001	+0.064	.001	.008	
138-139	71.94	-0.619	-0.622	-0.620	-0.003	+0.061	.003	.007	
139-140	71.94	+1.815	+1.815	+1.815	.000	+0.061	.000	.007	
140-141	72.32	+4.739	+4.739	+4.739	.000	+0.061	.000	.007	
141-142	73.07	+2.085	+2.081	+2.083	-0.004	+0.057	.004	.007	
142-143	73.47	-1.774	-1.775	-1.774	-0.001	+0.056	.002	.007	
143-144	73.77	+1.278	+1.278	+1.278	.000	+0.056	.000	.007	
144-145	73.87	-6.146	-6.145	-6.145	+0.001	+0.057	.003	.007	
145-146	74.58	+2.945	+2.938	+2.941	-0.007	+0.050	.009	.006	
146-147	76.28	-0.853	-0.848	-0.850	+0.005	+0.055	.004	.006	
147-148	76.58	+3.326	+3.325	+3.325	-0.001	+0.054	.002	.006	
148-149	76.58	+0.277	+0.277	+0.277	.000	+0.054	.000	.006	
149-150	77.43	+4.334	+4.327	+4.330	-0.007	+0.047	.007	.005	
150-151	77.71	+1.761	+1.759	+1.760	-0.002	+0.045	.004	.005	
151-152	77.71	-0.020	-0.020	-0.020	.000	+0.045	.000	.005	
152-153	78.25	+1.342	+1.349	+1.345	+0.007	+0.052	.009	.006	
153-154	79.72	-1.141	-1.138	-1.139	-0.003	+0.049	.003	.006	
154-155	80.00	+3.793	+3.790	+3.791	-0.003	+0.046	.006	.005	

TABLE NO. 8—(Continued).

(1) Bench marks.	(2) Distance from Green- bush.	(3) Difference of Elevation.			(5) Mean.	(6) Partial excess = e.	(7) Total excess = E.	(8) Value of "c" in e = c/miles. Col. 6.	(9) Value of "C" in E = C/miles. Col. 7.
		Line west.	Line east.						
155-156	80.57	+0.097	+0.097	+0.097	.000	+.046	.000	.005	
156-157	80.89	+1.854	+1.848	+1.851	-.006	+.040	.011	.004	
157-158	80.89	+0.568	+0.567	+0.567	-.001	+.039	.000	.004	
158-159	81.19	-0.360	-0.365	-0.362	-.005	+.034	.009	.004	
159-160	81.59	+0.958	+0.957	+0.957	-.001	+.033	.002	.004	
160-161	82.19	-1.936	-1.934	-1.935	+.002	+.035	.003	.004	
161-162	82.72	-0.234	-0.236	-0.235	-.002	+.033	.003	.004	
162-163	83-18	+7.213	+7.214	+7.213	+.001	+.034	.001	.004	
163-164	83.28	+1.118	+1.117	+1.117	-.001	+.033	.003	.004	
164-165	83.61	+1.091	+1.096	+1.093	+.005	+.038	.009	.004	
165-166	83.61	+0.070	+0.070	+0.070	.000	+.038	.000	.004	
166-167	84.06	+2.471	+2.471	+2.471	.000	+.038	.000	.004	
167-168	85.87	-1.728	-1.719	-1.723	+.009	+.047	.007	.005	
168-169	87.55	+6.645	+6.663	+6.651	+.013	+.060	.010	.006	
169-170	88.17	+10.041	+10.041	+10.041	.000	+.060	.000	.006	
170-171	88.33	+9.630	+9.630	+9.630	.000	+.060	.000	.006	
171-172	88.55	+10.049	+10.044	+10.046	-.005	+.055	.011	.006	
172-173	88.65	+4.302	+4.301	+4.301	-.001	+.054	.003	.006	
173-174	89.21	-0.305	-0.298	-0.301	+.007	+.061	.009	.006	
174-175	89.76	+0.602	+0.593	+0.597	-.009	+.052	.012	.005	
175-176	90.78	+0.579	+0.574	+0.576	-.005	+.047	.005	.006	
176-177	90.78	-0.109	-0.110	-0.109	-.001	+.046	.000	.005	
177-178	91.31	+2.712	+2.707	+2.709	-.005	+.041	.007	.004	
178-179	91.31	+0.106	+0.106	+0.106	.000	+.041	.000	.004	
179-180	92.22	+4.190	+4.192	+4.191	+.002	+.043	.002	.005	
180-181	92.87	-0.290	-0.291	-0.290	-.001	+.042	.001	.004	
181-182	93.29	-0.269	-0.262	-0.265	+.007	+.049	.010	.005	
182-183	93.95	+4.447	+4.443	+4.445	-.004	+.045	.005	.005	
183-184	94.32	+4.116	+4.120	+4.118	+.004	+.049	.006	.006	
184-185	94.32	+0.004	+0.006	+0.005	+.002	+.051	.000	.005	
185-186	95.31	+1.196	+1.203	+1.204	+.007	+.058	.007	.006	
186-187	95.42	-5.908	-5.906	-5.907	+.002	+.060	.006	.006	
187-188	96.43	+3.748	+3.744	+3.746	-.004	+.056	.004	.006	
188-189	96.55	+0.819	+0.819	+0.819	.000	+.056	.000	.006	
189-190	96.96	-0.304	-0.296	-0.300	+.008	+.064	.012	.007	
190-193	97.32	+15.126	+15.124	+15.125	-.002	+.062	.003	.006	
193-194	97.68	+2.293	+2.297	+2.295	+.004	+.066	.007	.007	
194-195	98.39	-0.985	-0.983	-0.984	+.002	+.068	.002	.007	
195-196	98.63	-0.688	-0.687	-0.687	+.001	+.069	.002	.007	
196-197	98.91	-0.073	0.073	-0.073	.000	+.069	.000	.007	
197-198	99.17	+1.774	+1.777	+1.775	+.003	+.072	.006	.007	
198-199	99.60	-1.097	-1.093	-1.095	+.004	+.076	.006	.008	
199-201	100.13	+11.129	+11.126	+11.127	-.003	+.073	.004	.007	
201-202	100.56	+2.159	+2.155	+2.157	-.004	+.069	.006	.007	
202-203	101.13	-3.761	-3.766	-3.763	-.005	+.064	.007	.006	
203-204	101.24	+8.611	+8.607	+8.609	-.004	+.060	.012	.006	
204-205	101.68	+3.138	+3.133	+3.135	-.005	+.055	.007	.005	
205-206	102.15	+0.353	+0.355	+0.354	+.002	+.057	.003	.005	
206-207	102.43	-1.368	-1.371	-1.369	-.003	+.054	.006	.005	
207-208	102.97	+1.715	+1.723	+1.719	+.008	+.062	.011	.006	
208-209	103.56	-0.191	-0.193	-0.192	-.002	+.060	.003	.006	
209-210	103.94	-0.904	-0.898	-0.901	+.006	+.066	.010	.006	
210-211	104.93	-0.508	-0.507	-0.507	+.001	+.067	.001	.006	
211-212	105.33	-1.026	-1.036	-1.031	-.010	+.057	.016	.006	
212-213	105.77	+2.510	+2.509	+2.509	-.001	+.056	.001	.005	
213-214	106.06	-1.271	-1.272	-1.271	-.001	+.055	.002	.005	
214-215	106.83	-2.098	-2.091	-2.094	+.007	+.062	.008	.006	
215-216	107.41	+2.485	+2.488	+2.486	+.003	+.065	.004	.006	
216-217	107.98	+1.208	+1.202	+1.202	-.001	+.064	.001	.006	
217-218	108.88	-5.274	-5.245	-5.259	+.029	+.093	.030	.009	
218-219	109.98	+5.384	+5.397	+5.390	+.013	+.106	.011	.010	
219-221	110.68	-3.765	-3.779	-3.772	-.014	+.092	.017	.009	
221-222	110.98	+3.387	+3.909	+3.898	+.022	+.114	.040	.011	
222-224	111.68	+2.544	+2.506	+2.525	-.038	+.076	.045	.007	
224-225	112.58	+1.592	+1.607	+1.599	+.015	+.091	.015	.009	
225-226	113.28	-0.088	-0.092	-0.090	-.004	+.087	.004	.008	
226-227	113.58	-2.067	-2.074	-2.070	-.007	+.080	.012	.007	
227-228	114.18	+0.178	+0.192	+0.185	+.014	+.094	.019	.009	
228-229	114.58	+1.299	+1.289	+1.294	-.010	+.084	.018	.008	
229-230	115.58	+1.623	+1.614	+1.618	-.009	+.075	.008	.007	
230-231	116.78	-0.412	-0.440	-0.426	-.028	+.047	.025	.004	
231-232	117.28	-2.197	-2.178	-2.187	+.019	+.066	.024	.006	
232-233	118.38	+1.871	+1.853	+1.864	-.013	+.053	.013	.005	
233-234	118.98	-0.750	-0.742	-0.746	+.008	+.061	.009	.006	
234-235	120.28	-0.087	-0.116	-0.101	-.029	+.032	.026	.003	

SPIRIT LEVELS OF THE BARGE CANAL SURVEY.

TABLE NO. 8—(Continued).

(1)	(2)	(3) Difference of Elevation.			(4)	(5)	(6)	(7)	(8)	(9)
Bench marks.	Distance from Green-bush.	Line west.	Line east.	Mean.	Partial excess = e.	Total excess = E.	Value of "c" in e = c/miles. Col. 6.	Value of "C" in E = C/miles. Col. 7.		
235-236	121.63	+1.141	+1.142	+1.141	+ .001	+ .033	.001	.003		
236-237	123.58	+1.550	+1.559	+1.559	+ .019	+ .052	.013	.005		
237-238	125.56	-5.124	-5.110	-5.117	+ .014	+ .066	.009	.006		
238-239	126.63	+2.766	+2.748	+2.757	- .018	+ .048	.017	.004		
239-240	127.86	-0.319	-0.334	-0.326	- .015	+ .033	.013	.003		
240-241	129.61	+0.505	+0.515	+0.510	+ .010	+ .043	.008	.004		
241-242	131.05	+2.723	+2.711	+2.717	+ .012	+ .055	.010	.005		
242-243	132.40	+2.620	+2.633	+2.626	+ .013	+ .068	.011	.006		
243-244	133.72	-5.846	-5.836	-5.841	+ .010	+ .078	.008	.007		
244-245	134.37	+6.162	+6.159	+6.160	- .003	+ .075	.004	.006		
245-246	135.17	-0.214	-0.206	-0.210	+ .008	+ .003	.009	.007		
246-247	136.18	-2.133	-2.129	-2.131	+ .004	+ .087	.004	.007		
247-248	136.58	+0.744	+0.745	+0.744	+ .001	+ .088	.002	.008		
248-249	136.85	-5.946	-5.945	-5.945	+ .001	+ .089	.002	.008		
249-250	137.43	+3.818	+3.828	+3.823	+ .010	+ .099	.012	.008		
250-251	137.64	-3.470	-3.471	-3.470	- .001	+ .098	.002	.008		
251-252	137.98	+0.075	+0.081	+0.078	+ .006	+ .104	.010	.009		
252-253	138.11	+4.013	+4.013	+4.013	.000	+ .104	.000	.009		
253-254	138.70	+0.071	+0.074	+0.072	+ .003	+ .107	.004	.009		
254-255	139.04	-4.487	-4.492	-4.489	- .005	+ .102	.009	.009		
255-256	139.74	+0.421	+0.420	+0.420	- .001	+ .101	.001	.009		
256-257	140.71	+5.219	+5.208	+5.213	- .011	+ .090	.011	.008		
257-258	140.83	-1.122	-1.122	-1.122	.000	+ .090	.000	.008		
258-259	141.01	-1.195	-1.198	-1.197	- .003	+ .089	.008	.007		
259-260	141.16	+1.676	+1.678	+1.677	+ .002	+ .087	.005	.007		
260-261	142.08	+1.067	+1.063	+1.065	- .004	+ .085	.004	.007		
261-262	142.66	-3.963	-3.964	-3.963	- .001	+ .084	.001	.007		
262-263	143.78	+1.838	+1.835	+1.836	- .003	+ .081	.003	.007		
263-264	144.86	-3.952	-3.957	-3.959	+ .005	+ .086	.005	.007		
264-265	145.66	+4.234	+4.230	+4.232	- .004	+ .082	.005	.007		
265-266	146.06	-1.909	-1.913	-1.911	- .004	+ .078	.006	.006		
266-267	146.24	+2.648	+2.646	+2.647	- .002	+ .076	.005	.006		
267-268	146.92	-3.781	-3.775	-3.778	+ .006	+ .082	.007	.007		
268-269	147.80	+3.750	+3.761	+3.755	+ .011	+ .093	.012	.008		
269-270	148.29	+0.254	+0.258	+0.256	+ .004	+ .097	.006	.008		
270-271	148.88	-4.432	-4.427	-4.429	+ .005	+ .102	.006	.008		
271-272	149.75	+4.527	+4.531	+4.529	+ .004	+ .106	.004	.009		
272-273	150.44	-5.341	-5.343	-5.342	- .002	+ .104	.002	.009		
273-274	150.84	+5.452	+5.453	+5.452	+ .001	+ .105	.001	.009		
274-275	152.39	-1.011	-1.002	-1.006	+ .009	+ .114	.007	.009		
275-276	152.74	-0.310	-0.308	-0.309	- .002	+ .112	.003	.009		
276-277	152.96	-4.560	-4.558	-4.559	+ .002	+ .114	.004	.009		
277-278	153.61	+5.846	+5.841	+5.843	- .005	+ .109	.006	.009		
278-279	154.60	+1.279	+1.280	+1.279	+ .001	+ .110	.001	.009		
279-280	155.79	-0.281	-0.278	-0.279	+ .003	+ .113	.003	.009		
280-281	156.94	+0.483	+0.496	+0.489	+ .013	+ .126	.012	.010		
281-282	157.42	-9.376	-9.371	-9.373	+ .005	+ .131	.007	.010		
282-283	157.86	-5.533	-5.531	-5.532	+ .002	+ .133	.003	.011		
283-284	159.94	+12.628	+12.628	+12.627	+ .002	+ .135	.001	.011		
284-285	160.38	+1.547	+1.555	+1.551	+ .008	+ .143	.012	.011		
285-286	160.76	-0.528	-0.530	-0.529	- .002	+ .141	.003	.011		
286-287	161.32	+1.330	+1.324	+1.327	- .006	+ .135	.008	.011		
287-288	161.82	-7.081	-7.090	-7.085	- .009	+ .128	.013	.010		
288-289	162.83	+5.514	+5.502	+5.508	- .012	+ .114	.012	.009		
289-290	165.04	-0.393	-0.402	-0.397	- .009	+ .105	.006	.008		
290-291	166.70	-1.877	-1.875	-1.876	+ .002	+ .107	.002	.008		
291-292	166.75	-1.572	-1.572	-1.572	.000	+ .107	.000	.008		
292-293	167.25	+0.528	+0.536	+0.532	+ .008	+ .115	.011	.009		
293-294	167.44	-10.599	-10.604	-10.601	- .005	+ .110	.011	.009		
294-295	167.81	-7.309	-7.307	-7.308	+ .002	+ .112	.003	.009		
295-296	168.09	-1.058	-1.056	-1.057	+ .002	+ .114	.004	.009		
296-297	168.15	-1.930	-1.929	-1.929	+ .001	+ .115	.004	.009		
297-298	168.17	-1.253	-1.252	-1.252	+ .001	+ .115	.007	.009		
298-299	168.26	-3.369	-3.365	-3.367	+ .004	+ .120	.013	.009		
299-300	168.42	-2.199	-2.200	-2.199	- .001	+ .119	.003	.009		
300-301	168.42	+1.422	+1.422	+1.422	.000	+ .119	.000	.009		
301-302	168.61	+2.283	+2.286	+2.284	+ .003	+ .122	.007	.009		
302-303	168.67	-1.355	-1.354	-1.354	+ .001	+ .122	.004	.009		
303-304	168.96	+0.310	+0.306	+0.307	- .005	+ .113	.009	.009		
304-305	169.58	+0.677	+0.667	+0.672	- .010	+ .108	.013	.008		
305-306	170.25	-2.552	-2.548	-2.550	+ .004	+ .112	.005	.009		
306-307	170.58	+3.011	+3.011	+3.011	.000	+ .112	.000	.009		
307-308	170.95	-2.645	-2.641	-2.643	+ .004	+ .116	.007	.009		
308-309	171.46	+3.795	+3.786	+3.790	- .009	+ .107	.013	.008		
309-310	172.26	-0.465	-0.465	-0.465	.000	+ .107	.000	.008		

TABLE No. 8—(Continued).

(1) Bench marks.	(2) Distance from Green- bush.	(3) Difference of Elevation.			(5) Mean.	(6) Partial excess = e.	(7) Total excess = E.	(8) Value of "c" in e = c/miles, Col. 6.	(9) Value of "C" in E = C/miles, Col. 7.
		Line west.	Line east.						
310-311	173.05	-9.533	-9.536	-9.534	- .003	+ .104	.003	.008	
311-312	173.17	+12.777	+12.774	+12.775	- .003	+ .101	.009	.008	
312-313	173.35	+5.344	+5.342	+5.343	- .002	+ .099	.005	.008	
313-314	174.19	-0.038	-0.026	-0.032	+ .012	+ .111	.013	.008	
314-315	174.94	-8.986	-8.986	-8.986	.000	+ .111	.000	.008	
315-316	175.08	+8.728	+8.725	+8.726	- .003	+ .108	.008	.008	
316-317	175.98	-4.996	-5.004	-5.000	- .008	+ .100	.008	.008	
317-318	176.68	-6.407	-6.421	+6.414	- .014	+ .086	.016	.006	
318-319	177.10	+12.311	+12.314	+12.312	+ .003	+ .089	.005	.007	
319-320	179.21	+0.007	+0.010	+0.008	+ .003	+ .092	.002	.007	
320-321	179.23	-8.988	-3.989	-3.988	- .001	+ .091	.007	.007	
321-322	181.79	+3.936	+3.922	+3.929	- .014	+ .077	.009	.006	
322-323	182.58	-10.352	-10.362	-10.357	- .010	+ .067	.011	.005	
323-324	183.40	+7.483	+7.491	+7.487	+ .008	+ .075	.009	.006	
324-325	184.33	+0.963	+0.955	+0.954	+ .002	+ .077	.002	.006	
325-326	184.35	-3.078	-3.080	-3.079	- .002	+ .075	.014	.006	
326-327	185.26	+0.250	+0.262	-0.256	+ .012	+ .087	.013	.006	
327-328	186.60	+2.242	+2.244	+2.243	+ .002	+ .089	.002	.007	
328-329	186.87	+0.276	+0.270	+0.273	- .006	+ .083	.012	.006	
329-330	186.96	-1.153	-1.153	-1.153	.000	+ .083	.000	.006	
330-331	187.14	+0.005	+0.011	+0.008	+ .006	+ .089	.014	.006	
331-332	188.07	-2.524	-2.513	-2.518	+ .011	+ .100	.011	.007	
332-333	188.40	-3.920	-3.923	-3.921	- .003	+ .097	.005	.007	
333-334	188.94	+2.245	+2.247	-2.246	+ .002	+ .099	.003	.007	
334-335	189.26	-2.778	-2.786	-2.782	- .008	+ .091	.014	.007	
335-336	189.46	+1.955	+1.956	+1.955	+ .001	+ .092	.002	.007	
336-337	190.70	-0.245	-0.257	-0.251	- .012	+ .080	.011	.006	
337-338	191.12	-0.862	-0.860	-0.861	+ .002	+ .082	.003	.006	
338-339	191.19	+0.910	+0.909	+0.909	- .001	+ .081	.004	.006	
339-340	191.25	-3.579	-3.578	-3.578	+ .001	+ .082	.004	.006	
340-341	191.47	+2.797	+2.795	+2.796	- .002	+ .080	.004	.006	
341-342	192.02	+0.984	+0.986	+0.985	+ .002	+ .082	.003	.006	
342-343	192.44	-0.123	-0.113	-0.118	+ .010	+ .092	.015	.007	
343-344	192.85	-3.193	-3.189	-3.191	+ .004	+ .096	.006	.007	
344-345	193.68	+4.701	+4.687	+4.694	- .014	+ .082	.015	.006	
345-346	195.06	-6.736	-6.767	-6.776	+ .019	+ .101	.016	.006	
346-347	195.11	+5.954	+5.954	+5.954	.000	+ .101	.000	.007	
347-348	195.23	-1.186	-1.189	-1.187	- .003	+ .098	.009	.007	
348-349	195.45	-3.261	-3.262	-3.261	- .001	+ .097	.002	.007	
349-350	195.56	+3.301	+3.303	+3.302	+ .002	+ .099	.006	.007	
350-351	195.66	-0.920	-0.921	-0.920	- .001	+ .098	.003	.007	
351-352	195.67	-3.341	-3.340	-3.340	+ .001	+ .099	.002	.007	
352-353	196.68	-7.481	-7.483	-7.482	- .002	+ .097	.002	.007	
353-354	198.53	+0.564	+0.543	+0.554	- .021	+ .076	.015	.005	
354-355	198.70	+1.029	+1.028	+1.028	- .001	+ .075	.003	.005	
355-356	198.81	-1.013	-1.014	-1.013	- .001	+ .074	.003	.005	
356-357	199.81	+1.053	+1.055	+1.056	- .003	+ .071	.003	.005	
357-358	199.89	-0.259	-0.260	-0.259	- .001	+ .070	.004	.005	
358-359	200.19	-0.251	-0.250	-0.250	+ .001	+ .071	.002	.006	
359-360	200.64	+0.237	+0.296	+0.291	+ .009	+ .080	.013	.006	
360-361	200.79	-0.169	-0.165	-0.167	+ .004	+ .084	.010	.006	
361-362	202.95	-0.141	-0.129	-0.135	+ .012	+ .096	.008	.007	
362-363	202.95	-0.260	-0.260	-0.260	.000	+ .096	.000	.007	
363-364	203.21	-4.835	-4.834	-4.834	+ .001	+ .097	.002	.007	
364-365	204.22	+2.003	+2.012	+2.007	+ .009	+ .106	.009	.007	
365-366	204.96	+2.280	+2.281	+2.280	+ .001	+ .107	.001	.007	
366-367	205.31	-6.530	-6.576	-6.578	+ .004	+ .111	.007	.008	
367-368	206.39	-0.438	-0.450	-0.444	- .012	+ .099	.012	.007	
368-369	206.65	+8.044	+8.040	+8.042	- .004	+ .095	.008	.007	
369-370	207.18	-9.173	-9.170	-9.171	+ .003	+ .098	.004	.007	
370-371	208.10	+1.109	+1.106	+1.107	- .003	+ .095	.003	.007	
371-372	208.65	+0.908	+0.910	+0.909	+ .002	+ .097	.003	.007	
372-373	208.97	+7.356	+7.373	+7.364	+ .017	+ .114	.003	.008	
373-374	209.27	-1.690	-1.694	-1.692	- .004	+ .110	.007	.008	
374-375	209.79	-6.112	-6.098	-6.105	+ .014	+ .124	.019	.009	
375-376	211.43	+9.376	+9.382	+9.379	+ .006	+ .130	.005	.009	
376-377	212.67	+0.346	+0.374	+0.360	+ .023	+ .158	.025	.011	
377-378	212.84	+2.060	+2.052	+2.056	- .008	+ .150	.019	.010	
378-379	213.63	+0.316	+0.309	+0.312	- .007	+ .143	.008	.010	
379-380	214.29	+0.653	+0.651	+0.652	- .002	+ .141	.002	.010	
380-381	215.10	-8.257	-8.234	-8.245	+ .023	+ .164	.026	.011	
381-382	215.63	+7.083	+7.076	+7.079	- .007	+ .157	.009	.011	
382-383	215.83	+5.448	+5.440	+5.444	- .008	+ .149	.021	.010	
383-384	216.23	+2.401	+2.417	+2.409	+ .016	+ .165	.025	.011	
384-385	216.70	+0.849	+0.874	+0.861	+ .025	+ .190	.037	.013	

## SPIRIT LEVELS OF THE BARGE CANAL SURVEY.

649

TABLE NO. 8—(Continued).

(1) Bench marks.	(2) Distance from Green- bush.	(3) (4) (5) Difference of Elevation.			(6) Partial excess = e.	(7) Total excess = E.	(8) Value of "c" in e = c/√miles, Col. 6.	(9) Value of "C" in E = C/√miles, Col. 7.
		Line west.	Line east.	Mean.				
385-386	217.38	-0.745	-0.740	-0.742	+ .005	+ .195	.006	.013
386-387	217.72	-0.142	-0.132	-0.132	+ .019	+ .214	.083	.015
387-388	218.06	-0.071	-0.067	-0.069	+ .004	+ .218	.007	.015
388-389	218.90	+0.806	+0.814	+0.810	+ .008	+ .226	.009	.015
389-390	218.97	-0.334	-0.340	-0.337	- .006	+ .220	.023	.015
390-391	219.05	-1.635	-1.627	-1.631	+ .008	+ .228	.028	.015
391-392	219.24	+4.719	+4.716	+4.717	- .003	+ .225	.007	.015
392-393	219.67	+0.379	+0.371	+0.375	- .008	+ .217	.012	.015
393-394	220.47	+3.099	+3.099	+3.099	.000	+ .217	.000	.015
394-395	220.85	+0.899	+0.899	+0.899	.000	+ .217	.000	.015
395-396	220.92	+5.939	+5.942	+5.940	+ .003	+ .220	.011	.015
396-397	221.90	+2.416	+2.414	+2.415	- .002	+ .218	.002	.015
397-398	222.17	-8.135	-8.133	-8.134	+ .002	+ .220	.004	.015
398-399	222.82	+7.872	+7.876	+7.874	+ .004	+ .224	.005	.016
399-400	223.60	-7.024	-7.036	-7.030	- .004	+ .212	.014	.014
400-401	224.13	+12.369	+12.365	+12.367	- .004	+ .208	.006	.014
401-402	224.29	+8.300	+8.309	+8.304	+ .009	+ .217	.022	.014
402-403	224.45	+7.899	+7.896	+7.897	- .003	+ .214	.008	.014
403-404	224.92	+1.329	+1.324	+1.326	- .005	+ .209	.007	.014
404-405	225.28	-2.040	-2.035	-2.037	+ .005	+ .214	.008	.014
405-406	226.21	+3.695	+3.742	+3.718	+ .047	+ .261	.049	.017
406-407	226.83	-0.686	-0.683	-0.684	+ .003	+ .264	.004	.017
407-408	227.53	+0.002	+0.002	+0.002	.000	+ .264	.000	.017
408-409	227.95	+0.372	+0.394	+0.383	+ .022	+ .286	.084	.019
409-410	228.47	-0.104	-0.109	-0.106	- .005	+ .281	.007	.019
410-411	231.04	+0.523	+0.519	+0.521	- .004	+ .277	.002	.018
411-412	232.88	-0.632	-0.621	-0.627	+ .012	+ .289	.008	.019
412-413	233.32	+2.260	+2.261	+2.260	+ .001	+ .290	.002	.019
413-414	233.82	-3.737	-3.765	-3.751	- .028	+ .262	.040	.017
414-415	234.50	+1.118	+1.108	+1.113	- .010	+ .262	.012	.016
415-416	234.71	-1.954	-1.956	-1.955	- .002	+ .250	.004	.016
416-417	235.13	+3.391	+3.385	+3.388	- .006	+ .244	.000	.016
417-418	235.49	+0.096	+0.095	+0.095	- .001	+ .243	.002	.016
418-419	236.60	+6.217	+6.211	+6.214	- .006	+ .237	.006	.015
419-420	237.44	+7.135	+7.139	+7.137	+ .004	+ .241	.004	.016
420-421	238.61	+2.309	+2.329	+2.319	+ .020	+ .261	.018	.017
421-422	240.77	+0.622	+0.576	+0.599	- .046	+ .215	.031	.014
422-423	243.06	+1.112	+1.096	+1.104	- .016	+ .199	.010	.013
423-424	244.10	-6.939	-5.905	-5.922	+ .034	+ .233	.063	.015
424-425	244.75	+5.959	+5.953	+5.956	- .006	+ .227	.007	.014
425-426	245.25	-1.243	-1.254	-1.248	- .011	+ .216	.016	.014
426-427	246.34	-0.284	-0.286	-0.285	- .002	+ .214	.002	.014
427-428	246.76	-9.948	-9.963	-9.955	- .015	+ .199	.023	.013
428-429	247.87	+8.608	+8.591	+8.599	- .017	+ .182	.016	.012
429-430	248.22	+1.342	+1.342	+1.342	.000	+ .182	.000	.012
430-431	248.99	-1.324	-1.322	-1.323	+ .002	+ .184	.002	.012
431-432	249.33	+1.137	+1.142	+1.139	+ .005	+ .189	.009	.012
432-433	250.92	-1.305	-1.322	-1.313	- .017	+ .172	.013	.011
433-434	251.57	+1.410	+1.404	+1.407	- .006	+ .166	.007	.010
434-435	252.06	+0.572	+0.587	+0.579	+ .015	+ .181	.021	.011
435-436	252.36	-0.002	-0.008	-0.005	- .006	+ .176	.011	.011
436-437	252.82	-0.146	-0.153	-0.149	- .007	+ .168	.010	.011
437-438	253.27	-11.783	-11.801	-11.792	- .018	+ .150	.026	.009
438-439	253.71	-3.417	-3.416	-3.416	+ .001	+ .151	.001	.009
439-440	254.33	+15.015	+15.029	+15.022	+ .014	+ .165	.018	.010
440-441	254.60	+6.234	+6.244	+6.239	+ .010	+ .176	.020	.011
441-442	255.09	+2.092	+2.082	+2.087	+ .010	+ .165	.014	.010
442-443	255.53	+1.552	+1.558	+1.555	+ .006	+ .171	.009	.011
443-444	256.36	-0.080	-0.074	-0.077	- .006	+ .177	.007	.011
444-445	257.07	-0.069	-0.069	-0.069	.000	+ .177	.000	.011
445-446	257.44	+5.455	+5.441	+5.448	- .014	+ .163	.023	.010
446-447	257.99	+9.933	+9.990	+9.991	- .003	+ .160	.004	.010
447-448	258.37	+10.132	+10.130	+10.131	- .002	+ .158	.003	.010
448-449	258.70	+3.422	+3.419	+3.420	- .003	+ .155	.005	.010
449-450	259.43	+5.900	+5.899	+5.899	- .001	+ .154	.001	.010
450-451	259.71	+2.908	+2.905	+2.906	- .003	+ .151	.006	.009
451-452	260.13	-0.150	-0.144	-0.147	+ .006	+ .157	.009	.010
452-453	260.76	-3.218	-3.218	-3.218	.000	+ .157	.000	.010
453-454	261.62	+2.758	+2.748	+2.753	- .010	+ .147	.011	.009
454-455	262.54	-0.776	-0.758	-0.767	- .008	+ .165	.019	.010
455-456	263.37	+2.169	+2.176	+2.172	+ .007	+ .172	.008	.011
456-457	263.90	-1.767	-1.763	-1.765	+ .004	+ .176	.006	.011
457-458	264.82	+0.860	+0.849	+0.854	- .011	+ .165	.011	.010
458-459	265.35	+0.740	+0.736	+0.738	- .004	+ .161	.005	.010
459-460	267.32	-0.257	-0.283	-0.270	- .026	+ .135	.019	.008

TABLE No. 8—(Continued).

(1) Bench marks.	(2) Distance from Green- bush.	(3) Difference of Elevation.			(5) Mean.	(6) Partial excess = e.	(7) Total excess = E.	(8) Value of "c" in e = c/miles. Col. 6.	(9) Value of "C" in E = C/miles. Col. 7.
		Line west.	Line east.						
460-461	268.21	-1.382	-1.369	-1.875	+ .013	+ .148	.014	.009	
461-462	268.90	+0.540	+0.557	+0.548	- .017	+ .165	.029	.010	
462-463	270.23	+1.406	+1.361	+1.383	- .045	+ .120	.038	.007	
463-464	271.35	-1.231	-1.220	-1.225	+ .011	+ .131	.011	.008	
464-465	272.26	+0.160	+0.185	+0.172	+ .025	+ .156	.026	.009	
465-466	273.01	+0.248	+0.248	+0.248	.000	+ .156	.000	.009	
466-467	273.01	+1.047	+1.048	+1.048	+ .001	+ .157	.000	.009	
467-468	274.33	-1.351	-1.375	-1.363	- .024	+ .133	.021	.008	
468-469	275.40	+0.923	+0.927	+0.925	+ .004	+ .137	.004	.008	
469-470	275.73	-0.410	-0.413	-0.411	- .003	+ .134	.005	.008	
470-471	276.80	+1.630	+1.551	+1.540	+ .021	+ .155	.020	.009	
471-472	277.26	-6.154	-6.151	-6.152	+ .003	+ .153	.004	.010	
472-473	277.86	+3.630	+3.647	+3.638	+ .017	+ .175	.022	.010	
473-474	278.17	+1.615	+1.616	+1.615	+ .001	+ .176	.002	.011	
474-475	280.27	-2.833	-2.843	-2.838	- .010	+ .166	.007	.010	
475-476	280.74	+1.806	+1.822	+1.814	+ .016	+ .182	.023	.011	
476-477	280.75	-1.541	-1.544	-1.542	- .003	+ .179	.030	.011	
477-478	281.94	+3.867	+3.861	+3.864	- .006	+ .173	.005	.010	
478-479	283.32	-4.136	-4.156	-4.146	- .020	+ .153	.014	.009	
479-480	284.51	+4.829	+4.852	+4.840	+ .023	+ .176	.021	.010	
480-481	284.97	-0.861	-0.846	-0.853	+ .015	+ .191	.022	.011	
481-482	286.48	+0.569	+0.568	+0.568	- .011	+ .180	.009	.011	
482-483	288.15	-0.228	-0.222	-0.225	+ .006	+ .186	.006	.011	
483-484	289.42	-0.681	-0.674	-0.677	+ .007	+ .193	.006	.011	
484-485	290.16	+1.379	+1.355	+1.367	- .024	+ .169	.028	.010	
485-486	291.68	+0.281	+0.277	+0.279	- .004	+ .165	.003	.010	
486-487	293.23	-1.502	-1.481	-1.491	+ .021	+ .186	.017	.011	
487-488	294.49	-1.922	-1.898	-1.910	+ .024	+ .210	.021	.012	
488-489	295.74	+2.948	+2.946	+2.947	- .002	+ .208	.002	.012	
489-490	296.37	-1.795	-1.781	-1.788	+ .014	+ .222	.018	.013	
490-491	297.92	+1.028	+0.988	+1.007	- .038	+ .184	.030	.011	
491-492	297.92	+0.007	+0.007	+0.007	.000	+ .184	.000	.011	
492-493	298.21	+1.146	+1.158	+1.152	+ .012	+ .196	.021	.011	
493-494	299.17	-1.173	-1.173	-1.173	.000	+ .196	.000	.011	
494-495	300.39	-5.051	-5.082	-5.066	- .031	+ .165	.028	.010	
495-496	300.97	+6.003	+6.005	+6.004	+ .002	+ .167	.003	.010	
496-497	302.69	-3.037	-2.986	-3.011	+ .051	+ .218	.038	.013	
497-498	303.36	+1.564	+1.540	+1.552	- .024	+ .194	.029	.011	
498-499	304.12	+1.313	+1.294	+1.303	- .019	+ .175	.022	.010	
499-500	304.77	-0.601	-0.601	-0.601	.000	+ .175	.000	.010	
500-501	305.00	-2.133	-2.139	-2.136	- .006	+ .169	.012	.010	
501-503	305.14	+1.676	+1.675	+1.675	.000	+ .169	.000	.010	
502-503	305.62	+1.791	+1.788	+1.789	- .003	+ .166	.004	.009	
503-504	305.85	-2.863	-2.867	-2.865	- .004	+ .162	.008	.009	
504-505	306.36	-2.769	-2.764	-2.766	+ .005	+ .167	.007	.010	
505-506	307.12	+4.701	+4.705	+4.703	+ .004	+ .171	.005	.010	
506-507	307.79	+1.583	+1.588	+1.585	+ .005	+ .176	.006	.010	
507-508	308.54	-0.057	-0.046	-0.051	+ .011	+ .187	.013	.011	
508-509	309.63	-6.215	-6.217	-6.216	- .002	+ .185	.002	.011	
509-510	310.25	+4.064	+4.066	+4.060	- .008	+ .177	.010	.010	
510-511	311.08	-6.829	-6.817	-6.823	+ .012	+ .189	.013	.011	
511-512	311.94	+7.811	+7.804	+7.807	- .007	+ .182	.007	.010	
512-513	313.49	+0.166	+0.166	+0.166	.000	+ .182	.000	.010	
513-514	314.06	-0.459	-0.469	-0.464	- .010	+ .172	.013	.010	
514-515	315.46	-5.870	-5.878	-5.874	- .008	+ .164	.007	.009	
515-516	316.82	-0.996	-1.007	-1.001	- .011	+ .153	.018	.009	
516-517	316.72	+6.669	+6.689	+6.679	+ .020	+ .173	.021	.010	
517-518	317.27	-7.461	-7.469	-7.465	- .008	+ .165	.011	.009	
518-519	317.52	-1.766	-1.766	-1.766	.000	+ .165	.000	.009	
519-520	318.69	+13.803	+13.825	+13.814	+ .022	+ .187	.020	.010	
520-521	319.55	-0.166	-0.166	-0.166	.000	+ .187	.000	.010	
521-522	320.47	+0.666	+0.664	+0.660	- .012	+ .176	.012	.010	
522-523	321.17	-8.265	-8.236	-8.245	+ .019	+ .194	.023	.011	
523-524	321.46	+2.591	+2.591	+2.591	.000	+ .194	.000	.011	
524-525	321.88	+0.895	+0.890	+0.892	- .005	+ .189	.008	.011	
525-526	322.12	+2.407	+2.389	+2.398	- .018	+ .171	.036	.010	
526-527	322.22	+51.727	+51.728	+51.728	+ .001	+ .172	.010	.010	
527-528	323.63	+4.435	+4.415	+4.425	- .020	+ .152	.017	.008	
528-529	324.96	+2.482	+2.483	+2.482	+ .001	+ .153	.001	.008	
529-530	326.23	-2.669	-2.632	-2.650	+ .037	+ .190	.032	.010	
530-531	327.41	+6.537	+6.547	+6.542	+ .010	+ .200	.009	.011	
531-532	328.94	-6.061	-6.107	-6.084	- .046	+ .154	.037	.009	
532-533	331.05	+0.710	+0.713	+0.711	+ .003	+ .157	.002	.009	
533-534	331.74	+0.487	+0.487	+0.487	.000	+ .157	.000	.009	
534-535	333.46	+0.951	+0.971	+0.961	+ .020	+ .177	.015	.010	



TABLE No. 8—(Concluded).

(1) Bench marks.	(2) Distance from Green- bush.	(3) Difference of Elevation.			(5) Mean.	(6) Partial excess = e.	(7) Total excess = E.	(8) Value of "c" in e = c/√miles. Col. 6.	(9) Value of "C" in E = C/√miles. Col. 7.
		Line west.	Line east.						
535-536	334.46	-2.135	-2.130	-2.132	+ .005	+ .182	.005	.010	
536-537	336.66	+0.377	+0.350	+0.363	-.027	+ .165	.018	.008	
537-538	340.24	+3.348	+3.391	+3.369	+ .043	+ .198	.023	.011	
538-539	340.66	-3.874	-3.863	-3.868	+ .011	+ .209	.017	.011	
539-540	341.07	+3.480	+3.492	+3.486	+ .012	+ .221	.019	.012	
540-541	341.72	-0.168	-0.160	-0.164	+ .008	+ .229	.010	.012	
541-542	343.36	+0.028	+0.048	+0.038	+ .020	+ .249	.015	.014	
542-543	344.39	-2.341	-2.336	-2.338	+ .005	+ .254	.005	.014	
543-544	345.23	+1.059	+1.058	+1.058	-.001	+ .263	.001	.014	
544-545	346.25	+0.861	+0.860	+0.860	-.001	+ .252	.001	.014	
545-546	348.07	+1.368	+1.390	+1.379	+ .022	+ .274	.016	.015	
546-547	348.52	-3.023	-3.025	-3.024	-.002	+ .272	.003	.015	
547-548	348.92	+3.399	+3.401	+3.400	+ .002	+ .274	.003	.015	
548-549	350.12	+1.803	+1.813	+1.810	+ .016	+ .289	.014	.015	
549-550	351.27	-5.387	-5.414	-5.400	-.027	+ .262	.026	.014	
550-551	351.90	+5.538	+5.534	+5.536	-.004	+ .258	.005	.013	
551-552	353.08	-2.289	-2.292	-2.290	-.003	+ .255	.003	.014	
552-553	353.89	+10.577	+10.589	+10.583	+ .012	+ .267	.013	.014	

TABLE No. 9.

## ERIE CANAL.

Comparison of Differences—Results of Levels of 1901, Survey and Levels of U. S. Deep Waterway.

(1) Bench Marks.	(2)		(3) Elevations above Greenbush.		(4)		(5) Differences.	
	1901.	U. S. D. W.	1901.	U. S. D. W.	1901.	U. S. D. W.	1901.	U. S. D. W.
		a		a				
0		0.00	0.000	0.000				
12		7.06	7.310	7.360			+7.310	+7.360
26		10.76	145.901	146.000	+138.591	+138.640		
33		12.09	146.740	146.910	+0.839	+0.910		
36		14.05	180.674	180.820	+33.934	+33.910		
57		27.41	256.540	256.540	+75.866	+75.720		
65		30.70	226.365	226.340	-30.175	-30.200		
67		31.53	218.978	218.940	-7.387	-7.400		
71		33.41	221.051	221.000	+2.073	+2.060		
74A		34.77	228.633	228.540	+7.582	+7.540		
76A		36.00	236.724	236.640	+8.091	+8.100		
89		44.86	249.667	249.630	+12.943	+12.930		
95		50.45	265.931	265.860	+16.264	+16.230		
97		52.19	268.453	268.460	+2.527	+2.600		
101		53.27	284.969	284.950	+16.511	+16.490		
106		54.97	288.785	288.790	+3.816	+3.840		
112		56.88	284.465	284.490	-4.320	-4.300		
115		58.28	285.935	285.970	+1.470	+1.480		
118		60.72	285.364	285.400	-0.571	-0.570		
121		62.28	285.728	285.820	+0.364	+0.420		
124		63.68	283.287	283.320	-2.491	-2.500		
125		64.78	283.213	283.310	-0.024	-0.010		
127		66.56	284.874	284.950	+1.961	+1.640		
131		67.96	289.502	289.610	+4.628	+4.660		
136		70.50	292.413	292.530	+2.911	+2.920		
140		72.86	293.333	293.450	+0.920	+0.920		
142A		74.00	299.949	300.060	+6.616	+6.610		
148		77.46	298.930	299.100	-1.019	-0.960		
151		78.66	305.297	305.520	+6.367	+6.420		
154		80.82	307.762	308.010	+2.465	+2.490		
158		81.84	314.069	314.280	+6.307	+6.270		
160		82.56	314.664	314.870	+0.595	+0.590		
164		84.19	320.825	321.000	+0.161	+0.130		
168		86.84	322.736	322.920	+1.911	+1.920		
169		88.51	329.388	329.570	+6.652	+6.650		
173		89.59	363.407	363.580	+34.019	+34.010		
175		90.73	363.703	363.890	+0.296	+0.310		
177		91.75	364.170	364.340	+0.467	+0.450		
179		92.28	366.985	367.170	+2.815	+2.830		
182		94.29	370.620	370.860	+3.635	+3.690		
187		96.39	374.481	374.680	+3.861	+3.820		
203		101.66	404.621	404.850	+30.140	+30.170		
232		117.28	419.975	420.270	+15.354	+15.420		
Phoenix		173.34	344.329	344.260	-75.646	-76.010		

TABLE NO. 10.

## ERIE CANAL.

Comparison of Differences—Results of Levels of 1901, Survey and Levels of U. S. Lake Survey.

(1) Bench Marks.		(2) U. S. L. S.		(3) Elevations above Greenbush.		(4) U. S. L. S.		(5) Differences.		(6) U. S. L. S.	
1901.				1901.				1901.			
	0		α		0.000		α				
	4a		2		2.929		2.870		+2.929		+2.870
	5b		3		12.337		12.256		+9.408		+9.386
	26		8A		145.901		145.804		+133.564		+133.548
	58		15		203.389		203.270		+57.488		+57.466
	81		19		236.933		236.814		+33.544		+33.544
	89		21		249.667		249.583		+12.734		+12.769
	95		24A		265.931		265.819		+16.264		+16.236
	102		25		283.288		283.256		+22.357		+22.437
	129		29		291.291		291.338		+3.003		+3.080
	133		30		289.675		289.808		-1.616		-1.528
	136		31		292.413		292.499		+2.738		+2.691
	151		34		305.297		305.533		+12.834		+13.034
	152		34A		305.278		305.492		-0.019		-0.041
	157		35		313.502		313.764		+8.224		+8.272
	158		35A		314.069		314.303		+0.567		+0.539
	165		36		321.919		322.144		+7.850		+7.841
	166		36A		321.989		322.200		+0.070		+0.056
	169		87		329.388		329.546		+7.399		+7.346
	177		38A		364.170		364.367		+34.782		+34.821
	184		39A		379.183		379.648		+15.013		+15.281
	185		39		379.188		379.605		+0.005		-0.043
	203		41		404.621		404.889		+25.433		+25.284

α Appendix No. 8, Report of U. S. Coast and Geodetic Survey for 1898-1899, pages 540-541, adjusted line. These figures in the original C. and G. S. table were given in metres, but are here reduced to feet.

TABLE NO. 11.

## ERIE CANAL.

Comparison of Differences—Results of Levels of 1901, Survey and Levels of U. S. Lake and Deep Waterway Surveys.

(1) Bench Marks.			(2) U. S. L. S.			(3) U. S. D. W.			(4) Elevations above Greenbush.			(5) U. S. L. S.			(6) U. S. D. W.			(7) Differences.			(8) U. S. L. S.			(9) U. S. D. W.				
1901.			1901.			1901.			1901.			1901.			1901.			1901.			1901.			1901.				
00	0																											
26	8A	10.76	145.901	145.804	146.000	+145.901	+145.804	+146.000																				
89	21	44.86	249.667	249.583	249.630	+103.766	+103.779	+103.630																				
95	24A	50.45	265.931	265.819	265.860	+16.264	+16.236	+16.230																				
136	31	70.50	292.413	292.499	292.530	+26.482	+26.680	+26.670																				
151	34	78.66	305.297	305.533	305.520	+12.884	+13.034	+12.990																				
158	35A	81.84	314.069	314.303	314.280	+8.772	+8.770	+8.760																				
169	37	88.51	329.388	329.546	329.570	+15.319	+15.243	+15.290																				
203	41	101.68	404.621	404.889	404.850	+75.233	+75.343	+75.280																				

NOTE.—Columns 1 and 2—Number of bench mark. Column 3—Miles from Greenbush, U. S. D. W. benches. No numbers in U. S. D. W. record. Columns 5 and 8 are deduced from Appendix No. 8 (U. S. Coast and Geodetic Survey), report for 1898-99, adjusted line. Columns 3, 6 and 9 are from the report of the Board of Engineers on Deep Waterways, 1900, pages 1017-1021.

TABLE NO. 12.

## CHAMPLAIN CANAL.

Comparison of Differences—Results of Levels of 1901, Survey and Levels of U. S. D. W.

A column gives list number of bench marks in this report.

B column gives miles from Greenbush B. M.

Bench Marks.	B. U. S. D. W.	Elevations above Greenbush.		Differences	
		1901.	U. S. D. W.	1901.	U. S. D. W.
Erle Canal B. M.:					
12	7.06b	7.310	7.360b		
Champlain Canal B. M.:					
6	12.60a	21.779	21.840a	+14.469	+14.480
13	15.90	38.313	38.380	+16.534	+16.540
20	20.00	74.490	74.600	+36.177	+36.220
21	20.10	74.663	74.790	+0.173	+0.190
25	22.10	72.167	72.260	-2.496	-2.530
30	23.60	75.187	75.260	+3.020	+3.000
35	27.10	89.357	89.470	+14.170	+14.210
38	28.10	91.153	91.300	+1.801	+1.830
50	34.10	91.864	92.050	+0.706	+0.750
55	37.20	91.970	92.160	+0.106	+0.110
57	38.30	90.412	90.610	-1.558	-1.550
60	39.00	95.203	95.340	+4.791	+4.730
67	41.80	109.295	109.480	+14.092	+14.140
76	45.00	127.991	128.140	+18.696	+18.660
82	47.10	128.111	128.200	+0.120	+0.060
89	49.80	130.693	130.800	+2.582	+2.600
95	53.20	131.753	131.960	+1.060	+1.150
101	57.70	127.643	127.810	-4.110	-4.140
112	62.00	125.440	125.630	-2.203	-2.180
115	65.10	117.135	117.350	-8.305	-8.280
120	68.10	119.747	119.930	+2.612	+2.580
130	73.20	89.645	89.820	-30.102	-30.110

a Report of Board of Engineers on Deep Waterways, 1900, pages 1023-1023.

b Report of Board of Engineers on Deep Waterways, 1900, page 1018.

Cornell University Library of Architecture and Marine Studies  
Hydrographic Collection

---

---

LIST

OF

BENCH MARKS

NEW YORK STATE CANALS

EASTERN DIVISION

ERIE CANAL,

FROM ALBANY TO THE HERKIMER-ONEIDA COUNTY LINE.

---

FROM LEVELS OF 1900 AND 1901.

---

---

TABLE NO. 13.

List of Bench Marks, Erie Canal, Eastern Division, from Albany to the East Line of Oneida County, N. Y. Greenbush to Herkimer Levels of 1901, Herkimer to East Line of Oneida County, Differences, Corrected for Rod Error, from Levels of 1900.

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE	
			Mean tide, New York, 1900.	Green- bush, 1901.
0	Grist Mill, a cross cut on the (vertical face) N. W. side of the N. E. corner of stone foundation of steam grist mill at Greenbush, N. Y. ....	0.00	0.00	14.730
1	Cross + cut in iron bolt N. E. corner N. coping stone W. abutment Island bridge foot of State street, Albany. ....	0.76	-1.043	13.687
2	Government building foot of State street, Albany, N. Y. lower basement window sill E. end State street side. Marked ⊕. ....	0.76	4.509	19.299
3	State hall, Albany. ....	1.20		
4	On shelf at lower end of pier between locks at lock No. 1 marked ⊕ with chisel. (Canal B. M. No. 1.) ....	1.44	-3.770	10.960
4a	Lock No. 1 top of stone at center of cross in top of masonry at S. W. corner of east wall of west lock. ....	1.44	2.929	17.659
5	On coping of lock No. 2 between ends of anchor of S. W. gate of W. lock marked ⊕. (Canal B. M. No. 7.) ....	2.68	12.321	27.051
5a	On the N. end towpath parapet of culvert, marked ⊕ with chisel E. of bridge No. 6. (Canal B. M. No. 8.) ....	3.18	11.135	25.865
6	Square □ cut in first step, towpath abutment, S. wing, E. end of D. & H. R. R. bridge, New B. M. ....	3.75	16.162	30.892
7	On coping of retaining wall at S. end of towpath parapet of Culvert marked ⊕ with chisel. (Canal B. M. No. 12.) ....	5.03	11.863	26.593
8	Bridge No. 12, N. E. corner N. wing of towpath abutment on coping marked ⊕ with chisel. (Canal B. M. No. 14.) ....	5.53	18.296	33.026
9	On coping of lock at "lower side cut" at anchor of N. W. gate marked with chisel. (Canal B. M. No. 15.) ....	6.18	12.312	27.942
10	On towpath abutment of old arsenal bridge at N. angle of main wall, top of lower course, marked ⊕ and above B. M. with chisel. (Canal B. M. No. 16.) ....	6.48	15.189	29.919
11	Square □ cut near N. E. corner of foundation stone S. main tower towpath end lift bridge Congress street, Watervliet. ....	7.18	14.528	29.258
12	U. S. D. W. B. M., on second stone second course of masonry, N. E. corner W. abutment Congress street bridge over Hudson River. ....	7.30	7.310	22.040
13	On coping of N. wall of N. lock of "upper side cut" N. W. corner of W. stone marked ⊕ with chisel. Canal B. M. No. 18.) ....	7.38	12.977	27.707
14	On coping of lock No. 3 between ends of anchor S. W. gate of W. lock, marked ⊕ with chisel. (Canal B. M. No. 21.) ....	7.93	23.829	38.559
15	On coping of lock No. 4 between ends of anchor S. W. gate of W. lock, marked ⊕ with chisel. (Canal B. M. No. 23.) ....	8.25	34.985	49.715
16	On coping of lock No. 5 between ends of anchor S. W. gate of W. lock, marked ⊕ with chisel. (Canal B. M. No. 25.) ....	8.52	45.763	60.493
17	On coping of lock No. 6 between ends of anchor S. W. gate of W. lock, marked ⊕ with chisel. (Canal B. M. No. 27.) ....	8.73	55.767	70.497
18	On coping of lock No. 7 between ends of anchor S. E. gate of E. lock, marked □ with chisel. (Canal B. M. No. 29.) ....	8.86	65.413	80.143
19	On coping of lock No. 8 between ends of anchor S. W. gate of W. lock, marked ⊕ with chisel. (Canal B. M. No. 31.) ....	9.02	75.063	90.393

TABLE NO. 13—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE	
			Mean tide, New York, 1900.	Mean tide, New York, 1901.
20	On coping of lock No. 9 between ends of anchor S. E. gate of E. lock, marked ⊕ with chisel. (Canal B. M. No. 33.)	9.35	85.796	100.526
21	Square □ cut on coping of lock No. 10 between ends of anchor S. W. gate of W. lock. (Canal B. M. No. 35.)	9.53	95.740	110.470
22	On coping of lock No. 11 between ends of anchor S. W. gate of W. lock, marked ⊕ with chisel. (Canal B. M. No. 37.)	9.69	105.750	120.480
23	On coping of lock No. 12 between ends of anchor S. W. gate of W. lock, marked ⊕ with chisel. (Canal B. M. No. 39.)	9.84	115.839	130.569
24	On coping of lock No. 13 between ends of anchor S. E. gate of E. lock, marked ⊕ with chisel. (Canal B. M. No. 41.)	10.04	125.736	140.466
25	On coping of lock No. 14 between ends of anchor S. E. gate of E. lock, marked ⊕ with chisel. (Canal B. M. No. 43.)	10.26	135.674	150.404
26	Arrow † cut on coping S. W. corner of E. wall, W. lock, lock No 15 U. S. D. W. B. M., U. S. L. S. B. M. No. 8a	10.53	145.901	160.631
27	On coping of lock No. 15 between ends of anchor S. E. gate of E. lock, marked ⊕ with chisel. (Canal B. M. No. 45.)	10.53	145.801	160.531
28	On coping of lock No. 16 between ends of anchor S. E. gate of E. lock, marked ⊕ with chisel. (Canal B. M. No. 47.)	10.72	155.742	170.472
29	Bolt head in coping of lock No. 17 between ends of anchor S. W. gate of W. lock, marked + with chisel	11.04	165.881	180.611
30	On coping of lock No. 18 between ends of anchor S. W. gate of W. lock, marked ⊕ with chisel. (Canal B. M. No. 51.)	11.23	176.163	190.893
31	Square □ cut on coping E. end S. side wall of waste-weir No. 5, just N. of bridge No. 30. (Canal B. M. destroyed.)	11.50	176.409	191.139
32	Point cut in square □ on N. E. corner lower step N. end of berme abutment bridge No. 31, new B. M.	11.97	178.150	192.880
33	U. S. D. W. B. M., arrow † cut on the S. W. corner of the top stone on the S. end of breakwater above the Cohoes Water Company's gatehouse and near the western end of this Company's dam	12.07	146.740	161.470
34	Destroyed			
35	On top of coping of S. wing at end of towpath abutment, bridge No. 33 marked ⊕ B. M. with chisel. (Canal B. M. No. 57.)	13.34	178.372	193.102
36	On top of coping S. W. corner S. E. wing of aqueduct at Crescent, marked ⊕ with chisel. (Canal B. M. No. 59.)	13.98	180.674	195.404
37	On top of coping N. W. corner S. E. wing of aqueduct at Crescent, marked ⊕ with chisel. (Canal B. M. No. 60.)	14.20	180.581	195.311
38	Bridge No. 36 at center of towpath abutment on face, sixth course under coping, marked ⊕ B. M. with chisel. (Canal B. M. No. 62.)	15.47	177.508	192.233
39	Bridge No. 37 at center of towpath abutment on face, sixth course under coping, marked ⊕ B. M. with chisel	15.87	179.066	193.796
40	Destroyed			
41	Bridge No. 38, on projection sixth course below coping near centre towpath abutment, marked ⊕ B. M. with chisel. (Canal B. M. No. 64.)	16.62	177.253	191.983
42	Bridge No. 39, on projection sixth course below coping near W. angle face of towpath abutment, marked ⊕ B. M. with chisel. (Canal B. M. No. 66.)	17.62	178.351	193.081

TABLE NO. 13—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Green- bush, 1901.	Mean tide, New York, 1901.
43	Bridge No. 41, on face towpath abutment six course below coping near E. angle, marked ⊕ B. M. (Canal B. M. No. 68.)....	18.00	.....	178.262	192.992
41	Bridge No. 42, on face towpath abutment fifth course below coping near W. angle, marked ⊕ B. M. (Canal B. M. No. 69.)....	18.31	.....	178.289	193.019
45	Bridge No. 43, on face towpath abutment sixth course below coping near centre, marked ⊕ B. M. (Canal B. M. No. 70.)....	18.69	.....	176.801	191.531
46	Bridge No. 46, second bridge E. of lock No. 19, on projection of towpath abutment fifth course below coping near E. angle, marked ⊕ B. M. (U. S. L. S. 12.) (Canal B. M. No. 72.).....	19.44	.....	176.952	191.682
47	Bridge No. 47, first bridge E. of lock No. 19, on top of first stone under coping E. corner E. wing on towpath abutment, marked ⊕ B. M. (Canal B. M. No. 73).....	19.86	.....	179.097	193.827
48	On coping of lock No. 19, near end of anchor N. E. gate S. lock pier wall, marked ⊕ B. M. (Canal B. M. No. 75.).....	20.09	.....	184.582	199.312
49	Bridge No. 48, Vischer's Ferry, square □ cut on third course of masonry E. wing tow- path abutment, new B. M. ....	20.96	.....	189.349	204.079
50	Point □ cut in square between ends of anchor N. lock, S. E. gate of lock No. 20, new B. M. ....	22.83	.....	191.478	209.208
51	Bridge No. 49, at Fonda's Basin, on top of coping E. end of wing berme abutment, marked ⊕ with chisel. (Canal B. M. No. 81).....	24.18	.....	198.740	213.479
52	Square □ cut on the N. E. corner of coping of lock No. 21, about 10 feet from end of anchor of S. E. gate S. lock. (Old B. M. destroyed.).....	26.05	.....	207.568	222.298
53	Square □ cut on coping of lock No. 22 be- tween ends of anchor N. E. gate of N. lock. (Old B. M. destroyed.).....	26.23	.....	217.473	232.203
54	On N. E. corner of coping on end of towpath wing at N. end of upper Mohawk Aqued- uct at Rexford Flats marked, ⊕ B. M. (Canal B. M. No. 86.).....	26.31	.....	218.377	233.107
55	On top dowel in coping of parapet near end of parapet at Rexford Flats towpath wing S. end of Upper Mohawk Aqueduct, marked ⊕ B. M. (Canal B. M. No. 87.).....	26.43	.....	222.054	236.784
56	Bridge No 51, on top of coping N. wing berme abutment, first bridge W. of aqueduct marked ⊕ B. M. (Canal B. M. No. 84.)....	26.53	.....	221.867	236.597
57	U. S. D. W. B. M., a square □ cut in W. corner of step at ladies' entrance to the R. R. station of the Troy and Schenectady branch at aqueduct.....	26.60	.....	256.540	271.270
58	U. S. L. S. B. M. No. 15 on coping 1.5 feet from S. corner of W. abutment of Rexford feeder bridge, 4 miles south of Schenectady.	26.05	.....	203.389	218.119
59	Bridge No. 52, on projection of lower course on face towpath abutment near W. angle marked ⊕ B. M. (Canal B. M. No. 89.) ...	28.00	.....	217.347	232.077
60	Bridge No. 53, on face of towpath abutment near centre, on projection of sixth course under coping, marked ⊕ B. M. (Canal B. M. No. 90.).....	28.22	.....	219.217	233.947
61	On second step W. end towpath abutment of D. & H. R. R. bridge E. of Schenectady marked □ B. M. New B. M. ....	28.85	.....	220.935	235.665
62	Bridge No. 54, on top of coping W. wing wall, berme abutment, marked ⊕ B. M. (Canal B. M. No. 92.).....	29.10	.....	219.061	233.791
63	Bridge No. 55, on top of coping on end of E. wing of towpath abutment, marked ⊕ B. M. (Canal B. M. No. 93.).....	29.52	.....	220.563	235.293

TABLE NO. 13—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE	
			Mean tide, New York, 1900.	Mean tide, New York, 1901.
64	Square □ cut on S. W. corner of coping W. end of towpath abutment on swing bridge near Schenectady Locomotive Works. New B. M. ....	29.77		235.883
65	U. S. D. W. B. M., a square □ cut on the S. W. end of the top of the S. W. coping stone of culvert No. 47 of the Troy and Schenectady branch opposite the Schenectady Locomotive Works and about 400 feet E. of Romeyn street crossing. ....	30.11	226.365	241.095
66	Bridge No. 56, square □ cut on first step W. wing wall towpath abutment at Green street, Schenectady, new B. M. ....	30.07	218.971	233.701
66a	Bridge No. 57, Jefferson street, Schenectady, on S. W. corner of coping of retaining wall E. of towpath abutment, marked ⊕ B. M. (Canal B. M. No. 95.) ....	30.10	222.406	237.226
66b	Bridge No. 59, Liberty street, on coping of retaining wall W. end of bridge approach towpath abutment, new B. M. marked □ with chisel. ....	30.13	221.107	235.837
67	U. S. D. W. B. M., a square □ cut on the S. E. corner of foundation stone of the N. W. column of the Church street lift bridge over the Erie canal at Schenectady. ....	30.57	218.978	233.708
68	On top of coping W. end of parapet S. W. corner of waste weir opposite Westing-house works, marked ⊕ B. M. (Canal B. M. No. 97.) ....	30.77	220.297	235.027
69	Square □ cut on N. E. corner of coping on culvert No. 23, towpath at W. end of General Electric works, new B. M. ....	31.33	209.255	223.985
70	Bridge No. 63, Navonier's bay, on projection of sixth course below coping, near center of towpath abutment, on face marked ⊕ B. M. (Canal B. M. No. 98.) ....	32.47	217.970	232.700
71	U. S. D. W. B. M., square □ cut on N. W. corner of top of N. stone in third course of the E. abutment of bridge No. 63 over the Erie canal, about 1½ miles W. of Rotterdam street bridge at Schenectady. ....	32.47	221.051	235.781
72	On top of coping of lock No. 23, between ends of anchor N. E. gate of N. lock, marked ⊕ B. M. (Canal B. M. No. 99.) ....	33.15	225.590	240.320
73	Bridge No. 64, on face tow path abutment near W. angle on projection of sixth course below coping, marked ⊕ B. M. (Canal B. M. No. 101.) ....	33.26	226.250	240.980
74a	U. S. D. W. B. M., Square □ cut on E. corner of N. E. end of shelf at lower end of lock No. 24. Marked □ B. M. ....	33.94	228.633	243.363
74	On coping of lock No. 24, between ends of anchor N. E. gate of N. lock, marked ⊕ B. M. (Canal B. M. No. 103.) ....	33.94	234.013	248.743
75	Bridge No. 65, on projection of sixth course on face near centre of tow-path abutment, marked ⊕ B. M. (Canal B. M. No. 104.) ...	34.56	236.586	251.316
76a	U. S. D. W. B. M., Square □ cut on the N. corner of the bottom stone step of brick house (Van Slyck homestead), at bridge No. 66, E. of Flat Stone Creek aqueduct. ...	35.18	236.724	251.454
76	Bridge No. 66, on projection of sixth course below coping on face near E. angle tow-path abutment, marked ⊕ B. M. (Canal B. M. No. 105.) ....	35.18	235.155	249.885
77	Flat Stone Creek aqueduct, square □ cut E. end of parapet N. E. corner towpath side, new B. M. ....	35.35	237.993	252.723
78	Bridge No. 67, on projection of sixth course below coping near center on face of tow-path abutment, marked ⊕ B. M. (Canal B. M. No. 107) ....	36.20	236.559	251.289



TABLE NO. 13—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Green- bush, 1901.	Mean tide, New York, 1901.
79	Bridge No. 68, on projection of seventh course below coping on face near W. angle towpath abutment, marked ⊕ B. M. (Canal B. M. No. 108.)	36.66		235.396	250.126
80	Bridge No. 69, on projection of seventh course below coping near center on face of towpath abutment, marked ⊕ B. M. This is also U. S. L. S. B. M. No. 19. (Canal B. M. No. 109.)	37.61		234.124	248.854
81	Bridge No. 69, U. S. L. S. B. M. No. 15a, top of projection of third course S. E. wing towpath abutment, marked ⊕ B. M.	37.61		236.933	251.663
82	On coping of lock No. 25 between ends of anchor N. E. gate of N. lock, marked ⊕ B. M. (Canal B. M. 111.)	37.74		241.861	256.591
83	Bridge No. 71, on corner of coping on end of W. wing towpath abutment, marked ⊕ B. M. (Canal B. M. No. 112.)	38.24		244.264	258.094
84	Bridge No. 72, on projection of fourth course below coping on face of towpath abutment near W. angle, marked ⊕ B. M. (Canal B. M. No. 113.)	38.66		245.143	259.873
85a	On projection of seventh course fourth stone from S. E. angle of pier E. E. bridge over Erie Canal and Mohawk River about three-quarters of a mile E. of Pattersonville, marked ⊕ B. M. New B. M.	39.21		243.453	258.183
85	Bridge No. 73 on coping end of W. wing berme abutment, marked ⊕ B. M. (Canal B. M. No. 114.)	39.21		241.493	259.223
86	On the coping of parapet Sansal Kill aqueduct at E. angle (junction of wing with straight wall) marked ⊕ B. M. (Canal B. M. No. 115.)	39.87		245.885	260.115
87	On flat sandstone on back angle of towpath at W. end of second tangent E. of bridge No. 76, marked ⊕ B. M. (Canal B. M. No. 118.)	42.07		240.863	255.593
88	Bridge No. 76 on first stone under coping E. wing towpath abutment, (marked ⊕ B. M.)	43.48		244.496	259.226
89	U. S. L. S. B. M. No. 21 and U. S. D. W. B. M. ○ on E. corner of coping of S. wall of N. lock. (Lock No. 26.)	44.12		249.667	264.397
90	On coping of lock No. 26, between ends of anchor N. E. gate N. lock, marked ⊕ B. M. (Canal B. M. No. 123.)	44.12		249.729	264.459
91	Square □ cut on coping of lock No. 27, between ends of anchor N. E. gate of N. lock, new B. M.	44.32		257.672	272.402
92	Square □ cut on N. W. corner of wastewair top of E. wall one-half mile E. of Amsterdam river bridge. New B. M.	46.37		258.018	272.748
93	Bridge No. 78, on top of lower step at W. end towpath abutment, marked ⊕ B. M. (Canal B. M. No. 129.)	46.86		265.421	280.151
94	On top of coping on centre pier of Chautunda creek culvert, towpath side, marked ⊕ B. M. (Canal B. M. No. 130.)	47.13		249.649	264.379
95	U. S. L. S. B. M. No. 24a and U. S. D. W. B. M. top of iron bolt in top coping about one-half way between the two locks on E. wall of lock No. 28, marked ⊕ B. M.	49.54		265.931	280.661
96	Bridge No. 80, on projection sixth course below coping on face in centre of towpath abutment, marked ⊕ B. M. (Canal B. M. No. 134.)	51.26		268.449	283.179
97	Bridge No. 80, U. S. D. W. B. M., on same bridge as B. M. No. 96, square □ cut on coping of W. wing towpath abutment, first bridge E. of lock No. 29.	51.26		268.458	283.188

TABLE NO. 13—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE	
			Mean tide, New York, 1900.	Green- bush, 1901.
98	On coping of lock No. 29 between ends of anchor N. E. gate of N. lock, marked ⊕ B. M. (Canal B. M. No. 136.)	51.51	273.255	287.985
99	Bridge No. 81, on projection of fourth course below coping on face of towpath abutment near E. angle, marked ⊕ B. M. (Canal B. M. No. 137.)	51.88	276.458	291.188
100	On coping of lock No. 30 between ends of anchor N. E. gate of N. lock, marked ⊕ B. M. Condition poor. (Canal B. M. No. 139.)	52.14	283.901	298.631
100a	On N. wall S. lock No. 30, first stone E. of junction of old wall and extension, new B. M., marked □ B. M., 1901	52.14	283.896	298.626
101	At foot of parapet on end of W. wing of Schoharie Creek aqueduct, towpath side, marked □ B. M. This is also U. S. D. W. B. M. (Canal B. M. No. 140.)	52.37	284.969	299.699
102	Bridge No. 83, U. S. L. S. B. M. No. 25. Cross cut on face of corner stone, fifth course N. E. corner of towpath abutment, marked ⊕ B. M.	52.80	288.288	303.018
104	Bridge No. 84, on top of lower step W. wing berme abutment, marked ⊕ B. M. (Canal B. M. No. 142.)	53.68	288.134	302.£64
105	Bridge No. 85, on face towpath abutment near E. angle on projection fifth course below coping, marked ⊕ B. M. (Canal B. M. No. 143.)	54.04	286.548	301.278
106	U. S. D. W. B. M. Square □ cut on the W. end of the W. wing wall of N. abutment of bridge over Erie Canal about 2,000 feet west of W. S. R. R. station at Auriesville, Bridge No. 85.	54.04	288.785	303.515
107	Bridge No. 86, on face of towpath abutment near W. angle on projection sixth course below coping, marked ⊕ B. M. (Canal B. M. No. 144.)	54.40	286.096	300.826
109	Bridge No. 88, on face of towpath abutment near E. angle on projection fourth course below coping marked ⊕ B. M. (Canal B. M. No. 145.)	55.30	286.092	300.822
110	Bridge No. 89, on face of towpath abutment near W. angle on projection of fourth course below coping marked ⊕ B. M. (Canal B. M. No. 146.)	55.64	286.897	301.627
111	Bridge No. 90, on top of lower step W. wing berme abutment, marked ⊕ B. M. (Canal B. M. No. 147.)	55.96	287.868	302.598
112	U. S. D. W. B. M., same bridge point on face of stone about three feet from corner of the first course W. wing towpath abutment.	55.96	284.465	299.195
113	Bridge No. 91, on top of lower step E. berme abutment, marked ⊕ B. M. (Canal B. M. No. 148.)	56.45	286.592	301.322
114	Bridge No. 93, on second step of E. wing berme abutment Main street, Fultonville. New B. M., marked ⊕ B. M.	57.31	288.032	302.762
115	Bridge No. 94, U. S. D. W. B. M., point cut on top of projection fourth stone of second course on the W. end of towpath abutment, marked □ B. M.	57.43	285.935	300.665
116	Bridge No. 95, on top of coping at end of E. wing towpath abutment, marked ⊕ B. M. (Canal B. M. No. 150.)	58.17	287.496	302.226
117	Bridge No. 96, on face towpath abutment near E. angle on projection of fourth course below coping, marked ⊕ B. M. (Canal B. M. No. 151.)	58.87	285.925	300.656
118	Bridge No. 91, U. S. D. W. B. M. on projection of stone W. wing second stone from angle towpath abutment, marked □ B. M.	59.79	285.364	300.094

TABLE NO. 12—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE	
			Mean tide, New York, 1900.	Mean tide, New York, 1901.
119	Bridge No. 97, on face of top stone end of W. wing towpath abutment, marked ⊕ B. M. (Canal B. M. No. 152.)	59.79	286.889	301.619
120	On top of coping at end of E. wing of Tokkon Creek aqueduct, towpath side, marked ⊕ B. M. (Canal B. M. No. 153.)	60.44	283.017	297.747
121	Bridge No. 98, U. S. D. W. B. M. on face of towpath abutment near E. angle on projection of fourth stone below coping, marked ⊕ B. M. (Canal B. M. No. 154.)	61.34	285.728	300.458
122	Bridge No. 99, on top of second stone below coping at end of E. wing berm abutment, marked ⊕ B. M. (Canal B. M. No. 155.)	62.30	285.558	300.288
123	On top of coping N. E. corner N. E. wing of Leonardson's Creek aqueduct, towpath side, marked ⊕ B. M. (Canal B. M. No. 156.)	62.71	283.190	297.920
124	U. S. D. W. B. M., on top of coping S. E. corner W. wing Leonardson's Creek aqueduct, towpath side, marked □ B. M.	62.71	283.237	297.967
125	U. S. D. W. B. M., square □ cut on coping N. E. corner N. W. wing of N. wal., second aqueduct W. of Downing's station, W. S. R. R.	63.82	283.213	297.943
126	On face of towpath abutment of private road bridge E. of lock No. 31 on projection of second course from bottom near center. New B. M. marked ⊕ B. M.	64.72	285.571	300.301
127	Bridge No. 102, U. S. D. W. B. M., projection on face of second stone from E. end of E. wing of towpath abutment, about three feet above ground, marked ⊕ B. M.	65.63	284.874	299.604
128	On coping of lock No. 31, between ends of anchor N. E. gate S. lock. New B. M., marked ⊕ B. M.	68.00	289.787	304.517
129	Bridge No. 104, U. S. L. S. B. M. No. 29, top of iron bolt in coping W. wing towpath abutment Ferry street bridge, Spraker's.	66.22	291.291	306.021
130	Bridge No. 105, on face towpath abutment near W. angle on projection, fifth course below coping, marked ⊕ B. M. (Canal B. M. No. 162.)	66.62	292.128	306.858
131	Bridge No. 106, U. S. D. W. B. M., on projection of bottom course first stone from E. end of E. wing, towpath side, marked ⊕ B. M.	67.04	289.502	304.233
132	Bridge No. 108, on face of towpath abutment near centre on projection, sixth course below coping, marked ⊕ B. M. (Canal B. M. No. 163.)	67.04	290.653	305.383
133	Bridge No. 107, N. Y. S. and U. S. L. S. B. M. N. 90, on face of towpath abutment near W. angle on projection, seventh course below coping marked ⊕. (Canal B. M. No. 164.)	67.79	289.675	304.406
134	Bridge No. 108, on face of towpath abutment near centre, on projection of fourth course below coping, marked ⊕ B. M. (Canal B. M. No. 165.)	68.59	290.590	305.320
135	On coping of parapet at N. E. wing of Canajoharie Creek aqueduct, towpath side, marked ⊕ B. M. (Canal B. M. No. 166.)	69.17	294.098	308.828
136	U. S. D. W. B. M. and U. S. L. S. B. M. No. 31, cross ⊕ cut in first stone of second course E. corner of wall under old barn on towpath near foot bridge W. of Canajoharie	69.55	292.413	307.143
137	Bridge No. 111, on coping at end of W. wing towpath abutment, marked ⊕ B. M. (Canal B. M. No. 167.)	69.93	293.341	308.071

TABLE NO. 13—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Green- bush, 1901.	Mean tide, New York, 1901.
138	Bridge No. 112, on rear upper corner of stone under coping at W. wing, berme abutment, marked ⊕ B. M. (Canal B. M. No. 168) ..	70.63	.....	292.139	306.869
139	Bridge No. 113, on face near center of E. wing, towpath abutment, on projection second stone above ground, marked ⊕ B. M. (Canal B. M. No. 169).....	71.94	.....	291.518	306.248
140	Bridge No. 113, U. S. D. W. B. M., square □ cut under coping on rear side of E. wing towpath abutment.....	71.94	.....	293.333	308.063
141	On coping of lock No. 32 between ends of anchor N. E. gate of N. lock, marked ⊕ B. M. (Canal B. M. No. 171).....	72.32	.....	298.072	312.802
142a	Bridge No. 117, U. S. D. W. B. M., square □ cut on coping E. wing towpath abutment first bridge E. of Fort Plain .....	73.07	.....	299.949	314.679
142	Bridge No. 117, on top of coping at end of W. wing towpath abutment, marked ⊕ B. M. (Canal B. M. No. 173).....	73.07	.....	300.155	314.885
143	Bridge No. 118, on face of towpath abutment on projection sixth course below coping (near center), marked ⊕ B. M. (Canal B. M. No. 174) .....	73.47	.....	298.381	313.111
144	W. S. R. R. bridge No. 278, on face of towpath abutment near center on projection second course from ground. New B. M., marked ⊕ B. M.....	73.77	.....	299.659	314.389
145	On coping of culvert No. 63 near center towpath, marked ⊕ B. M. (Canal B. M. No. 175) .....	73.87	.....	293.513	308.243
146	On top of coping W. wing of culvert No. 65 towpath side, marked □ B. M. New B. M. (Canal B. M. No. 176).....	74.58	.....	296.455	311.185
147	On corner of coping E. wing wall (towpath side) of culvert No. 67 marked ⊕ B. M. (Canal B. M. No. 176).....	76.28	.....	295.605	310.335
148	Bridge No. 119, U. S. D. W. B. M., on top of coping E. wing towpath abutment, marked □ B. M.....	76.58	.....	298.930	313.660
149	Bridge No. 119, on face of towpath abutment near W. angle on projection sixth course below coping, marked ⊕ B. M. (Canal B. M. No. 177).....	76.58	.....	299.207	313.937
150	On coping of lock No. 33 between ends of anchor N. E. gate of N. lock, marked ⊕ B. M. (Canal B. M. No. 179) .....	77.43	.....	303.538	318.268
151	Bridge No. 120, U. S. D. W. B. M., and U. S. L. S. B. M. No. 34 on face of second course of masonry of E. wing wall near center towpath abutment, marked ⊕ B. M.....	77.71	.....	305.297	320.027
152	Bridge No. 120, U. S. L. S. B. M. No. 34a, on face of second course of masonry W. wing wall towpath abutment, marked B. M. with chisel .....	77.71	.....	305.278	320.008
153	Bridge No. 121, on top of second step E. wing towpath abutment of bridge at St. Johnsville. New B. M., marked □ B. M.....	78.25	.....	306.623	321.353
154	Bridge No. 122, U. S. D. W. B. M., on top of lower step E. wing of towpath abutment, marked □ B. M.....	79.72	.....	307.762	322.492
155	On coping of lock No. 34 between ends of anchor N. E. gate of N. lock, marked □ B. M. New B. M.....	80.00	.....	311.554	326.284
156	Bridge No. 124, on face of towpath abutment near W. angle on projection of seventh course below coping, marked ⊕ B. M. (Canal B. M. No. 185).....	80.57	.....	311.651	326.381
157	Bridge No. 125, U. S. L. S. B. M. No. 35 on projection second course E. wing towpath abutment, marked ⊕ B. M.....	80.89	.....	313.502	328.232

TABLE NO. 13—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE	
			Mean tide, New York, 1900.	Mean tide, New York, 1901.
158	Same bridge, U. S. L. S. B. M. No. 35 A and U. S. D. W. B. M. on projection of second course W. wing towpath abutment, marked ⊕ B. M.	80.89	314.069	328.799
159	Bridge No. 126, on projection of seventh course below coping near center towpath abutment, marked ⊕ B. M. (Canal B. M. No. 186.)	81.19	313.717	328.447
160	Bridge No. 127, U. S. D. W. B. M. on top of stone third course E. wing rear of towpath abutment, marked □ B. M.	81.58	314.864	329.394
161	Bridge No. 128, on face of towpath abutment near W. angle on projection of seventh course below coping, marked ⊕ B. M. (Canal B. M. No. 187.)	82.19	312.729	327.459
162	Bridge No. 129, on face of towpath abutment near center on projection seventh course below coping marked ⊕ B. M. (Canal B. M. No. 188.)	82.72	312.494	327.224
163	On coping of lock No. 85 between end's of anchor N. E. gate of N. lock marked ⊕ B. M. (Canal B. M. No. 190.)	83.18	319.708	334.438
164	U. S. D. W. B. M. on cap stone of E. wing of aqueduct No. 12, Indian Castle aqueduct, towpath side, marked □ B. M.	83.28	320.825	335.555
165	Bridge No. 131 at center of W. wing on face of towpath abutment third course from ground marked ○ (U. S. L. S. B. M. No. 36)	83.61	321.919	336.649
166	Bridge No. 131 on face towpath abutment on projection third course from ground (near center) marked ○ "U. S. L. S. B. M. No. 36A"	83.61	321.989	336.719
167	Bridge No. 132 on top of coping E. wing berme abutment of farm bridge marked ⊕ with chisel (Canal B. M. No. 192.)	84.06	324.469	339.199
168	Bridge No. 133. U. S. D. W. B. M. on top of cap stone E. wing towpath abutment of farm bridge about 600 feet N. of the Herkimer monument marked □ with chisel.	85.87	322.736	337.466
169	Lock No. 36 U. S. D. W. B. M. and U. S. L. S. No. 37. Top of iron bolt between ends of anchor N. E. gate N. Lock, marked ⊕ with chisel.	87.55	329.388	344.118
170	On coping of lock No. 37 at ends of anchor N. E. gate N. lock, marked ⊕ with chisel.	88.17	339.429	354.159
171	On coping of lock No. 38 between ends of anchor N. E. gate N. lock, marked □ with chisel. (Canal B. M. No. 200.)	88.33	349.059	363.789
172	On coping lock No. 39 at ends of anchor N. E. gate N. lock, marked ⊕ with chisel. (Canal B. M. No. 202.)	88.55	359.105	373.835
173	U. S. D. W. B. M. on top of coping of west wing towpath abutment Bellinger street bridge, Little Falls, N. Y., marked □ with chisel.	88.65	363.407	378.137
174	On top of lower step E. wing towpath abutment third bridge W. of lock No. 39, marked □ with chisel. (Private bridge.)	89.21	363.195	377.835
175	U. S. D. W. B. M. bridge No. 137 on top of coping of E. wing towpath abutment of farm bridge, marked ⊕ with chisel. (Canal B. M. No. 204.)	89.76	363.703	378.433
176	Bridge No. 138, on top of coping W. wing berme abutment of farm bridge, marked ⊕ with chisel. (Canal B. M. No. 205.)	90.78	364.279	379.009
177	Bridge No. 138, on top of lower step W. wing towpath abutment, first bridge E. of lock No. 40. U. S. L. S. B. M. No. 38A. and U. S. D. W. B. M., marked with chisel.	90.78	364.179	378.909

TABLE NO. 13—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Green- bush, 1901.	Mean tide, New York, 1901.
178	On coping of lock No. 40 at ends of anchor, N. E. gate N. lock, marked ⊕ with chisel. (Canal B. M. No. 207.).....	91.31	.....	366.879	381.609
179	U. S. D. W. B. M., + cross cut on head of iron bolt, N. E. gate N. lock No. 40.....	91.31	.....	366.985	381.715
180	Bridge No. 139, on top of lower step E. wing towpath abutment, second bridge west of lock No. 40, marked □ with chisel.....	92.23	.....	371.176	385.906
181	Bridge No. 140, on top of coping W. wing towpath abutment of farm bridge, marked ⊕ with chisel (Canal B. M. No. 209.).....	92.87	.....	370.886	385.616
182	U. S. D. W. B. M. on top of coping at the end of E. wing towpath abutment, second bridge E. of lock No. 41, marked □ with chisel.....	93.29	.....	370.620	385.350
183	On coping of lock No. 41, ends of anchor N. E. gate N. lock, marked ⊕ with chisel. (Canal B. M. No. 212.).....	93.95	.....	375.065	389.795
184	Bridge No. 143, on coping E. wing towpath abutment, farm bridge, U. S. L. S. B. M. No. 39A, marked with chisel.....	94.82	.....	379.183	393.913
185	Bridge No. 143, on coping W. wing towpath abutment farm bridge U. S. L. S. B. M. No. 39, marked with chisel.....	94.82	.....	379.188	393.918
186	Bridge No. 144, barge canal B. M. No. 1 on N. E. corner lower step, E. wing towpath abutment, marked ○ with chisel. (Herkimer road bridge.).....	95.31	.....	380.388	395.118
187	U. S. D. W. B. M., on top of masonry N. E. corner N. abutment of Mohawk river bridge, Washington street, over Mohawk river, Herkimer, N. Y., marked ⊕ U. S. D. W. B. M.....	95.42	.....	374.481	389.211
188	Cut in small shelf on third stone from W. end lower course, towpath abutment, of street railway bridge between Herkimer and Mohawk.....	96.43	393.156	378.227	392.957
189	Cross cut in circle on shelf of fourteenth stone from W. end of second course, towpath abutment of W. S. R. R. bridge over the canal at Mohawk, N. Y.....	96.55	393.975	379.046	393.776
190	Cross cut in circle on N. W. corner, lower step, W. wing, berne abutment, Mohawk canal bridge.....	96.96	393.675	378.746	393.476
191	Lock No. 42, square cut on coping between ends of anchor, N. E. gate, towpath lock.....	97.08	.....	384.264	398.994
192	Lock No. 43, square cut on coping between ends of anchor, N. E. gate, towpath lock.....	97.29	.....	392.285	407.015
193	Cross cut in circle on N. E. corner of towpath parapet wall coping of Fulmer Creek aqueduct, at Mohawk.....	97.32	408.800	393.871	408.601
194	Circle cut in square on S. W. corner, lower step, W. wing, towpath abutment, Meyer's farm bridge, at Mohawk, N. Y.....	97.68	411.095	396.166	410.896
195	Circle cut in square on S. W. corner, W. wing, towpath abutment, Typewriters' bridge, Ilion, N. Y.....	98.39	410.111	395.182	409.912
196	Circle cut in square on S. E. corner of top foundation stone of N. E. stair landing near post of Railroad street lift bridge, Ilion, N. Y.....	88.63	409.423	394.494	409.224
197	Cross cut in circle on W. corner of coping of Steel Creek aqueduct, towpath side, Ilion, N. Y.....	98.91	409.350	394.421	409.151
198	Circle cut in square on S. W. corner, lower step of W. wing of towpath abutment of London bridge, Ilion, N. Y.....	99.17	411.125	396.196	410.926
199	Cross cut in circle on N. E. corner, second step of east wing, towpath abutment of street railway bridge between Ilion and Frankfort.....	99.60	410.030	395.101	409.831

TABLE NO. 13—(Concluded).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Green- bush, 1901.	Mean tide, New York, 1901.
200	Lock No. 44, square cut on coping between ends of anchor, N. E. gate, towpath lock.	100.00	.....	403.343	418.073
201	Circle cut in square on S. W. corner, lower step, W. wing, towpath abutment of bridge 650 feet W. of lock 44, Erie canal.....	100.13	421.157	406.228	420.958
202	Circle cut in square on S. W. corner, lower step, W. wing, towpath abutment, Reese's road bridge, Frankfort, N. Y.....	100.56	423.314	408.395	423.115
203	Projection on top of stone in bottom course of stones on S. E. corner towpath abutment of first bridge east of lock 45, Frankfort.	101.13	419.550	404.621	419.351
204	Cross cut in circle on coping, two feet E. of E. hollow quooin, towpath side of Lock 45, Frankfort.....	101.24	428.159	413.230	427.960
205	Circle cut in square on S. E. corner of lower step, east wing, towpath abutment of Beehive bridge, about three-quarters of a mile west of Frankfort.....	101.68	431.294	416.365	431.095
206	Cross cut in circle on S. E. corner, second step, east wing, towpath abutment, bridge No. 161, next west of Beehive bridge.....	102.15	431.648	416.719	431.449
207	Circle cut in projection on face of fifth stone from west end in second course in towpath abutment, Frankfort, Centre bridge.....	102.43	430.278	415.849	430.079
208	Circle cut on S. W. corner, lower step, west wing, towpath abutment, Bargo's farm bridge, five miles E. of Herkimer-Oneida county line.....	102.97	431.997	417.068	431.798
209	Circle cut in S. W. corner, lower step, west wing, towpath abutment, Farm bridge No. 164, 4.4 miles E. of Herkimer-Oneida county line.....	103.56	431.805	416.876	431.606
210	Cross cut in circle on face of stone near W. angle of towpath abutment of Farm bridge No. 165, four miles E. of Herkimer-Oneida county line.....	103.94	430.904	415.975	430.705
211	Circle cut on first stone W. of E. angle, second course, towpath abutment, Farm bridge No. 163, three miles E. of Herkimer-Oneida county line.....	104.93	430.396	415.467	430.197
212	Cross cut in circle on projection of first stone in second course, W. angle of towpath abutment, Farm bridge No. 167, 3.7 miles E. of Herkimer-Oneida county line.....	105.33	429.365	414.436	429.166
213	Cross cut in circle on projection on face of first stone W. of E. angle in second course, towpath abutment, Farm bridge No. 168, 2.2 miles E. of Herkimer-Oneida county line.....	105.77	431.876	416.946	431.676
214	Circle cut in square on projection on face of second stone from E. angle in second course, towpath abutment, Harbor bridge No. 169.....	106.06	430.603	415.674	430.404
215	Cross cut in circle on S. E. corner of coping stone on the extreme E. end of parapet wall of Ferguson Creek aqueduct.....	106.88	428.508	413.579	428.309
216	Cross cut in circle on S. E. corner, lower step, E. wing, towpath abutment of first bridge east of Herkimer-Oneida county line.....	107.41	430.995	416.066	430.796
217	Copper plug in S. E. corner, lower step, east wing, towpath abutment, Green's road bridge at the Herkimer-Oneida county line.....	107.98	432.198	417.269	431.999

---

---

LIST

OF

BENCH MARKS

NEW YORK STATE CANALS

CHAMPLAIN CANAL,

FROM LOCK No. 3, ERIE CANAL, TO WHITEHALL, N. Y.

---

FROM LEVELS OF 1896 AND 1901.

---

---



TABLE NO. 14.

List of Bench Marks, Champlain Canal, from Lock No. 3, Erie Canal, to Whitehall. Levels of 1901.

B. M. No.	DESCRIPTION.	Miles from Lock No. 3 of Erie Canal, 6 1/2 m. N. of Albany.	ELEVATION ABOVE	
			Greenbush.	Mean tide, New York.
0	On coping of lock No. 3. Erie canal between ends of anchor S. W. gate of W. lock, corresponds with Canal Survey B. M. No. 14, marked ⊕	0.00	23.829	88.559
1	On coping of lock No. 1, between ends of anchor S. E. gate, marked ⊕ with chisel. (Canal B. M. No. 1)	1.45	24.357	39.087
2	On coping of lock No. 2, between ends of anchor S. E. gate, marked ⊕ with chisel. (Canal B. M. No. 3)	1.56	35.707	50.437
3	On coping of lock No. 3, between ends of anchor S. W. gate, marked ⊕ with chisel. (Canal B. M. No. 5)	2.36	37.604	52.334
4	On coping of lock No. 4, between ends of anchor N. E. gate, marked □ with chisel	2.79	41.625	56.355
5	On coping of Waterford side cut, S. W. angle, upper combined lock, marked ⊕ with chisel. (Canal B. M. No. 9)	3.89	35.334	50.064
6	At Waterford, U. S. D. W. B. M., D. & H. R. R. (lower depot) on door sill to W. entrance, marked □ with chisel	4.30	21.779	36.509
7	D. & H. R. R. bridge over canal one-quarter mile N. of Waterford, on lower step N. wing towpath abutment, marked □ with chisel	4.69	40.635	55.365
8	On coping of lock No. 5, between ends of anchor S. E. gate, marked □ with chisel	5.04	48.360	63.090
9	On coping of lock No. 6, between ends of anchor S. E. gate, marked □ with chisel	5.34	61.571	76.301
10	Bridge No. 11, on third step N. wing towpath abutment, marked □ with chisel	5.62	67.188	81.918
11	Bridge No. 13, on second step S. wing towpath abutment, marked □ with chisel (third bridge N. of lock No. 6)	6.42	66.428	81.158
12	Bridge No. 15, on first step S. wing towpath abutment, marked □ with chisel	7.16	66.436	81.166
13	U. S. D. W. B. M., square cut on W. windowsill on S. side of Geo. S. Forases' road house, about three and one-half miles N. of Waterford and about one-fourth mile E. of canal	7.36	38.813	53.043
14	Bridge No. 16, on first step N. wing towpath abutment of farm bridge, marked □ with chisel	7.94	65.519	80.249
15	On coping of lock No. 7, between ends of anchor S. E. gate, marked □ with chisel	8.36	69.162	83.892
16	Bridge No. 19, on first step N. wing towpath abutment, about 400 feet W. of schoolhouse, marked □ with chisel	9.06	74.182	88.912
17	On coping of lock No. 8, between ends of anchor S. E. gate, marked □ with chisel	9.72	80.246	94.976
18	Bridge No. 21, S. W. corner S. wing lower step towpath abutment, marked □ with chisel	11.16	81.393	96.128
19	Bridge No. 22, on first step S. wing towpath abutment, marked □ with chisel	11.72	82.075	96.805
20	U. S. D. W. B. M., Presbyterian church at Mechanicville, on S. end of stone windowsill between tower and entrance on E. side, square cut	12.27	74.490	89.220
21	U. S. D. W. B. M., N. E. corner of water table of main building of M. E. church on Main street, Mechanicville	12.28	74.663	89.393
22	Bridge No. 24, square cut on S. W. corner of S. foundation to lift bridge, Park avenue, Mechanicville, towpath side	12.27	81.193	95.923
23	Pulp mill side track bridge, S. W. corner of S. foundation, towpath side, marked □ with chisel	12.58	81.342	96.072
24	Waste-weir No. 5, on N. E. corner of coping stone of S. abutment, first waste-weir N. of Mechanicville, marked □ with chisel	13.31	80.450	95.180
25	U. S. D. W. B. M., head of bolt at base of first S. column just E. of Electric R. R. track W. end of Fitchburg R. R. bridge over Hudson river	13.82	72.167	86.897

TABLE NO. 14—(Continued).

B. M. No.	DESCRIPTION.	Miles from Lock No. 3 of Erie Canal, 6½ m. N. of Albany.	ELEVATION ABOVE	
			Greenbush.	Mean tide, New York.
26	On coping, lock No. 9, between ends of anchor S. W. gate, marked □ with chisel.....	13.84	89.305	104.035
27	Bridge No. 30, on second step S. wing berme abutment, marked □ with chisel.....	14.36	89.619	104.349
28	Bridge No. 32, on lower step S. wing, berme abutment, marked □ with chisel.....	14.58	91.677	106.407
29	Bridge No. 33, on lower step S. wing, towpath abutment, Sisson street, Stillwater, marked □ with chisel.....	14.72	89.760	104.490
30	Stillwater, U. S. D. W. B. M., square cut on large flat stone step of entrance to First M. E. church (S. end of stone).....	14.82	75.187	89.917
31	Bridge No. 35, second step S. wing towpath abutment, marked □ with chisel.....	15.55	90.699	105.429
32	Bridge No. 36, on second step S. wing towpath abutment of farm and highway bridge, marked □ with chisel.....	16.81	90.886	105.616
33	Bridge No. 38, on projection S. wing about 3 feet above ground, towpath abutment, Ford's farm bridge, marked □ with chisel.....	17.45	92.135	106.865
34	Bridge No. 39, on lower step S. wing towpath abutment, Britton's farm bridge, marked □ with chisel.....	17.66	91.260	105.990
35	Bemis Heights, U. S. D. W. B. M., S. E. corner of N. abutment of waste-weir, iron bolt and stone chiseled away around bolt.....	17.86	89.357	104.087
36	S. E. corner of middle abutment of Bemis Heights waste-weir, marked + with chisel.....	17.86	89.605	104.235
37	Bridge No. 41, point cut on face of masonry second course above ground at E. angle, towpath abutment.....	18.26	90.198	104.928
38	U. S. D. W. B. M., bridge No. 43, square cut on lower step S. wing towpath abutment, about 1 mile N. of Bemis Heights.....	18.83	91.158	105.888
39	Bridge No. 44, on lower step S. wing towpath abutment of Van Wie's farm bridge, marked □ with chisel.....	19.43	91.548	106.278
40	Wilber's waste-weir, square cut on N. E. corner of stone, first step from top of middle abutment.....	20.01	88.451	103.181
41	Bridge No. 48, on lower step N. wing towpath abutment of farm bridge, marked ○ with chisel..	20.51	90.907	105.637
42	Bridge No. 49, circle cut on lower step N. wing towpath abutment (bridge down).....	20.91	91.365	106.095
43	Bridge No. 50, on lower step S. wing towpath abutment of road bridge, marked ○ with chisel..	21.71	90.649	105.379
44	Bridge No. 51, on lower step N. wing towpath abutment of farm bridge, marked ○ with chisel..	21.91	91.323	106.053
45	Bridge No. 52, on second step S. wing berme abutment, first bridge S. of Salisbury's road bridge, marked □ with chisel.....	22.36	90.826	105.556
46	Bridge No. 53, on first step N. wing towpath abutment of Salisbury's road bridge, marked □ with chisel.....	22.61	91.286	106.016
47	Bridge No. 54, on second step N. wing towpath abutment of farm bridge, marked □ with chisel.....	23.21	91.034	105.764
48	Bridge No. 55, on second step N. wing towpath abutment, first bridge S. of Electric E. R. bridge near Coveville, marked ○ with chisel.....	23.97	89.895	104.625
49	Waste-weir at Coveville, on coping of N. abutment, marked ○ with chisel.....	24.58	88.733	103.468
50	U. S. D. W. B. M., bridge No. 57, on lower step N. wing towpath abutment, 1,000 feet N. of Coveville P. O., marked □ with chisel.....	24.96	91.864	106.594
51	Bridge No. 58, on lower step N. wing towpath abutment, marked ○ with chisel.....	25.11	92.075	106.805
52	Bridge No. 59, on lower step S. wing towpath abutment, marked ○ with chisel.....	25.91	92.975	107.705
53	Bridge No. 60, on lower step, S. wing towpath abutment, marked □ with chisel (Dwyer farm bridge).....	26.21	92.474	107.204
54	Bridge No. 62, on lower step N. wing towpath abutment, first bridge S. of Ferry street, Schuylerville, marked □ with chisel.....	27.81	92.340	107.070

TABLE NO. 14—(Continued).

B. M. No.	DESCRIPTION.	Miles from Lock No. 8 of Erie Canal, 6 $\frac{1}{2}$ m. N. of Albany.	ELEVATION ABOVE	
			Greenbush.	Mean tide, New York.
55	Bridge No. 63, Schuylerville, U. S. D. W. B. M., on second step N. wing towpath abutment of Ferry street bridge, marked $\bigcirc$ with chisel.....	27.91	91.970	106.700
56	Bridge No. 64, Saratoga street, Schuylerville, on lower step N. wing towpath abutment, first bridge N. of Ferry street, marked $\square$ with chisel.....	28.11	91.388	106.118
57	U. S. D. W. B. M., bridge No. 65, on second step S. wing berme abutment, road and trolley R. E. bridge, marked $\square$ with chisel.....	29.01	90.412	105.142
58	On lower step S. wing towpath abutment marked $\square$ with chisel. (Bridge down.).....	29.51	98.459	108.189
59	On coping of lock No. 10 between ends of anchor S. E. gate, marked $\oplus$ with chisel. (Canal B. M. No. 46.).....	29.90	95.146	109.876
60	U. S. D. W. B. M., square cut on S. E. corner of coping of E. wall, lock No. 10, marked $\square$ with chisel.....	29.90	95.203	109.933
61	On coping of lock No. 11, between ends of anchor S. E. gate, marked $\square$ with chisel.....	30.53	98.446	113.176
62	Bridge No. 69, on lower step S. wing berme abutment, first bridge N. of lock No. 11, marked $\oplus$ with chisel. (Canal B. M. No. 49.).....	31.01	100.259	114.989
63	Waste weir No. 12, on top step S. abutment, towpath side, marked $\square$ with chisel.....	31.60	97.583	112.313
64	On coping of lock No. 12, between ends of anchor, S. E. gate, marked $\square$ with chisel.....	31.96	107.277	122.007
65	Waste weir No. 13, on top of coping, S. wing, marked $\square$ with chisel.....	32.21	106.351	121.081
66	Bridge No. 74, on lower step N. wing of E. abutment of Fort Miller change bridge, marked $\square$ with chisel.....	32.45	108.928	122.758
67	Ft. Miller, U. S. D. W. B. M., square cut on S. end of S. window sill of brick blacksmith shop facing Hudson river and on E. side of highway.....	32.50	109.295	124.025
68	Bridge No. 75, on lower step, N. wing, towpath abutment, first bridge S. of lock No. 13, marked $\oplus$ with chisel.....	32.94	109.148	123.878
69	On coping of lock No. 13, between ends of anchor, S. W. gate, marked $\bigcirc$ with chisel. (Canal B. M. No. 56.).....	33.19	117.855	132.585
70	Bridge No. 77, on lower step, N. wing, towpath abutment of farm bridge, marked $\square$ with chisel..	33.44	118.596	133.326
71	Bridge No. 78, on second step, N. wing, towpath abutment of farm bridge, marked $\oplus$ with chisel.	34.05	118.028	132.758
72	Bridge No. 79, on lower step, N. wing, berme abutment of Comer's farm bridge, marked $\oplus$ with chisel.....	34.38	118.598	133.328
73	Bridge No. 80, on lower step, S. wing, berme abutment of farm bridge, marked $\oplus$ with chisel.....	34.72	118.914	133.644
74	Bridge No. 81, on lower step, S. wing, towpath abutment, marked $\bigcirc$ with chisel.....	35.06	118.214	132.944
75	On coping of lock No. 14, between ends of anchor, S. E. gate, marked $\oplus$ with chisel. (Canal B. M. No. 63.).....	35.88	126.516	141.246
76	U. S. D. W. B. M., bridge No. 83, on rear of second course of masonry, N. wing, towpath abutment, marked $\square$ with chisel.....	36.06	127.991	142.721
77	Bridge No. 84, on lower step, S. wing, towpath abutment, marked $\bigcirc$ with chisel.....	36.33	126.087	140.787
78	Bridge No. 85, on second step, N. wing, towpath abutment, marked $\square$ with chisel.....	36.92	126.379	141.109
79	Waste weir No. 14, on N. W. corner of coping of S. abutment, marked $\bigcirc$ with chisel.....	37.24	124.538	139.268
80	Bridge No. 87, on lower step S. wing berme abutment, first bridge N. of Satterlees foot bridge, marked $\square$ with chisel.....	37.43	127.938	142.668
81	Bridge No. 88, on lower step N. wing towpath abutment of road bridge, marked $\oplus$ with chisel..	37.98	127.558	142.288
82	U. S. D. W. B. M., bridge No. 90, on second step N. wing towpath abutment of road bridge, marked $\square$ with chisel.....	38.25	128.111	142.814

TABLE NO. 14—(Continued).

B. M. No.	DESCRIPTION.	Miles from Lock No. 3 of Eric Canal, 6 $\frac{1}{2}$ m. N. of Albany.		ELEVATION ABOVE	
		Greenbush.	Mean tide, New York.		
83	Bridge No. 91, on lower step S. wing berme abutment of farm bridge, marked $\oplus$ , about 600 feet N. of brick house in field .....	38.71	127.055	141.785	
84	Bridge No. 93, on lower step S. wing, berme abutment of farm bridge, marked $\oplus$ with chisel.....	39.17	126.311	141.041	
85	Bridge No. 94, on lower step N. wing berme abutment of farm bridge, marked $\oplus$ with chisel.....	39.40	127.319	142.049	
86	Bridge No. 95, on lower step N. wing berme abutment of road bridge, first bridge S. of electric R. R. near Ft. Edward, marked $\oplus$ with chisel.....	40.37	127.925	142.655	
87	Bridge No. 96, on second step N. wing towpath abutment, marked $\oplus$ with chisel .....	40.65	127.651	142.381	
88	On S. end of coping of wall at edge of canal, towpath side of aqueduct No. 4, Ft. Edward, marked $\oplus$ with chisel.....	40.75	126.057	140.787	
89	Ft. Edward U. S. D. W. B. M., and U. S. Geol. Survey aluminum bronze tablet set in N. side of W. entrance of High school building.....	41.15	130.693	145.423	
90	On coping of lock No. 15, between ends of anchor S. E. gate, marked $\oplus$ with chisel. (Canal B. M. No. 76.).....	41.40	134.642	149.372	
91	Bridge No. 99, on lower step S. wing berme abutment, first bridge N. of lock No. 15, marked $\oplus$ with chisel .....	41.66	135.872	150.602	
92	Waste-weir No. 15, on coping of E. wing N. abutment, about 1 $\frac{1}{2}$ miles N. of Ft. Edward, marked $\square$ with chisel .....	42.53	134.405	149.135	
93	Bridge No. 100, on lower step N. wing berme abutment of change bridge at Glens Falls feeder, marked $\oplus$ with chisel .....	43.41	138.937	153.667	
94	Bridge No. 101, on second step N. wing berme abutment of farm bridge, marked $\circ$ with chisel.....	43.85	136.497	151.227	
95	U. S. D. W. B. M., N. W. corner of W. stone, top course of masonry of S. abutment of D. & H. R. R. bridge over canal overflow 600 feet S. of highway at Durham's Basin, marked $\square$ with chisel.....	44.53	131.753	146.483	
96	Bridge No. 102, on lower step N. wing berme abutment of Dunham's road bridge, marked $\square$ with chisel.....	44.55	134.950	149.680	
97	N. W. corner of red barn, on towpath, on stone foundation, marked $\square$ with chisel.....	45.80	133.845	148.575	
98	Spike in W. side of elm tree about 30 feet from front angle of towpath in Davison's front yard, about 3 miles north of Dunham's Basin .....	47.15	136.808	151.538	
99	Bridge No. 103, on projection N. end of second course of masonry, towpath abutment, marked $\square$ with chisel .....	47.70	136.673	151.403	
100	Bridge No. 104, on lower step N. wing towpath abutment, marked $\square$ with chisel .....	47.90	137.545	152.275	
101	Smith's Basin U. S. D. W. B. M., on N. W. corner of W. stone, top course, S. abutment of small plate girder bridge on D. & H. R. R., near station, marked $\square$ with chisel .....	49.12	127.643	142.373	
102	Bridge No. 105, Smith's Basin, on second step N. wing towpath abutment, marked $\square$ with chisel..	49.12	135.989	150.749	
103	Bridge No. 106, on lower step S. wing berme abutment, marked $\oplus$ with chisel .....	49.60	135.891	150.621	
104	Bridge No. 107, on lower step N. wing berme abutment, marked $\square$ with chisel.....	50.10	135.996	150.726	
105	Bridge No. 108, on lower step S. wing berme abutment, marked $\square$ with chisel.....	50.35	135.889	150.619	
106	Bridge No. 110, on lower step N. wing berme abutment of road bridge, 1 $\frac{1}{2}$ miles S. of Fort Ann, marked $\square$ with chisel .....	51.00	137.404	152.134	
107	Bridge No. 111, on lower step N. wing towpath abutment of road bridge, marked $\square$ with chisel..	51.47	135.184	149.914	
108	Bridge No. 112, on lower step N. wing. towpath abutment of farm bridge, marked $\square$ with chisel..	51.95	137.972	152.702	
109	Bridge No. 113, on lower step, S. wing berme abutment of farm bridge, marked $\square$ with chisel .....	52.50	137.228	151.958	

TABLE NO. 14—(Concluded).

B. M. No.	DESCRIPTION.	Miles from Lock No. 3 of Erie Canal, 6½m. N. of Albany.	ELEVATION ABOVE	
			Greenbush.	Mean tide, New York.
110	On coping of lock No. 16, between ends of anchor, S. W. gate, marked □ with chisel .....	53.10	134.415	149.145
111	On coping of lock No. 18, between ends of anchor, N. E. gate, marked □ with chisel .....	53.80	118.223	132.953
112	Ft. Ann U. S. D. W. B. M., cross cut on coping of parapet wall to N. abutment of D & H. R. R. bridge over canal. Cross is near N. edge of stone and directly opposite space between the two bridges (cross in hollow) .....	53.33	125.440	140.170
113	Dewey's private bridge on projection of 5th stone in 2d course of masonry of S. wing, towpath abutment, marked with chisel .....	55.85	114.369	129.099
114	On coping of lock No. 19, between ends of anchor of N. W. gate, marked □ with chisel .....	56.54	112.693	127.423
115	Comstock's U. S. D. W. B. M., square cut on S. E. corner of S. coping stone of culvert and on E. side of roadbed of D. & H. R. R., about 2,800 feet S. of station .....	56.87	117.135	131.865
116	Comstock's road bridge No. 118, on projection of 1st course of masonry, S. wing, towpath abutment, marked □ with chisel .....	57.42	111.190	125.920
117	Private road bridge, on projection of 5th course of masonry below coping, towpath abutment (near center) marked ○ with chisel .....	58.32	110.778	<del>125.598</del>
118	Bridge No. 120, on 2d step S. wing, towpath abutment, marked □ with chisel .....	59.16	112.111	126.841
119	On coping of lock No. 20, between ends of anchor of N. W. gate, marked □ with chisel .....	59.51	112.884	127.614
120	Between Comstock's and Whitehall U. S. D. W. B. M., square cut on S. E. corner of stone S. berme abutment of D. & H. R. R. bridge over canal on W. side at N. end of plate girder where it connects with middle truss of bridge .....	59.97	119.747	134.477
121	Bridge No. 125, on lower step, N. wing, berme abutment of farm bridge, about 1 mile N. of lock No. 20, marked □ with chisel .....	60.59	109.316	124.046
122	Bridge No. 126, lower step N. wing, towpath abutment (iron bridge), marked □ with chisel .....	61.11	110.119	124.849
123	Bridge No. 127, lower step, N. wing, towpath abutment, marked □ with chisel .....	61.73	120.020	134.750
124	Bridge No. 129, on lower step N. wing, towpath abutment of farm bridge, marked □ with chisel .....	62.46	109.199	123.929
125	Bridge No. 130, on second step S. wing, berme abutment of farm bridge, marked ⊕ with chisel .....	62.87	109.962	124.692
126	Bridge No. 131, on lower step N. wing, berme abutment, first bridge S. of D. & H. R. R. bridge, marked □ with chisel .....	63.72	111.655	126.385
127	Waste-weir No. 24, on coping of N. wall, E. stone, about 1100 feet S. of D. & H. R. R., Rutland branch, marked □ with chisel .....	64.24	108.775	123.505
128	Bridge No. 132, on lower step, N. wing, towpath abutment, Fordman street, Whitehall, marked □ with chisel .....	64.65	110.975	125.705
129	On coping of lock No. 21, between ends of anchor, N. E. gate, marked □ with chisel .....	65.06	107.586	122.316
130	U. S. D. W. B. M., on coping of lock No. 23, between ends of anchor, N. W. gate, marked ⊕ U. S., with chisel .....	65.10	89.645	104.875

## CORRECTED ELEVATIONS.

Elevation Above

Page	B. M. No.	Greenbush	Mean Tide, New York.
674	102	136.989	151.719
"	107	137.184	151.914
675	117	111.718	126.448
"	123	112.020	126.570

---

LIST  
OF  
BENCH MARKS  
NEW YORK STATE CANALS  
CHAMPLAIN CANAL,  
ON GLENS FALLS FEEDER  
SUPPLYING SUMMIT-LEVEL FROM FORT EDWARD  
TO FORT ANN, N. Y.

---

FROM LEVELS OF 1897.

---

These elevations were obtained from a line of levels run by Theodore A. Hendrickson in 1897, and from data on file in the office of the division engineer. They are referred to the datum of the levels of the Barge Canal Survey of 1901, viz., the bench mark on the old grist mill at Greenbush, N. Y., elevation 14.73 feet above mean tide water at New York as established and adopted by the United States Coast and Geodetic Survey in 1877.

*List of Bench Marks on the Glens Falls Feeder.*

No.	DESCRIPTION.	Distance from Champlain canal, feet.	ELEVATION ABOVE	
			Greenbush B. M., feet.	Mean tide at New York, feet.
1	Road and change bridge No. 100, on the Champlain Canal, at the foot of the Glens Falls Feeder, on lower step, N. wing, berme abutment, marked ⊕ with chisel.....	-----	138.937	153.667
2	On coping of lock No. 1, E. end of lock, N. E. quoin, between gate anchors.....	250	143.116	157.846
3	On coping of lock No. 2, E. end of lock, N. E. quoin, between gate anchors.....	703	153.272	168.002
4	On coping of lock No. 3, E. end of lock, N. E. quoin, between gate anchors.....	805	163.467	178.197
5	On coping of lock No. 4, E. end of lock, N. E. quoin, between gate anchors.....	1,346	173.562	188.292
6	On coping of lock No. 5, E. end of lock, N. E. quoin, between gate anchors.....	1,861	183.826	198.556
7	On coping of lock No. 6, E. end of lock, N. E. quoin, between gate anchors.....	2,597	194.021	208.751
8	On coping of lock No. 7, E. end of lock, N. E. quoin, between gate anchors.....	2,703	204.126	218.856
9	On coping of lock No. 8, E. end of lock, N. E. quoin, between gate anchors.....	2,809	214.321	229.051
10	On coping of lock No. 9, E. end of lock, N. E. quoin, between gate anchors.....	2,915	224.285	239.015
11	On coping of lock No. 10, E. end of lock, N. E. quoin, between gate anchors.....	3,020	234.174	248.904
12	On bridge No. 1, W. of lock No. 10, berme abutment, N. W. corner, W. end, third step, fourth course above water.....	3,386	238.933	253.663
13	On coping of lock No. 11, towing path side, lower hollow quoin, between gate anchors.....	3,544	246.121	260.851
14	On coping of lock No. 12, towing path side, lower hollow quoin, between gate anchors.....	4,762	255.096	269.826
15	On coping of lock No. 13, towing path side, lower hollow quoin, between gate anchors.....	5,554	265.505	280.235
16	On bridge No. 3, Maple street, Sandy Hill, towing path abutment, E. end, first step.....	6,303	270.390	285.120
17	On bridge No. 4, Basin street, Sandy Hill, berme abutment, W. end, N. W. corner, first step....	-----	269.593	284.323
18	On bridge No. 6, Ferry street, Sandy Hill, towing path abutment, W. end, N. W. corner first step.....	-----	270.263	284.993
19	On bridge No. 7, Brown, near Cold spring, towing path abutment, W. end, second step..	13,629	268.160	282.890
20	On bridge No. 9, Monty, towing path abutment, W. end, third step.....	17,924	270.389	285.119

## List of Bench Marks on the Glens Falls Feeder—(Concluded).

Number.	DESCRIPTION.	Distance from Champlain canal, feet.	ELEVATION ABOVE	
			Greenbush B. M., feet.	Mean tide at New York, feet.
21	On bridge No. 10, below cement works, berme abutment, E. end step, level with vertical wall .....	19,506	271.003	285.733
22	On bridge No. 11, D. & H. C. Co. railroad bridge, berme abutment, E. end second step, N. W. corner .....	19,932	269.637	284.367
23	On bridge No. 12, Sherman's lime kiln, towing path abutment, second step, W. end .....	22,202	269.880	284.610
24	On top of stone foundation of trestle, W. end, in rear of Finch & Pruyn's office, Glen street, Glens Falls .....	about 26,664	269.943	284.673
25	On bridge No. 15, Morgans (first W. of Glen street bridge) on projecting stone at W. end of towing path abutment .....	28,849	273.550	288.280
26	On change bridge No. 16, north towing path abutment, first step, east end .....	34,056	270.257	284.987
27	On coping of lock No. 14, guard lock, east end, marked ⊕ with chisel .....	36,749	270.966	285.696



---

---

LIST

OF

BENCH MARKS

NEW YORK STATE CANALS

MIDDLE DIVISION

ERIE CANAL,

FROM THE HERKIMER-ONEIDA COUNTY LINE TO THE  
SENECA-WAYNE COUNTY LINE.

---

FROM LEVELS OF 1900 AND 1901.

---

---

TABLE NO. 15.

List of Bench Marks, Erie Canal, Middle Division, from the Herkimer-Oneida County Line to the Seneca-Wayne County Line. From the Herkimer-Oneida County Line to Grove Spring, from Levels of 1900; Grove Spring to Seneca-Wayne County Line, from Levels of 1901.

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
217	Copper plug in S. E. corner, lower step, E. wing, towpath abutment, Green's road bridge at the Herkimer-Oneida county line.....	107.98	432.198	417.269	431.999
218	Tack in elm stub, 40 feet from front angle of towpath, about 200 feet E. of Mohawk Valley Cotton Mills, Utica.....	108.88	426.939	412.010	426.740
219	Copper plug in S. W. corner of W. end, towpath abutment of Broad street lift bridge, Utica, N. Y.....	109.98	432.330	417.401	432.131
220	At Utica post-office, bronze tablet W. of E. basement door rear of building, marked "U. S. geological survey B. M. Elev. 419 feet.".....	110.88	.....	403.082	417.812
221	Copper plug in S. W. corner of stone forming foundation of western stairway of Broadway foot bridge, Utica, N. Y.....	110.68	428.558	413.629	428.359
222	Copper plug in S. W. corner, W. end, towpath abutment, Whitesboro street lift bridge, Utica, N. Y.....	110.98	432.456	417.527	432.257
223	Lock No. 46, copper plug between ends of anchor, N. E. gate, towpath lock....	111.85	.....	416.329	431.059
224	Copper plug in bottom step, E. wing, towpath abutment, Platt street, Utica, N. Y.....	111.68	434.981	420.052	434.782
225	Copper plug in lower step, E. wing, towpath abutment, Whitesboro road bridge at W. line of city of Utica. ....	112.58	436.581	421.652	436.382
226	Copper plug, lower step, E. wing towpath abutment, Yorkville road bridge.	113.28	436.491	421.562	436.292
227	Copper plug in second stone from N. E. end of towpath parapet wall of Saquoit Creek aqueduct.....	113.58	434.420	419.491	434.221
228	Copper plug, S. E. corner, bottom step, E. wing, towpath abutment, Clinton street bridge, Whitesboro.....	114.18	434.605	419.677	434.407
229	Copper plug, bottom step, E. wing, towpath abutment, Westmoreland street bridge, Whitesboro.....	114.58	435.899	420.970	435.700
220	Copper plug, S. W. corner, bottom step, E. wing, towpath abutment, Bradley's road bridge between Oriskany and Whitesboro.....	115.58	437.518	422.589	437.319
231	Copper plug, S. E. corner, bottom step, E. wing, towpath abutment, Evans' farm bridge just E. of Oriskany.....	116.78	437.092	422.163	436.892
232	Copper plug in S. W. corner of stone on W. end of coping of Oriskany aqueduct, towpath side. (This is also U. S. D. W. B. M. El. 435.00).....	117.28	434.904	419.975	434.705
233	Copper plug, S. W. corner, bottom step, W. wing, towpath abutment, Brainard's Bridge, just W. of Oriskany..	118.38	436.769	421.840	436.570
234	Copper plug in S. W. corner, bottom step, W. wing, towpath abutment, Kieley's farm bridge, 1½ miles W. of Oriskany.....	118.88	436.023	421.094	435.824
235	Copper plug, S. E. corner, bottom step, East wing, towpath abutment, Murphy's farm bridge, 3 miles W. of Oriskany.....	120.28	435.921	420.092	435.722
236	Copper plug, S. W. corner, bottom step, W. wing, towpath abutment, Clark's farm bridge, 4½ miles W. of Oriskany.....	121.68	437.052	422.134	436.861

TABLE NO. 15—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
237	Copper plug, S. E. corner, bottom step, E. wing, towpath abutment, Stanwix road bridge.....	123.58	438.623	423.694	438.424
238	Knob cut on projection on face of stone in lower courses near W. end of towpath abutment, George street bridge, Rome, N. Y.....	125.56	433.506	418.577	433.307
239	Copper plug in bottom step, E. wing, towpath abutment, Barnes' farm bridge, just W. of Rome, N. Y.....	126.68	436.263	421.334	436.064
240	Knob cut on face of first stone, third course, W. wing, towpath abutment, Brainard's farm bridge, just E. of Fort Bull waste weir.....	127.86	435.936	421.007	435.737
241	Copper plug, lower step, W. wing, towpath abutment, Armstrong's farm bridge.....	129.61	436.446	421.517	436.247
242	Knob cut on face of stone in second course, towpath abutment, Sand's farm bridge.....	131.05	433.729	418.800	433.530
243	Copper plug in bottom step, E. wing, towpath abutment, New London road bridge.....	132.40	436.356	421.427	436.157
244	Copper plug in W. end of foundation stone of berme supports, Grove Spring road bridge.....	133.72	430.515	415.586	430.316
245	Bridge No. 49, Stacey's Basin road bridge, copper plug, lower step, E. wing, towpath abutment.....	134.37	.....	421.746	436.476
246	Bridge No. 50, Happy Valley road bridge, copper plug, lower step, E. wing, towpath abutment.....	135.17	.....	421.537	436.267
247	Bridge No. 51, east road bridge, Higginsville, copper plug, second step, E. wing, towpath abutment.....	136.18	.....	419.405	434.135
248	Bridge No. 52, west road bridge, Higginsville, square cut on fourth step, W. wing, towpath abutment.....	136.58	.....	420.150	434.860
249	Square cut on N. E. corner of parapet of first culvert W. of bridge No. 52 (Higginsville) towpath side.....	136.85	.....	414.204	428.934
250	Bridge No. 53, Dunbarton bridge, copper plug, step flush with ground, E. wing, towpath abutment.....	137.48	.....	418.027	432.757
251	Culvert No. 30, square cut N. E. corner of coping, towpath side.....	137.64	.....	414.557	429.287
252	Culvert No. 31, square cut N. E. corner of coping, towpath side.....	137.98	.....	414.635	429.365
253	Bridge No. 54, Durkee's road bridge, copper plug, third step, E. wing, towpath abutment.....	138.11	.....	418.648	433.378
254	Bridge No. 55, State road bridge, copper plug, second step, E. wing, towpath abutment.....	138.70	.....	418.720	433.450
255	Square cut on N. E. corner of coping of culvert just east of Midland E. R. bridge, towpath side.....	139.04	.....	414.231	428.961
256	Culvert No. 34, copper plug, N. E. corner, E. end of parapet coping, towpath side.....	139.74	.....	414.651	429.381
257	Bridge No. 56, E. road bridge, Durhamville, copper plug, third step, W. wing, towpath abutment.....	140.71	.....	419.865	424.595
258	Bridge No. 57, Main street bridge, Durhamville, copper plug, third step, E. wing, towpath abutment.....	140.88	.....	418.743	433.473
259	Waste weir No. 4, square cut on S. E. corner of stone, N. end of coping of W. abutment.....	141.02	.....	417.546	432.276
260	Bridge No. 58, Bennett's road bridge, Durhamville, copper plug, lower step, W. wing, towpath abutment.....	141.16	.....	419.223	433.953

TABLE NO. 15—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
261	Bridge No. 59, Shollhamer's road bridge, copper plug, second step, E. wing, berme abutment.....	142.08	.....	420.288	435.018
262	Cowasselon aqueduct No. 3, copper plug near center of E. face of coping of buttress, E. wing, towpath side.....	142.66	.....	416.325	431.055
263	Bridge No. 60, Lenox basin road bridge, copper plug, second step, W. wing, towpath abutment.....	143.78	.....	418.161	432.891
264	Culvert No. 38, copper plug, coping of parapet over face of E. wing, towpath abutment.....	144.86	.....	414.202	428.932
265	E. C. & N. R. E. bridge at Canastota, point cut on projection of third course of masonry above ground, towpath abutment, near center.....	145.66	.....	418.434	433.164
266	Bridge No. 61, Peterboro street bridge, Canastota, chisel mark on coping, berme vertical wall, W. side of bridge, foot of step.....	146.05	.....	416.523	431.253
267	Bridge No. 62, Main street bridge, Canastota, copper plug, third step, E. wing, towpath abutment.....	146.24	.....	419.170	433.900
268	Culvert at cider mill, Canastota, copper plug, N. E. corner coping of parapet, towpath side.....	146.92	.....	415.392	430.122
269	Bridge No. 63, Beebes road bridge, copper plug, fourth step, E. wing, towpath abutment.....	147.60	.....	419.147	433.877
270	Bridge No. 64, Herrick's road bridge, square cut on fourth step, E. wing, towpath abutment.....	148.29	.....	419.403	434.133
271	Culvert No. 43, copper plug, N. W. corner, coping of parapet, towpath side at Fuller's bridge.....	148.88	.....	414.974	429.704
272	Bridge No. 66, New Boston road bridge, copper plug, fourth step, E. wing, towpath abutment.....	149.75	.....	410.503	434.233
273	Culvert No. 44, square cut on N. W. corner of coping of parapet, towpath side.....	150.44	.....	414.161	428.891
274	Bridge No. 67, Canasara road bridge, copper plug, fourth step, E. wing, towpath side abutment.....	150.84	.....	419.613	434.343
275	Bridge No. 68, Chittenango road bridge, square cut on second step, E. wing, towpath abutment.....	152.39	.....	418.607	433.337
276	Chittenango Aqueduct No. 4, copper plug, stone under coping of parapet W. wing towpath side.....	152.74	.....	418.916	433.646
277	Culvert No. 45, square cut on N. E. corner of coping of parapet, towpath side.....	152.96	.....	414.357	429.087
278	Bridge No. 69, Bolivar road bridge, copper plug, stone under coping of buttress, W. wing, towpath abutment.....	153.61	.....	420.200	434.930
279	Bridge No. 70, White's road bridge, copper plug, coping buttress, E. wing, towpath abutment.....	154.60	.....	421.480	436.210
280	Bridge No. 71, Pool's brook road bridge, copper plug, coping buttress, E. wing, towpath abutment.....	155.79	.....	421.200	435.990
281	Bridge No. 72, Kirkville road bridge, copper plug, coping buttress, E. wing, towpath abutment.....	156.94	.....	421.690	436.420
282	Culvert No. 47, copper plug, N. E. corner coping, towpath parapet.....	157.42	.....	412.316	427.046
283	Culvert No. 48, copper plug, N. E. corner of coping, towpath parapet.....	157.86	.....	406.784	421.514
284	Bridge No. 73, Manlius road bridge, copper plug, lower step, E. wing, berme abutment.....	159.94	.....	419.411	434.141

TABLE NO. 15—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
285	Bridge No. 74, Stearn's farm bridge, square cut, lower step, E. wing, berme abutment.....	160.38	.....	420.962	435.692
286	Limestone Creek aqueduct, copper plug, S. W. corner of parapet coping, W. wing, towpath side.....	160.76	.....	420.433	435.163
287	Bridge No. 76, Burdick's road bridge, square cut on coping of buttress, E. wing, towpath abutment.....	161.32	.....	421.760	436.390
288	Culvert No. 49, square cut, N. E. corner coping parapet, towpath side.....	161.82	.....	414.675	429.405
289	Butternut Creek aqueduct, copper plug, coping parapet, E. stone, E. wing, towpath side.....	162.83	.....	420.183	434.913
290	Bridge No. 78, Thompson's Landing road bridge, copper plug, coping W. buttress, towpath side.....	165.04	.....	419.785	434.515
291	Private bridge, point cut on second step, E. wing, towpath side.....	166.70	.....	417.909	432.639
292	Stop gate $\frac{1}{2}$ mile E. of lock No. 47, copper plug, W. end of coping, towpath side.....	166.75	.....	416.337	431.067
293	Lock No. 47, Syracuse, copper plug, S. E. hollow quoin, towpath lock.....	167.25	.....	416.899	431.599
294	Lock No. 48, Syracuse, copper plug, S. E. hollow quoin, towpath lock.....	167.44	.....	406.268	420.998
295	Bridge No. 80, William street bridge, Syracuse, copper plug, third step, E. wing, towpath abutment.....	167.81	.....	398.960	413.690
296	Bridge No. 81, Catherine street bridge, Syracuse, square cut, W. of bridge seat on vertical wall, towpath side.....	168.09	.....	397.903	412.633
297	Lock No. 49, Syracuse, copper plug, S. E. hollow quoin, towpath lock.....	168.15	.....	395.973	410.703
298	Bridge No. 82, Orange street, Syracuse, square cut on second step, E. wing, towpath abutment.....	168.17	.....	394.721	409.451
299	Bridge No. 88, Grape street, Syracuse, copper plug, third step, W. wing, towpath abutment.....	168.26	.....	391.354	406.084
300	Weigh lock, Syracuse, copper plug, N. E. hollow quoin.....	168.42	.....	389.154	403.884
301	U. S. G. S. B. M. at weigh lock, Syracuse, N. Y., tablet set in door sill of entrance to Collector's office.....	168.42	.....	390.576	405.306
302	Bridge No. 86, Salina street bridge, Syracuse, square cut S. W. corner on belting of abutment $2\frac{1}{2}$ feet above, towpath side.....	168.61	.....	392.861	407.591
303	Bridge No. 87, Clinton street bridge, Syracuse, square cut on N. W. corner of E. foundation stone to stairway on towpath side.....	168.67	.....	391.506	406.236
304	Bridge No. 89, West street, Syracuse, copper plug, in cap stone N. E. corner lift tower.....	168.96	.....	391.814	406.544
305	Bridge No. 90, Geddes street, Syracuse, S. W. corner stairway landing pier, foot of W. towpath stairs and U. S. G. S.....	169.58	.....	392.486	407.216
306	N. Y. C. E. E. bridge over Genesee street bridge, Syracuse, square cut on first step, S. wing, west abutment.....	170.25	.....	889.936	404.666
307	Bridge No. 92, Bridge street, Syracuse, square cut on stone under coping, W. wing, towpath abutment.....	170.58	.....	392.947	407.677
308	Discharge well near Salt Company's bridge, copper plug, S. W. corner stone coping.....	170.95	.....	390.304	405.034
309	Bridge No. 93, Blast Furnace road bridge, square cut on coping at buttress, W. wing, towpath abutment.....	171.46	.....	394.094	408.824

TABLE NO. 15—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
310	Bridge No. 94, Gere's Landing bridge, copper plug, coping buttress, W. wing, towpath abutment.....	172.26	.....	393.629	408.359
311	Culvert about 700 feet E. of lock No. 50, square cut on N. E. corner of parapet coping, towpath side.....	173.05	.....	384.095	398.825
312	Lock No. 50, copper plug, S. E. hollow quoin between anchors, towpath lock.	173.17	.....	396.870	411.600
313	Bridge No. 95, Gere's road bridge, copper plug, lower step, E. wing, towpath abutment.....	173.35	.....	402.213	416.943
314	Bridge No. 96, Belle Isle road bridge, copper plug, lower step, W. wing, towpath abutment.....	174.19	.....	402.181	416.911
315	First culvert E. of Amboy road bridge, copper plug, W. end of parapet coping, towpath side.....	174.94	.....	393.195	407.925
316	Bridge No. 97, Amboy road bridge, copper plug, lower step, W. wing, towpath abutment.....	175.08	.....	401.922	416.652
317	Nine mile creek aqueduct, copper plug, N. W. corner of coping of E. retaining wall, towpath side.....	175.98	.....	396.922	411.652
318	Culvert No. 58, square cut, N. E. corner of coping, E. wall, first culvert E. of Camillus road bridge, towpath side...	176.68	.....	390.508	405.238
319	Bridge No. 98, Camillus road bridge, copper plug, lower step, W. wing, towpath abutment.....	177.10	.....	402.820	417.550
320	Bridge No. 99, Newport road bridge, copper plug, lower step, W. wing, towpath abutment.....	179.21	.....	402.829	417.559
321	U. S. G. S. B. M., Newport at Warners; Erie Canal bench-mark; S. W. corner of hotel barn, 30 feet N. of canal, chisel mark on bouider.....	179.23	.....	398.840	413.570
322	Bridge No. 100, Memphis road bridge, copper plug, lower step, E. wing, towpath abutment.....	181.79	.....	402.760	417.499
323	Culvert No. 59, $\frac{1}{2}$ mile W. of Memphis, copper plug, coping of buttress, W. wing, towpath abutment.....	182.58	.....	392.412	407.142
324	Bridge No. 101, Peru road bridge, copper plug, lower step, W. wing, towpath abutment.....	183.40	.....	399.899	414.629
325	Bridge No. 102, Shanty Point road bridge, copper plug, third step, E. wing, towpath abutment.....	184.33	.....	400.853	415.583
326	Carpenter Brook waste-weir, square cut on N. E. corner of coping of W. wall, towpath side.....	184.35	.....	397.774	412.504
327	At Jordan Cement Works, square cut on S. E. corner of concrete foundation at end of R. R. siding at back angle of towpath.....	185.26	.....	398.030	412.760
328	Bridge No. 103, Beaver St. Jordan, copper plug, lower step, W. wing, towpath abutment.....	186.60	.....	400.278	415.093
329	Jordon Aqueduct, copper plug, coping of parapet, east wing, towpath side.....	186.87	.....	400.546	415.276
330	Bridge No. 104, Main street, Jordan, copper plug, lower step, west wing, towpath abutment.....	186.96	.....	399.393	414.123
331	Bridge No. 105, Hamilton street, Jordan, copper plug, lower step, east wing, towpath abutment.....	187.14	.....	399.401	414.131
332	Lock No. 51, copper plug, southeast hollow quoin, towpath lock.....	188.07	.....	396.683	411.613

TABLE NO. 15—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
333	Bridge No. 106, Cold Spring road bridge, copper plug, third step, west wing, towpath abutment.....	188.40	.....	392.961	407.691
334	Bridge No. 107, Fountainville road bridge, copper plug, fourth step, E. wing, towpath abutment. ....	188.94	.....	395.207	409.937
335	Bridge No. 108, Field's road bridge, copper plug, second step, E. wing, towpath abutment.....	189.26	.....	392.425	407.155
336	West Shore R. R. bridge E. of Weedsport, square cut on lower step, E. wing, towpath abutment.....	189.46	.....	394.381	409.111
337	Bridge No. 109, Putman's farm bridge, copper plug, third step, E. wing, towpath abutment.....	190.70	.....	394.130	408.860
338	Bridge No. 110, Young's farm bridge, copper plug, second step, E. wing, towpath abutment.....	191.12	.....	393.269	407.999
339	Southern Central R. R. bridge, square cut on second step, E. wing, towpath abutment.....	191.19	.....	394.178	408.908
340	Weedsport waste weir, copper plug in coping, E. end of E. wall of bulkhead.	191.25	.....	390.600	405.330
341	Bridge No. 111, Seneca street, Weedsport, copper plug, third step, E. wing, towpath abutment.....	191.47	.....	393.396	408.126
342	Bridge No. 112, Brutus street, Weedsport, copper plug, third step, E. wing, towpath abutment.....	192.02	.....	394.381	409.111
343	West Shore R. R. bridge, W. of Weedsport, square cut on lower step, W. wing, towpath abutment.....	192.44	.....	394.263	408.993
344	Centerport aqueduct, square cut on N. E. corner of coping buttress, W. wing, towpath side.....	192.85	.....	391.072	405.802
345	Bridge No. 113, Centerport road bridge, square cut on fourth step, E. wing, towpath abutment.....	193.68	.....	395.766	410.496
346	First culvert E. of Utica street, Port Byron, square cut on N. E. corner of coping, towpath side.....	195.06	.....	388.989	403.719
347	Bridge No. 114, Utica street, Port Byron, copper plug, third step, E. wing, towpath abutment.....	195.11	.....	394.943	409.673
348	Bridge No. 115, Main street, Port Byron, copper plug, lower step, E. wing, towpath abutment.....	195.23	.....	393.756	408.486
349	Port Byron aqueduct, copper plug, coping N. buttress, E. wing, towpath side.....	195.45	.....	390.494	405.224
350	Bridge No. 116, Owasco street, Port Byron, copper plug, fourth step, E. wing, towpath abutment, U. S. G. S. B. M.....	195.56	.....	393.796	408.526
351	Bridge No. 117, Canal street, Port Byron, copper plug, second step, E. wing, towpath abutment, U. S. G. S. B. M.....	195.66	.....	392.876	407.606
352	Lock No. 52, Port Byron, copper plug, fourth step from W. end, N. side of lock pier, U. S. G. S. B. M.....	195.87	.....	389.535	404.265
353	Bridge No. 118, Houghtaling road bridge, copper plug, lower step, E. wing, towpath abutment.....	196.66	.....	382.053	396.783
354	Bridge No. 119, McLeod's road bridge, copper plug, second step, W. wing, towpath abutment.....	198.58	.....	382.607	397.337
355	Crane Brook aqueduct, copper plug, coping parapet, end of W. wing, towpath.....	198.70	.....	383.635	398.365

TABLE NO. 15—(Concluded)

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
356	Bridge No. 120, Bucklin's farm bridge, square cut on third step, W. wing, towpath abutment. ....	198.81	.....	382.622	397.352
357	Bridge No. 121, Salt street, Montezuma, copper plug, fourth step, W. wing, towpath abutment. ....	199.81	.....	383.678	398.408
358	Bridge No. 122, Change bridge, Montezuma, copper plug, second step, W. wing, towpath abutment. ....	199.89	.....	383.419	398.149
359	Bridge No. 123, Clark street, Montezuma, copper plug, third step, W. wing, towpath abutment. ....	200.19	.....	383.168	397.898
350	Seneca River aqueduct, A 12, Montezuma, copper plug, coping parapet, E. end, towpath side. ....	200.64	.....	383.460	398.190
361	Seneca River aqueduct, A 12, Montezuma, copper plug, coping parapet, W. end, towpath side. ....	200.79	.....	383.293	398.023
362	Bridge No. 124, May's Point road and Change bridge, copper plug, third step, W. wing, S. abutment. ....	202.95	.....	383.158	397.888
363	Bridge No. 124, May's Point road and Change bridge, U. S. G. S., tablet set in third step, S. abutment, W. wing. ....	202.95	.....	382.898	397.628
364	First culvert W. of May's Point bridge, square cut on S. W. corner of coping, towpath abutment. ....	203.21	.....	378.063	392.793
365	Second culvert W. of May's Point bridge, copper plug, coping of parapet, towpath side. ....	204.22	.....	380.071	394.801
366	Bridge No. 1, Western Division, Wayne county line bridge, point cut on projection of fifth course of masonry below coping, near center, towpath abutment. ....	204.96	.....	382.251	397.081



Credit Library of Architecture and Marine Center  
Historic Nautical Collection

---

---

LIST

OF

BENCH MARKS

NEW YORK STATE CANALS

OSWEGO CANAL,

FROM SYRACUSE WEIGH LOCK TO OSWEGO.

---

FROM LEVELS OF 1900 AND 1901.

---

---

TABLE NO. 16.

List of Bench Marks, Oswego Canal, Syracuse Weigh Lock to Oswego. Syracuse to Lock No. 5, levels of 1901. Mud Lock to Phoenix, differences from levels of 1900. Phoenix to Oswego, differences from levels of U. S. D. W.

B. M. No.	DESCRIPTION.	Miles from weigh lock.	ELEVATION ABOVE.		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
0	Weigh lock, Syracuse, copper plug, N. E. hollow quoin.....	0	.....	389.154	403.884
1	Willow street bridge, Syracuse, copper plug, third step, S. wing, towpath abutment.....	.17	.....	393.068	407.708
2	Division street bridge, Syracuse, copper plug, third step, S. wing, towpath abutment.....	0.66	.....	391.284	406.014
3	Bear street bridge, Syracuse, copper plug, first step, S. wing, towpath abutment.....	1.30	.....	390.387	405.117
4	Lock No. 1, copper plug, N. E. lower berme hollow quoin.....	1.69	.....	389.357	403.987
5	Lock No. 2, copper plug, S. E. upper towpath hollow quoin.....	1.82	.....	378.234	392.964
6	Lock No. 3, copper plug, N. E. lower towpath hollow quoin.....	1.94	.....	367.052	381.782
7	Change bridge, square cut on coping buttress, N. wing, W. abutment.....	2.10	.....	359.554	374.284
8	Change bridge, copper plug in W. side of coping, N. wing, E. abutment.....	2.51	.....	359.994	374.724
9	E. W. & O. R. R. bridge, square cut on coping of buttress, S. wing, towpath abutment.....	3.51	.....	358.094	372.824
10	Culvert, square cut on N. W. cap stone, towpath side.....	4.35	.....	351.696	366.426
11	Liverpool road bridge, copper plug, first step, S. wing, towpath abutment.....	4.91	.....	358.544	373.274
12	Culvert, square cut on N. W. cap stone, towpath side.....	5.97	.....	351.375	366.105
13	Road and Change bridge, copper plug, first step, S. wing, towpath abutment.....	6.92	.....	359.481	374.211
14	Lock No. 5, copper plug, N. E. lower towpath hollow quoin, between anchors.....	7.38	.....	357.295	372.025
15	Copper plug in door sill of brick building 50 feet N. of E. wing of highway bridge over Seneca river, at Belgium..	12.72	370.299	355.688	370.368
16	Copper plug on coping of guard lock, Phoenix, between straps on S. E. hollow quoin.....	17.00	365.334	350.673	365.403
17	Lock No. 6, copper plug, flush with masonry, between anchors on lower hollow quoin (T. P. side).....	20.00	361.620	346.959	361.689
18	Lock No. 7, copper plug, flush with masonry, between anchors of middle hollow quoin (T. P. side).....	22.33	354.460	339.799	354.529
19	At Fulton, N. Y., copper plug, flush with masonry on first step of S. wing wall of E. abutment of highway bridge on N. First street.....	27.70	323.420	308.759	323.489
20	Guard lock No. 4, copper plug, flush with masonry, between anchors of middle hollow quoin (T. P. side).....	30.33	312.990	298.329	313.059
21	Lock No. 13, copper plug, flush with masonry, between anchors on N. E. lower hollow quoin (T. P. side).....	33.47	302.230	287.569	302.299
22	Lock No. 15, copper plug, flush with masonry, between anchors on N. E. lower hollow quoin (T. P. side).....	35.65	287.630	272.969	287.699
23	Top of iron bolt of masonry of old Government pier at the foot of W. Third street. 0.5 feet from E. face of pier, 3.5 feet N. of N. line of wooden dock leading to boat house; bolt is sunk one-half inch below top of masonry, and the letters "U. S." are obliterated by fresh masonry. This corresponds to bench mark "A" Oswego of the U. S. Lake Survey elevation 251.96...	38.61	252.850	238.189	252.919

---

---

LIST

OF

BENCH MARKS

NEW YORK STATE CANALS

MIDDLE DIVISION,

SENECA RIVER,

FROM PHOENIX TO CLYDE.

---

FROM LEVELS OF 1900 AND 1901.

---

---

TABLE NO. 17.

List of Bench Marks, Seneca River—Middle Division, Phoenix to Clyde. From Phoenix to B. M. 60 from levels of 1900 adapted to 1901 datum. From B. M. 60 to Clyde levels of 1900 corrected for new elevation at Clyde, determined by levels of 1901 and adapted to 1901 datum.

NOTE—Distances given are from Barge Canal Survey Station 0.0 at Three River Point.

B. M. No.	DESCRIPTION.	Miles from Three River Point.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
	<i>From U. S. D. W. B. M., at Phoenix, N. Y. To 1.8 miles east of Clyde, N. Y.</i>				
53	U. S. D. W. B. M., at Phoenix, N. Y., a copper nail in root of oak tree, located about 750 feet S. W. in the direction of highway from the intersection of highways, about 200 feet east of bridge over Brandy Brook and about 150 feet S. E., at right angles to highway, from this highway also about 450 feet north of north edge of Oswego Canal.....	North 2.80	358.990	344.329	359.059
54	Copper Plug on coping of Guard Lock No. 1, Phoenix, N. Y., between straps on the S. E. hollow quoil.....	North 2.39	365.834	350.673	365.403
55	Copper Plug in step on east wing, north abutment of bridge over Oneida River at Three River Point.....	00	367.081	352.370	367.100
56	Copper Plug in door sill of brick building 50 feet N. of the E. wing of highway bridge over Seneca River at Belgium.....	South 1.97	370.299	355.638	370.368
57	Nail in root of 20" elm tree on property of Henry Lacey, 350 feet from Italian shanty and 550 feet from place where ditch running into Seneca River crosses division line between lands of Henry Lacey and Luke Collins.....	8.84	365.575	350.914	365.644
58	Nail in root of elm tree located 220 feet from the dwelling of John Doyle at foot of bluff on flats S. side of Seneca River, one and one-eighth miles below Cold Spring Bridge.....	5.40	370.439	355.778	370.508
59	Highest point on stone monument at Sta. 337+30.22, about 725 feet above Cold Spring Bridge, on the left bank of Seneca River.....	6.77	370.167	355.506	370.236
60	Nail in root of oak tree about 40 feet W. of wire fence on property of Jay B. Klein, about 6,000 feet above Cold Spring Bridge.....	8.17	366.993	352.332	367.062
61	Nail in root of 16" elm tree on back angle of tow-path on property of Jay B. Klein, 5 feet from wire fence about 1,500 feet W. of division line between properties of Alonzo Wagner and J. B. Klein.....	7.85	367.841	353.178	367.908
62	Nail in root of 16" poplar, 170 feet E. of bridge over small creek and 350 feet from division line between properties of Harriet and Elmer Dixon and E. I. Bisdie, and on the property of E. I. Bisdie.....	9.98	368.228	353.555	368.285
63	Nail in root of 10" ash tree on left bank of Seneca River 300 feet from division line between properties of W. S. Names and Curtis Names, on property of W. S. Names, about 1,200 feet above D. L. & W. R. R. bridge, near Baldwinsville....	10.92	369.470	354.799	369.528
64	Point on Stone Monument near slaughter house, about 700 feet below lock in Baldwinsville side cut canal.....	12.05	374.953	360.281	375.011
65	Point cut in coping on the S. side of last stone on the W. end of wall at the N. end of Baldwinsville dam.....	12.88	377.258	362.578	377.308
66	Nail in root of elm tree on property of Otis M. Bigelow, one-half mile from Baldwinsville post-office, on the N. river bank.....	13.45	379.428	364.745	379.475
67	Highest point on boulder on top of river bank, on property of Mrs. Jennie M. Adsit, 550 feet from farm house and 420 feet from highway....	14.63	383.992	379.304	384.034
68	Mark cut on boulder 200 feet from water's edge, 15 feet from angle in rail fence between properties of Judson Maerfield and Hannah Butler, on Maerfield property.....	15.74	377.244	362.552	377.282
69	Nail in root of elm tree 5 feet from river on the property of Adelbert and Frank Fowler, 1,075 feet from W. line and 1,100 feet from their E. property line about four miles above Baldwinsville, opposite property of Seneca River Brick Co.....	16.98	378.074	363.376	378.106
70	Nail in root of chestnut tree on land of D. E. Voorheese, 500 feet from Voorheese E. line and 2,000 feet from his W. line, Plainville, N. Y.....	18.67	381.572	366.867	381.597

TABLE NO. 17—(Concluded).

B. M. No.	DESCRIPTION.	Miles from Three River Point.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
71	Nail in root of 13' elm in the N. edge of woods on property of David Tillison, about 200 feet from Seneca River, about 1½ miles S. of Plainville .....	20.21	379.315	364.604	379.334
72	Nail in root of stump beside 18' oak tree on top of river bank in edge of woods and at end of rail fence on the property of Emerson Gates about 1,500 feet N. of highway bridge over State Ditch at Jack's Reef.....	21.61	398.779	379.062	393.792
73	Nail in root of hickory tree on E. side of road 123 feet S. of the E. end of Jack's Reef River Bridge.....	23.28	391.137	376.413	391.143
74	Nail in root of large hickory tree on shore of Seneca River, at the beginning of lane along river on property of E. Graves, about opposite upper end of State Ditch.....	24.83	380.997	366.267	380.997
75	Nail in root of large hickory tree on shore of Cross Lake, 1,200 feet S. of outlet near high-water mark on property of W. T. Stephens....	26.12	382.718	367.982	382.712
76	Nail in root of 10' maple stump on S. shore of Cross Lake in woods, 1,100 feet W. of lane to boathouse on land of Mrs. Brotton.....	27.27	376.887	362.146	376.876
77	Point cut on N. E. corner coping stone, S. abutment, iron bridge over Seneca River about three-fourths mile up stream from Cross Lake,	29.35	384.889	370.140	384.870
78	Nail in root of 3 foot elm 50 feet N. of Skaneateles Creek about 1,500 feet E. of Bonta's Bridge over Seneca River, on property of J. A. Clements.....	31.08	383.363	368.606	383.336
79	B. M. 79. Poor, not used .....				
80	Point cut on bridge seat on E. side of S. abutment of River Bridge on highway directly N. of Weedsport.....	34.01	383.172	368.408	383.133
81	Nail in root of willow tree just W. of clubhouse known as Casey's and about 10 feet away.....	35.99	379.490	364.713	379.443
82	Mark cut on E. corner, S. abutment, bridge seat of Free Bridge across Seneca River about one and one-half miles N. of N. Y. C. & H. R. R. Station at Port Byron.....	37.93	386.138	371.353	386.033
83	Point cut on bridge seat at E. angle S. of abutment Mosquito Point Bridge over Seneca River, about ½ miles N. of Port Byron R. R. Station ..	38.98	386.363	371.573	386.303
84	Nail in root of maple tree, about 200 feet from river and 570 feet W. of lower bridge to Howland's Island.....	41.02	380.583	365.790	380.530
85	Point cut on large boulder at the road side just S. of N. Y. C. Depot at Fox Ridge, and about 10 feet from wire fence .....	42.69	387.807	373.002	387.732
86	Point cut on N. E. pedestal stone of water tank foundation at N. Y. C. Water Station No. 39, Seneca River, about 100 feet W. of bridge over Seneca River.....	44.05	389.991	375.178	389.905
87	Highest point on rail driven into ground at base and in front of N. Y. C. Mile Post, N. Y., 322, Buffalo, 118, about one-half mile E. of Savannah.	45.91	406.357	391.537	406.267
88	Point cut on face of stone in E. end, lower course, N. abutment of highway bridge over N. Y. C. R. R., about three-quarters mile W. of Savannah.....	47.09	394.009	379.185	393.915
89	Point cut on N. W. corner of bridge seat of W. S. R. R. Bridge over Crueso Creek, about 2 miles W. of Savannah .....	48.47	389.674	374.844	389.574
90	Point cut on back of lower step, towpath abutment, N. wing of N. Y. C. R. R. Bridge over Erie Canal, about 1.8 miles E. of Clyde.....	50.43	396.042	383.204	397.934
91	Culvert No. 5, (0.3 miles E. of Waldruff's Bridge), towpath, S. W. corner parapet wall, marked with chisel.....		391.054	376.216	390.946

LIST

OF

BENCH MARKS

NEW YORK STATE CANALS

WESTERN DIVISION

ERIE CANAL,

FROM SENECA-WAYNE COUNTY LINE TO BUFFALO.

FROM LEVELS OF 1900.

TABLE NO. 18.

List of Bench Marks, Erie Canal, Western Division, Seneca-Wayne County Line to Buffalo Light House B. M. Wayne County Line to Culvert No. 5, Levels of 1901. Culvert No. 5, to Buffalo Light House, Differences, from Levels of 1900.

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
366	Bridge No. 1, Western Division, Wayne county line bridge, point cut on projection of fifth course of masonry below coping, near center, towpath abutment.....	204.96			used
367	Culvert No. 1, Western Division, square cut on S. W. corner of coping of parapet, towpath side .....	205.81		382.851	397.081
368	Culvert No. 2, Western Division, square cut on S. W. corner of coping of parapet, towpath side .....	206.59		375.529	390.504
369	Bridge No. 2, Pittlock's road bridge, square cut on coping of buttress, W. wing towpath abutment .....	206.65		375.529	390.059
370	Culvert No. 3, Western Division, square cut on center of coping of parapet, towpath side.....	207.19		383.371	398.101
371	Culvert No. 4, Western Division, square cut on S. E. corner of coping of parapet, towpath side.....	208.10		374.200	388.980
372	Culvert No. 5, Western Division, (0.3 miles east of Waldruff's bridge) towpath, S. W. corner of parapet wall, marked <input type="checkbox"/> with chisel.....	208.10		375.307	390.037
373	Waldruff's Bridge No. 3, towpath abutment, W. wing, N. W. corner, marked [ ].....	208.65	391.054	376.216	390.946
374	W. S. K. R. Bridge (about 2.16 miles E. of Clyde), berme, on E. wing, marked [ ].....	208.97	398.418	383.580	398.810
375	Dive Culvert (about 1.6 miles E. of Clyde), towpath, on parapet wall, marked [ ].....	209.37	396.736	381.688	396.618
376	Glasgow Street Bridge No. 4, Clyde, berme, on E. wing, marked [ ].....	209.79	390.622	375.764	390.514
377	Lock No. 53, Clyde, berme, middle hollow quoin, marked [ ].....	211.43	400.000	385.163	399.892
378	Siegmund's Bridge No. 6, (about 1.4 miles W. of Clyde), towpath on W. wing, marked [ ].....	212.67	400.860	385.522	400.282
379	Barker's Farm Bridge, No. 7, towpath on E. wing, marked [ ].....	212.84	402.416	387.578	402.308
380	Long's Farm Bridge No. 8 (about 1.5 miles E. of Lock Berlin), towpath, on E. wing, marked [ ].....	218.63	402.729	387.891	402.621
381	Dive Culvert (about 0.7 miles E. of Lock Berlin), towpath, on parapet wall, marked [ ].....	214.29	408.881	388.548	408.273
382	Lock Berlin Highway Bridge No. 9, towpath, on E. wing, marked [ ].....	215.10	395.185	390.297	395.027
383	Lock Berlin, No. 54, berme, middle hollow quoin, marked [ ].....	215.68	402.215	387.377	402.107
384	Horton's Bridge, No. 10 (about 0.4 miles W. of Lock Berlin), berme, on E. wing, marked [ ].....	215.83	407.659	392.821	407.551
385	Goetzman's Farm Bridge No. 11 (about .9 miles W. of Lock Berlin), berme, on E. wing, marked [ ].....	216.23	410.068	395.230	409.960
386	Klaus' Highway Bridge No. 12 (about 1.5 miles W. of Lock Berlin), towpath, on W. wing, marked [ ].....	216.70	410.929	396.091	410.821
387	Richmond's Farm Bridge No. 13 (about 1.3 miles E. of Lyons), berme, on W. wing, marked [ ].....	217.38	410.187	395.549	410.079
388	Cole's Highway Bridge No. 14 (about 1 mile E. of Lyons), towpath, on W. wing, marked [ ].....	217.72	410.064	395.216	409.946
389	Geneva Street Bridge No. 15, Lyons, towpath, on W. wing, marked [ ].....	218.06	409.985	395.147	409.877
390	Montezuma Street Bridge No. 16, Lyons, towpath, on W. wing, marked [ ].....	218.90	410.795	395.957	410.687
391	Water Street Bridge No. 17, Lyons, towpath, on E. wing, marked [ ].....	218.97	410.458	395.620	410.850
392	Lock No. 55, Lyons, berme, on middle hollow quoin, marked [ ].....	219.05	408.837	393.989	403.719
393	Mud Creek Aqueduct, Lyons, towpath, W. wing, on Buttress, marked [ ].....	219.24	413.545	398.707	413.437
394	Prime's Farm Bridge No. 19 (about 1.4 miles W. of Lyons), berme, on W. wing, marked [ ].....	219.67	413.920	399.082	413.812
395	Park's Highway Bridge No. 20 (about 1.3 miles W. of Lyons), towpath, on E. wing, marked [ ].....	220.47	417.019	402.181	416.911
396	Poor House Lock No. 56 (about 2 miles W. of Lyons), berme, on middle hollow quoin, marked [ ].....	220.85	417.918	403.080	417.810
397	Mosher's Highway Bridge No. 21 (about 2.9 miles W. of Lyons), towpath on W. wing, marked [ ].....	220.92	423.858	409.020	433.750
		221.90	426.273	411.433	426.160

TABLE No. 18—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
398	Dive Culvert (about 8.1 miles W. of Lyons), tow- path, on parapet wall, marked [ ]	232.17	418.189	408.801	418.081
399	N. Y. C. R. R. Bridge (about 2.1 miles E. of Newark), E. wing, lower step, marked [ ]	232.82	426.013	411.175	425.905
400	Dive Culvert (about 1.3 miles E. of Newark), towpath, on centre parapet wall, marked [ ]	233.60	418.983	404.145	418.875
401	Lockville Lock No. 57, Newark, berme, on E. hol- low quoin, marked [ ]	234.13	431.350	416.512	431.242
402	Middle Lockville Lock No. 58, Newark, berme, on E. hollow quoin, marked [ ]	234.29	439.655	424.817	439.547
403	Upper Lockville Lock No. 5', Newark, berme, on E. hollow quoin, marked [ ]	234.45	447.552	432.714	447.444
404	Charles Street Bridge No. 24, Newark, towpath, on E. wing, marked [ ]	234.92	448.879	434.041	448.771
U. S. G. S.	{ Newark Baptist Church, corner Charles and Miller streets, tablet in water-table, marked 457, O. S. W. G. O.	.....	458.678	443.835	458.565
405	Waste weir, Newark, towpath, middle parapet wall, marked [ ]	235.28	446.841	432.003	446.733
406	Allerton's Highway Bridge No. 26 (about 1-3 mile W. of Newark), towpath, on E. wing, marked [ ]	226.21	450.560	435.722	450.452
407	Peck's Highway Bridge No. 27 (about 1.9 miles W. of Newark), towpath, on W. wing, marked [ ]	226.83	449.875	435.037	449.767
408	Swezey's Farm Bridge No. 28 (about 1.0 mile E. of Port Gibson), towpath, E. wing, first course below coping, marked O	227.53	449.877	435.039	449.769
409	Palmer's Farm Bridge No. 29 (about 0.5 mile E. of Port Gibson), towpath, on E. wing, marked [ ]	227.95	450.260	433.422	450.152
400	Port Gibson Bridge No. 30, towpath, on W. wing, marked [ ]	228.47	450.154	435.316	450.046
411	Galloway's Highway Bridge No. 31 (about 2.3 miles E. of Palmyra), towpath, E. wing, on lower step, marked [ ]	231.04	450.675	435.837	450.567
412	Kent Street Bridge No. 31½, Palmyra, berme, on W. wing, on second lower step, marked [ ]	232.88	450.048	435.210	449.940
413	R. E. Avenue Bridge No. 32, Palmyra, berme, on W. wing, marked [ ]	233.32	452.309	437.471	452.201
414	Church Street Bridge No. 34, Palmyra, towpath, on E. wing, lower step, marked [ ]	233.82	443.558	408.720	418.450
415	Change Bridge No. 35 (about 1.2 miles W. of Pal- myra), towpath, E. wing, N. side, marked [ ]	234.50	449.671	434.833	449.563
416	Mud Creek Aqueduct (about 1.4 miles W. of Pal- myra), towpath, W. wing, on buttress, marked [ ]	234.71	447.716	432.878	447.608
U. S. G. S.	{ Mud Creek Aqueduct (about 1.4 miles W. of Pal- myra), towpath, W. wing, on buttress, copper tablet, marked 446 feet	.....	447.783	432.695	447.625
417	Crandell's Highway Bridge No. 36 (about 1.8 miles W. of Palmyra), towpath, on E. wing, marked [ ]	235.13	451.104	436.266	450.996
418	Clark's Farm Bridge No. 37 (about 2 miles E. of Macedon), towpath, E. wing, lower step, marked [ ]	235.49	451.199	436.361	451.091
419	Lock No. 60, Macedon, berme, on middle hollow quoin, marked [ ]	236.60	457.413	442.575	457.305
420	Lock No. 61, Macedon, berme, on middle hollow quoin, marked [ ]	237.44	464.550	449.712	464.442
421	Frear's Highway Bridge No. 41 (about 1.2 miles W. of Macedon), towpath, on W. wing, marked [ ]	238.61	466.869	452.031	466.761
422	Wayneport Highway Bridge No. 42, towpath, on W. wing, marked [ ]	240.77	467.468	452.630	467.360
423	Knappsville Highway Bridge No. 43 (about 2.2 miles E. of Fairport), towpath, on E. wing, marked [ ]	243.06	468.672	453.734	468.464
424	Thomas Creek Culvert No. 26 (about 1.2 miles E. of Fairport), towpath, on center parapet, marked [ ]	244.10	462.650	447.812	462.542
425	Baker's Highway Bridge No. 44 (about 0.5 mile E. of Fairport), towpath, on E. wing, marked [ ]	244.75	468.606	453.768	468.498
426	Waste Weir, Fairport, towpath, middle parapet wall, marked [ ]	245.25	467.358	452.520	467.250
427	Fullman's Basin Bridge No. 47 (about 1.1 miles W. of Fairport), towpath, on E. wing marked [ ]	246.34	467.073	452.235	466.965
428	Pipe Culvert No. 27 (about 1.5 miles W. of Fair- port), towpath, middle parapet wall, marked [ ]	246.76	457.117	442.279	457.009



## LIST OF BENCH MARKS NEW YORK STATE CANALS.

703

TABLE NO. 18—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
429	Wapping's Highway Bridge No. 48 (about 2.6 miles W. of Fairport), towpath, on E. wing, marked [ ].....	247.87	465.717	450.879	465.609
430	Wiltzie's Highway Bridge No. 49 (about 3.0 miles W. of Fairport), berme, on E. wing, marked [ ].....	218.22	467.039	452.221	466.951
431	Stop Gate (about 0.3 mile E. of Bushnell's Basin), towpath, on E. end recess coping, marked [ ]..	248.99	465.736	450.898	465.638
432	Bushnell's Basin Bridge No. 50, towpath, inner face of W. wing, copper tablet, marked "O. S. W. G. O. 485 ft." U. S. G. S.....	249.33	466.875	452.087	466.767
433	Cartersville Bridge No. 51, towpath, middle abutment, inner face, fifth course below coping, marked "O.".....	250.92	465.563	450.724	465.454
434	Guernsey's Bridge No. 52 (about 0.8 mile E. of Pittsford), towpath, abutment, fifth course below coping, projecting stone, marked "O.".....	251.57	465.969	452.131	466.861
435	Highway Bridge No. 53, Pittsford, towpath, on E. wing, marked [ ].....	252.06	467.548	452.710	467.440
436	Main Street Bridge No. 54, Pittsford, middle towpath abutment, fifth course below coping, projecting stone marked "O.".....	252.86	467.548	453.705	467.435
437	Sutnerland's Highway Bridge No. 55 (about 0.5 mile W. of Pittsford), towpath on E. wing, marked [ ].....	252.82	467.994	452.556	467.286
438	Culvert No. 33 (about 0.9 mile W. of Pittsford), towpath, middle parapet wall, marked [ ].....	253.27	455.603	440.764	455.494
439	Culvert 34 (about 1.4 miles W. of Pittsford), towpath, middle parapet wall, marked [ ].....	253.71	452.185	437.347	452.077
440	Cook's Highway Bridge No. 56 (about 2.0 miles W. of Pittsford), towpath, E. wing, marked [ ].....	254.83	467.207	452.569	467.099
441	Lock No. 62 (about 2.2 miles W. of Pittsford), berme, on middle hollow quoin, marked [ ].....	254.60	473.446	455.608	473.358
442	Weed's Bridge No. 57 (about 2.6 miles E. of Brighton), towpath, on E. wing, marked [ ].....	255.09	475.533	460.695	475.425
443	Billinghurst's Bridge No. 58 (about 2.0 miles E. of Brighton), towpath, on E. wing, marked [ ].....	255.58	477.088	462.250	476.980
444	Done'l's Bridge No. 59 (about 1.3 miles E. of Brighton), towpath, on east wing, marked [ ].....	256.36	477.011	462.178	476.903
445	Drake's Bridge No. 60 (about 0.6 mile E. of Brighton), towpath, on E. wing, marked [ ].....	257.07	476.942	462.104	476.834
446	Miller's Lock No. 63, Brighton, berme, on middle hollow quoin, marked [ ].....	257.44	482.390	467.552	482.282
447	Sipple's Lock No. 64, Brighton, berme, on middle hollow quoin (center stone), not marked.....	257.99	492.382	477.544	492.274
448	Lock No. 65 (second lock E. of Rochester), berme, on middle hollow quoin, marked [ ].....	258.37	502.513	487.675	502.408
449	Culver Street Bridge No. 62, Rochester, towpath, on E. wing, marked [ ].....	258.70	505.933	491.095	505.825
450	Lock No. 66 (first E. of Rochester), berme, on middle hollow quoin, marked [ ].....	259.43	511.833	496.995	511.725
451	Goodman Street Bridge No. 64, Rochester, towpath, on E. wing, marked [ ].....	259.71	514.740	499.902	514.632
452	Averill Avenue Bridge No. 66, Rochester, towpath, on E. wing, marked [ ].....	260.13	514.592	499.754	514.484
453	Weigh Lock, Rochester, east end pier, near snubbing post, marked [ ].....	260.75	511.374	496.536	511.266
454	Ford Street Bridge No. 73, Rochester, east end towpath abutment, on third step, marked [ ].....	261.62	514.127	499.289	514.019
455	Niagara Falls E. R. Bridge, Rochester, towpath, E. end, on first step, marked [ ].....	262.54	518.360	498.522	518.252
456	Emerson Street Bridge No. 85, Rochester, towpath, parapet wall on W. end, marked [ ].....	263.37	515.533	500.695	515.425
457	Rowe Street Bridge No. 86, Rochester, towpath, foundation under E. tower, marked [ ].....	263.90	513.768	498.930	513.660
458	Scott's Bridge No. 88 (about 3.5 miles W. of Rochester), towpath, on E. wing, marked [ ].....	264.82	514.622	499.784	514.514
459	Four Mile Grocery Bridge No. 89, towpath, on E. wing, marked [ ].....	265.35	515.260	500.522	515.252
460	Splier's Bridge No. 90, 1.58 miles E. of South Greece, towpath abutment, W. wing face, corner of coping, marked [ ] with a chisel.....	267.32	518.091	500.252	514.982
461	Douglass's Farm Bridge No. 92, 0.69 mile E. of South Greece, towpath abutment, W. wing, near face corner, marked [ ] with a chisel.....	268.21	518.715	498.876	513.606
462	Findlay's Bridge No. 93, South Greece, E. wing, near face corner, berme abutment, marked [ ] with a chisel.....	268.90	514.264	499.426	514.156

TABLE NO. 18.—(Continued).

E. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
463	Cromwell's Bridge No. 95, 2.73 miles E. of Spencerport, towpath abutment, E. wing, near center of coping stone, marked [ ] with a chisel.....	270.28	515.647	500.808	515.538
464	Hiscock's Bridge No. 96, 1.66 miles E. of Spencerport, towpath abutment, E. wing, near center of coping stone, marked [ ] with a chisel.....	271.85	514.422	499.583	514.313
465	Norman's Farm Bridge No. 97, 0.75 mile E. of Spencerport, towpath abutment, W. wing, near center coping stone, marked [ ] with paint....	272.26	514.594	499.755	514.485
466	Amity Street Bridge No. 99, Spencerport, towpath abutment, W. wing, near center bottom step, marked [ ] with a chisel.....	273.01	514.842	500.003	514.738
467	Amity Street Bridge No. 99, Spencerport, U. S. G. S., bronze tablet in center of abutment, facing towpath and canal, marked "514 B," U. S. G. S., Elev. 513.700.....	273.01	515.890	501.051	515.781
468	Webster's Bridge No. 101, 1.86 miles W. of Spencerport, towpath abutment, E. wing, center of bottom step, marked [ ] with a chisel.....	274.93	524.527	499.683	514.418
469	Cressy's Bridge No. 102, 2.89 miles W. of Spencerport, towpath abutment, W. wing, marked [ ] with a chisel.....	275.40	515.432	500.613	515.348
470	Adams' Basin Bridge No. 103, towpath abutment, E. wing, marked [ ] with a chisel.....	275.73	515.040	500.201	514.931
471	Doty's Bridge No. 104, 3.47 miles E. of Brockport, berme abutment, E. wing, coping, marked [ ] with chisel.....	276.80	516.581	501.742	516.472
472	Culvert No. 55, 3.0 miles E. of Brockport, towpath parapet marked [ ] on coping.....	277.26	510.423	495.589	510.319
473	Brookway's Bridge No. 105, 2.41 miles E. of Brockport, towpath abutment, W. wing, marked [ ] with a chisel.....	277.86	514.067	499.228	513.958
474	Cooley's Basin Bridge No. 106, 2.10 miles W. of Brockport, towpath abutment, E. wing, third course, marked [ ] with a chisel.....	278.17	515.682	500.843	515.573
475	Mechanic Street Bridge No. 107, Brockport, towpath abutment, E. wing, lower step, marked [ ] with chisel, U. S. G. S., Elev. 510.669.....	280.27	512.844	498.005	512.735
476	Smith Street Bridge No. 109, Brockport, towpath abutment, E. wing, on lower step, marked [ ] with chisel.....	280.74	514.658	499.819	514.549
477	Waste Weir, Brockport, E. abutment, on E. pier, marked [ ] with chisel.....	280.75	513.116	498.277	513.007
478	Danforth's Bridge No. 110, 1 1/4 miles W. of Brockport, towpath abutment, E. wing, coping, marked [ ] with chisel.....	281.94	516.930	502.141	516.871
479	Miner's Bridge No. 111, 3.05 miles W. of Brockport, E. wing, towpath, on off-set, marked [ ] with chisel.....	283.32	512.834	497.995	512.725
480	Orr's Bridge No. 113, 0.50 mile E. of Holly, W. wing, towpath abutment, marked [ ] with chisel.....	284.51	517.674	502.835	517.565
481	Main Street Bridge No. 115, Holley, E. wing, towpath abutment, marked [ ] with red paint.....	284.97	516.831	501.982	516.712
482	Tuttle's Bridge No. 117, 1.50 miles W. of Holly, E. wing, towpath abutment, marked [ ] with chisel and red paint.....	286.48	517.384	502.545	517.275
483	Bridge No. 119, Hulberton, E. wing, towpath abutment, marked [ ] with a chisel.....	288.15	517.159	502.320	517.050
484	Brockville Bridge No. 120, 1.80 miles W. of Hulberton, E. wing, towpath abutment, marked [ ] with a chisel.....	289.42	516.481	501.642	516.372
485	Hindsburg Bridge No. 121, E. wing, towpath abutment, marked [ ] with chisel and red paint.....	290.16	517.848	503.009	517.739
486	Jacqueth's Bridge No. 123, 3.7 miles E. of Albion, E. wing, towpath abutment, marked [ ] with chisel, and O with red paint.....	291.63	518.123	503.289	518.019
487	Bralley's Bridge No. 125, 1.40 miles E. of Albion, W. wing, towpath abutment, marked [ ] with a chisel.....	293.23	516.636	501.797	516.527
488	Ingersoll Street Bridge No. 127, Albion, towpath abutment, E. wing, on lower step, marked [ ] with a chisel.....	294.49	514.726	499.887	514.617
489	Lattin's Bridge No. 129, 1.0 mile W. of Albion, W. wing, towpath abutment, marked [ ] with a chisel.....	295.74	517.673	502.834	517.564

TABLE NO. 18—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
490	Gaines Basin Bridge No. 180, 1.70 miles W. of Albion, towpath abutment, W. wing, on lower step, marked [ ] with a chisel.....	296.87	515.835	501.046	515.776
491	Eagle Harbor Bridge No. 131, towpath abutment, E. wing, lower step, marked [ ] with a chisel..	297.92	516.692	502.053	516.783
492	Eagle Harbor Bridge No. 131, towpath abutment, E. wing, lower step, copper bolt, marked U. S. G. S. B. M. 516 ft.....	297.92	516.699	502.060	516.790
493	Starkweather's Farm Bridge No. 182, 0.50 mile W. of Eagle Harbor, towpath, E. wing, marked [ ] with chisel.....	298.21	518.051	503.212	517.942
494	Long's Bridge No. 134, 1.8 miles E. of Knowlesville, E. wing, towpath abutment, face corner, marked [ ] with chisel.....	299.17	516.878	502.039	516.769
495	Dive Culvert No. 91, 0.50 mile E. of Knowlesville, towpath parapet, marked [ ].....	300.39	511.811	496.972	511.703
496	Knowlesville Bridge No. 135, W. wing, towpath abutment, second lower step, marked [ ] with a chisel.....	300.97	517.815	502.976	517.706
497	Knowlesville Stop-gate, 1.75 miles W. of Knowlesville, E. abutment, towpath side, marked [ ]...	302.69	514.804	499.965	514.693
498	Beal's Bridge, 1.8 miles E. of Medina, towpath abutment, E. wing, marked [ ] with a chisel...	303.36	516.356	501.517	516.347
499	Hasting's Bridge No. 137, 1.0 mile E. of Medina, W. wing, towpath abutment, on corner coping, marked [ ] with a chisel.....	304.12	517.659	502.820	517.560
500	Holloway's Bridge No. 138, Medina, E. wing, towpath abutment, marked [ ] around anchor bolt.	304.77	517.058	502.219	516.949
501	Medina Aqueduct, Medina, W. buttress, on the N. W. corner, marked [ ] with a chisel.....	305.00	514.924	500.035	514.815
502	Church Street Bridge No. 139, Medina, E. wing, towpath abutment, marked [ ] around anchor bolt.....	305.14	516.593	501.759	516.485
503	Prospect Street Bridge No. 140 $\frac{1}{2}$ , Medina, E. wing, towpath abutment, copper bolt, marked U. S. G. S. B. M.....	305.62	518.387	503.548	518.278
504	Old Stop-gate, 0.70 mile W. of Medina, E. end of towpath abutment, marked [ ] with red paint.	305.85	515.522	500.683	515.413
505	Dive Culvert No. 100, 1.2 miles W. of Medina, on towpath parapet, marked [ ].....	306.36	512.756	497.917	512.647
506	Jackson's Bridge No. 141, 2.0 miles W. of Medina, W. wing, towpath abutment, marked [ ] with a chisel.....	307.12	517.458	502.619	517.349
507	Shelby Basin Bridge No. 142, 2.7 miles W. of Medina, E. wing, towpath abutment, marked [ ] with a chisel.....	307.79	519.044	504.205	518.935
508	Gorman's Bridge No. 143, 1.70 miles E. of Middleport, E. wing, towpath abutment, marked [ ] with a chisel.....	308.54	519.993	504.154	518.884
509	Dive culvert No. 104, .60 mile E. of Middleport, on center of towpath parapet, marked [ ] with chisel.....	309.63	512.777	497.933	512.668
510	Main Street Bridge No. 145, Middleport, W. wing, towpath abutment, on lower step, marked [ ] with chisel.....	310.25	516.687	501.998	516.728
511	Dive Culvert No. 108, .80 mile W. of Middleport, on towpath parapet, end of coping, marked [ ] with chisel.....	311.08	510.014	495.175	509.905
512	Watson's Bridge No. 147, 1.70 miles W. of Middleport, W. wing, towpath abutment, marked [ ] with a chisel.....	311.94	517.821	502.982	517.712
513	Hurd's Bridge No. 148, 3.39 miles W. of Middleport, E. wing, towpath abutment, marked [ ] around anchor bolt.....	313.49	517.967	503.148	517.878
514	Reynold's Basin Bridge No. 149, 1.69 miles E. of Gasport, E. wing, towpath abutment, lower step, marked [ ] with a chisel.....	314.06	517.523	502.694	517.414
515	Dive Culvert No. 114, Gasport, towpath parapet, marked [ ] with chisel.....	315.46	511.649	496.810	511.540
516	Dive Culvert No. 115, Gasport, towpath parapet, marked [ ] with chisel.....	315.82	510.648	495.809	510.539
517	Orangeport Bridge No. 152, 1 mile W. of Gasport, W. wing, towpath abutment, marked [ ] with chisel.....	316.72	517.326	502.487	517.217
518	Dive Culvert No. 116, 1.50 miles W. of Gasport, towpath parapet, marked [ ] with chisel.....	317.27	509.862	495.023	509.753
519	Dive Culvert No. 117, 1.75 miles W. of Gasport, towpath parapet, marked [ ] with chisel.....	317.52	508.106	493.267	507.997

TABLE No. 18—(Continued).

B. M. No.	DESCRIPTION.	Miles from Green- bush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
520	Millard's Bridge No. 153, 3 miles W. of Gasport, E. wing, towpath abutment, marked [ ] with chisel.....	318.69	521.919	507.080	521.820
521	Wakeman's Bridge No. 154, 2.80 miles E. of Lockport, W. wing, towpath abutment, on coping, marked [ ] with paint.....	319.55	521.753	506.914	521.644
522	Young's Bridge No. 155, 1.80 miles E. of Lockport, W. wing, towpath abutment, on coping, marked [ ] with paint.....	320.47	522.413	507.574	522.304
523	N. Y. C. & H. R. R. Bridge (Lower Town branch), Lockport, towpath abutment, E. end, rear corner, marked [ ] with chisel.....	321.17	514.168	499.329	514.059
524	Adams Street Bridge No. 157, Lockport, towpath abutment, E. wing, lower step, marked [ ] with chisel.....	321.46	516.759	501.920	516.650
525	Cady Street Bridge No. 160, Lockport, W. wing, towpath abutment, first lower step, marked [ ] with chisel.....	321.88	517.643	502.803	517.533
526	Lock 67, Lockport, towpath, first lower step, marked [ ] with chisel.....	322.12	520.050	505.211	519.941
527	Lock 71, Lockport, E. berme, hollow quoin, marked [ ] with chisel.....	322.22	571.777	556.938	571.668
528	200 ft. E. of bridge No. 165, 1.30 miles W. of Lockport, iron ring bolt at N. E. corner of plank towpath bridge over horse hole.....	323.63	576.202	561.363	576.093
529	2.70 miles W. of Lockport, on stone wall, marked [ ] with paint and improvement bench-mark No. 184.....	324.96	578.684	563.845	578.575
530	Hawley's Bridge No. 167, 3.90 miles W. of Lockport, towpath abutment, W. end of pier, on first course of stone marked [ ] with chisel.....	326.23	576.034	561.195	575.925
531	Sulphur Springs Guard Lock, 1.50 miles E. of Pendleton, E. berme, hollow quoin, marked [ ] with chisel.....	327.41	582.576	567.737	582.467
532	Pendleton Change Bridge No. 169, berme side, E. wing, E. end of lower step, marked [ ] with chisel.....	328.94	576.492	561.653	576.353
533	Highway Bridge over Black Creek, 2.00 miles W. of Pendleton, W. abutment, N. W. wing, marked [ ] with chisel.....	331.05	577.203	562.364	577.094
534	New Home Bridge No. 173, 3.0 miles W. of Pendleton, towpath abutment, W. wing, corner, first lower step, marked [ ] with chisel.....	331.74	577.690	562.851	577.581
535	Pickard's Bridge No. 174, 4.50 miles W. of Pendleton, towpath, on face of abutment, near W. end, marked [ ] with chisel.....	333.46	578.651	563.812	578.542
536	Stone Road Culvert 5.50 miles W. of Pendleton, N. E. corner, marked [ ] with chisel.....	334.46	576.519	561.680	576.410
537	Bush's Bridge No. 175, 4.0 miles E. of Tonawanda, on face of towpath abutment, marked [ ] with chisel and paint.....	336.66	576.882	562.043	576.773
538	Erle R. R. Bridge, Tonawanda, towpath abutment, W. wing, first lower step, marked [ ] with chisel.....	340.24	590.252	565.413	580.143
539	Tonawanda Dam, S. abutment, N. E. surface stone, between bolted iron bars, marked [ ].....	340.66	576.333	561.544	576.274
540	Bouck Street Bridge No. 180, Tonawanda, towpath abutment, W. wing, marked [ ] with chisel.....	341.07	579.869	565.030	579.760
541	Tonawanda Change Bridge (Grand Island Ferry), No. 182, 1.10 miles W. of Tonawanda, E. wing, towpath abutment, first coping stone, marked [ ] with chisel.....	341.72	579.705	564.866	579.596
542	Three Mile Bridge No. 183, 3.00 W. of Tonawanda, E. wing, towpath abutment, marked [ ] with chisel.....	343.86	579.743	564.904	579.634
543	Cherry's Bridge No. 184, 3.80 miles W. of Tonawanda, towpath, W. wing, rear of abutment, second course below coping, marked [ ] with chisel and U. S. B. M., 218 with paint.....	344.39	577.406	562.566	577.296
544	Spies Bridge No. 185, 4.60 miles W. of Tonawanda, towpath abutment, E. wing, marked [ ] with chisel and U. S. B. M. 216 with paint.....	345.23	578.463	563.624	578.354
545	Grand Island Ferry (Scott's Bridge No. 186) 2.60 miles E. of International Bridge, Buffalo, W. wing towpath abutment, marked [ ] with chisel and U. S. B. M. with paint.....	346.25	579.324	564.483	579.215

TABLE NO. 18.—(Concluded.)

B. M. No.	DESCRIPTION.	Miles from Greenbush.	ELEVATION ABOVE		
			Mean tide, New York, 1900.	Greenbush, 1901.	Mean tide, New York, 1901.
546	Change Bridge No. 187, 0.97 mile E. of International Bridge, towpath, S. side of W. wing, marked [ ] with chisel and U. S. B. M. No. 9, with paint.....	348.07	580.708	565.864	580.594
547	Black Rock Guard Lock, S. side of W. hollow quoin, marked [ ] with chisel.....	348.52	577.679	562.840	577.570
548	International Bridge, Buffalo, towpath, on face of abutment, marked [ ] with chisel and U. S. B. M. No. 7 with paint.....	348.92	581.079	566.240	580.970
549	Ferry Street Bridge No. 194, Buffalo, towpath abutment, W. wing, marked [ ] with chisel and U. S. B. M. No. 6 with paint.....	350.12	582.889	568.050	582.780
550	Porter Avenue Bridge No. 196, Buffalo, towpath, on face of abutment, bottom course, between fourth and fifth arch ribs, marked [ ] with chisel.....	351.27	577.489	562.630	577.880
551	Hudson Street Bridge No. 196½, Buffalo, towpath abutment, S. wing, first lower step, marked [ ] with chisel and U. S. B. M. No. 211 with paint.....	351.90	583.025	568.186	582.916
552	Commercial Street Bridge No. 204, Buffalo, towpath abutment, N. wing, second lower step, marked [ ] with chisel.....	353.08	580.734	565.895	580.625
553	Lighthouse, upper surface of plinth, E. angle, marked by chiseling in stone so as to leave a rounded point (South U. S. Pier).....	353.89	591.317	576.478	591.209
554	Westerly Subway under the N. Y. C. & H. R. R. R. at the head of gulf about 1 mile W. of Lockport, W. abutment, S. angle, lower course, projecting stone, marked [ ].....	323.86	591.568	576.729	591.459
555	U. S. L. S. Charlotte, upper side of water table of the lighthouse, at the S. E. angle, E. of S. window.....	271.00	284.113	269.274	284.004

TABLE NO. 19.

## Champlain Canal.

Elevations of lower miter sills of locks.

Lock number.	Distance from junction.	Distance between locks.	BENCH MARKS.		ELEVATION OF LOWER MITER SILL.	
			Number.	Elevation + mean tide, New York.	Below bench mark.	Above mean tide, New York.
1.....	1.45		1	89.087	20.710	18.377
2.....	1.56	.11	2	80.437	20.622	29.815
3.....	2.36	.80	3	82.334	11.040	41.294
4.....	2.79	.43	4	86.355	14.295	43.060
5.....	5.04	2.25	8	83.090	20.920	42.170
6.....	5.84	.80	9	76.301	20.960	55.341
7.....	8.36	3.02	15	83.892	17.543	66.349
8.....	9.72	1.36	17	94.976	20.050	74.926
9.....	13.84	4.12	26	104.035	17.963	86.072
10.....	29.90	16.06	59	109.876	15.880	94.996
11.....	30.53	.63	61	113.176	19.170	94.006
12.....	31.96	1.43	64	122.007	17.900	104.107
13.....	33.19	1.23	69	132.585	18.946	115.639
14.....	35.88	2.69	75	141.246	17.950	123.296
15.....	41.40	5.52	90	149.374	16.652	132.690
16.....	53.10	11.70	110	149.145	16.530	132.625
17.....	53.13	.03	110	149.145	25.024	124.121
18.....	53.30	.17	111	132.953	16.034	116.919
19.....	56.54	3.24	114	127.423	12.561	114.862
20.....	59.51	2.97	119	127.614	13.000	114.614
21.....	65.06	5.55	129	122.316	15.330	106.986
22.....	65.07	.01	.....	113.410	17.939	95.471
23.....	65.10	.03	130	104.375	18.789	85.586

Water surface of Lake Champlain September 13, 1901 = 95.303.

TABLE NO. 20.  
Champlain Canal.  
Elevations of Spillways of Aqueducts and Waste-Weirs.

No.	NAME	Location.	ELEVATION OF SPILLWAY ABOVE	
			Greenbush.	Mean tide, New York.
1	Burton's (towpath).....	<i>Between Locks 4 and 5.</i> 3.70 miles from junction.....	34.030	48.760
2	Spillway (berme).....	<i>Between Locks 5 and 6.</i> 5.15 miles from junction.....	46.636	61.366
3	Flynn (towpath).....	<i>Between Locks 6 and 7.</i> 8.80 miles from junction.....	61.986	76.716
4	Fitzgerald (towpath).....	<i>Between Locks 7 and 8.</i> 9.32 miles from junction.....	63.754	83.424
5	Mechanicville (towpath).....	<i>Between Locks 8 and 9.</i> 18.20 miles from junction.....	78.481	93.211
6	Lansings or Stillwater (towpath)	<i>Between Locks 9 and 10.</i> 15.11 miles from junction.....	86.948	101.678
7	Bemis Heights (towpath).....	17.86 miles from junction.....	86.881	101.611
8	Wilbers Basin (towpath).....	20.01 miles from junction.....	87.118	101.848
9	Searles (towpath).....	22.15 miles from junction.....	87.168	101.899
10	Coveville (towpath).....	24.58 miles from junction.....	86.379	101.109
A1	Schuylerville Aqueduct.....	28.01 miles from junction.....	87.417	102.147
11	Bullards Bend (towpath).....	29.78 miles from junction.....	87.762	102.492
12	Towpath.....	<i>Between Locks 11 and 12.</i> 31.57 miles from junction.....	96.313	111.043
A2	Fort Miller Aqueduct.....	<i>Between Locks 12 and 13.</i> 32.22 miles from junction.....	103.839	118.069
13	Bristols (towpath).....	<i>Between Locks 13 and 14.</i> 35.00 miles from junction.....	106.848	121.578
A3	Moseskill Aqueduct.....	<i>Between Locks 14 and 15.</i> 35.97 miles from junction.....	123.410	138.140
14	Satterlees (towpath).....	37.22 miles from junction.....	123.201	137.931
A4	Ft. Edward Aqueduct.....	40.75 miles from junction.....	122.965	137.695
15	O'Brien's (spillway towpath).....	<i>Between Locks 15 and 16.</i> 42.53 miles from junction.....	133.151	147.831
16	Dunham's Basin (towpath).....	44.50 miles from junction.....	133.151	147.831
17	Towpath.....	48.26 miles from junction.....	132.955	147.655
18	Smith's Basin (towpath).....	49.15 miles from junction.....	132.138	146.868
19	Emples (berme).....	50.72 miles from junction.....	132.679	147.409
20	At Wood Creek (berme).....	<i>Between Locks 18 and 19.</i> 56.50 miles from junction.....	110.608	125.338
21	Spillway.....	<i>Between Locks 19 and 20.</i> 59.30 miles from junction.....	107.083	121.813
21	Just S. Lock 20 (berme).....	59.30 miles from junction.....	106.954	121.694
22	At Lock 20 (berme).....	59.47 miles from junction.....	107.040	121.770
23	Eastman's (towpath).....	<i>Between Locks 20 and 21.</i> 62.37 miles from junction.....	106.984	121.714
24	Maville (towpath).....	64.24 miles from junction.....	106.785	121.515

TABLE No. 21.  
Eastern Division—Erie Canal.  
Elevation of Lower Miter Sills of Locks.

LOCK NUMBER.	Distance from Greenbush.	Distance between locks.	BENCH MARKS.		ELEVATION OF LOWER MITER SILL.	
			Number.	Elevation + mean tide, New York.	Below bench mark.	Above mean tide, New York.
1.....	1.44	.....	4	10.960	.....	-6.196
2.....	2.68	1.24	5	27.051	.....	+8.573
Lower side cut, upper lock...	.....	.....	.....	.....	.....	+6.247
Lower side cut, lower lock...	.....	.....	.....	.....	.....	-7.022
Upper side cut, upper lock...	.....	.....	.....	.....	.....	+6.455
Upper side cut, lower lock...	.....	.....	.....	.....	.....	-6.291
3.....	7.93	5.25	14	88.559	.....	18.254
4.....	8.25	0.32	15	49.715	.....	29.420
5.....	8.52	0.27	16	60.493	.....	40.923
6.....	8.73	0.21	17	70.497	18.793	51.704
7.....	8.86	0.13	18	60.143	18.604	61.539
8.....	9.02	0.16	19	90.393	19.074	71.319
9.....	9.35	0.33	20	100.526	18.512	82.014
10.....	9.53	0.18	21	110.470	18.701	91.769
11.....	9.69	0.16	22	120.480	18.704	101.776
12.....	9.84	0.15	23	130.569	18.918	111.651
13.....	10.04	0.20	24	140.466	19.062	121.464
14.....	10.26	0.22	25	150.404	18.812	131.592
15.....	10.53	0.27	27	160.531	18.807	141.724
16.....	10.72	0.19	28	170.472	18.990	151.482
17.....	11.04	0.32	29	180.611	18.663	161.948
18.....	11.23	0.19	30	190.893	19.247	171.646
19.....	20.09	8.86	48	199.312	16.983	182.329
20.....	22.83	2.74	50	209.208	18.862	190.346
21.....	26.05	3.22	52	222.298	23.340	198.958
22.....	26.23	0.18	53	232.203	20.170	212.033
23.....	33.15	6.92	72	240.320	16.786	223.534
24.....	33.94	0.79	74	248.743	17.157	231.586
25.....	37.74	3.80	82	256.591	16.840	239.751
26.....	44.12	6.38	90	264.459	16.792	247.667
27.....	44.32	0.20	91	272.402	16.910	255.492
28.....	49.54	5.22	95	280.661	16.837	263.824
29.....	51.51	1.97	98	287.985	16.450	271.535
30.....	52.14	0.63	101a	298.626	19.372	279.254
31.....	66.00	13.86	123	304.517	14.737	289.780
32.....	72.32	6.32	141	312.802	17.134	295.668
33.....	77.43	5.11	150	318.268	14.700	303.568
34.....	80.00	2.57	155	326.284	16.926	309.359
35.....	83.18	3.18	163	334.453	16.762	317.676
36.....	87.55	4.37	169	344.118	18.924	325.194
37.....	88.17	0.62	170	351.159	18.820	333.339
38.....	88.33	0.16	171	363.769	18.229	345.560
39.....	88.55	0.22	172	373.835	18.920	354.915
40.....	91.31	2.76	173	381.609	16.901	364.708
41.....	93.95	2.64	183	389.795	17.028	372.767
42.....	97.03	3.08*	191	398.994	18.020	380.974
43.....	97.29	0.26	192	407.015	18.142	388.873
44.....	100.60	2.71	200	418.073	21.070	397.003
45.....	101.24	1.24	204	427.960	20.033	407.927
Herkimer-Oneida county line.	107.98	6.74	...	.....	.....	.....

\* Level between lock No. 41 and 42 is 2.86 miles by direct measurements, and 3.08 miles by line followed by the levels crossing Mohawk River twice between these locks.

TABLE NO. 22.

## Eastern Division—Erie Canal.

## Elevation of Spillway of Waste-Weirs.

No.	LOCATION.	ELEVATION OF SPILLWAY ABOVE	
		Greenbush.	Mean tide, New York.
1	3.85 miles west of Lock No. 1 .....	11.857	26.087
2	Abandoned.		
3	0.03 miles east of Lock No. 4 .....	22.233	36.963
4	0.05 miles east of Lock No. 10 .....	84.331	99.061
5	0.23 miles west of Lock No. 18 .....	174.743	189.472
6	0.15 miles west of Lock No. 20 .....	193.419	208.149
7	Abandoned.		
8	2.04 miles west of Lock No. 27 .....	256.431	271.161
9	13.70 miles west of Lock No. 30 .....	281.841	296.571
10	0.03 miles west of Lock No. 33 .....	302.419	317.149
11	0.25 miles west of Lock No. 33 .....	302.270	317.000
12	3.58 miles west of Lock No. 35 .....	318.266	332.996
13	0.03 miles west of Lock No. 36 .....	328.344	343.074
14	0.20 miles west of Lock No. 39 .....	358.503	373.233
15	0.13 miles west of Lock No. 41 .....	374.445	389.175
16	At Lock No. 43 .....	390.296	405.026

TABLE NO. 23.

## Eastern Division—Erie Canal.

## Elevation of Spillway of Aqueducts.

No.	NAME.	Location.	ELEVATION OF SPILLWAY ABOVE	
			Greenbush.	Mean tide, New York.
1	Lower Mohawk .....	Between locks 18-19 .....	174.159	188.899
2	Upper Mohawk .....	Between locks 22-23 .....	216.092	230.822
3	Flat Stone Creek, Van Slyok's .....	Between locks 24-25 .....	232.284	247.014
4	Sansai kill, Pattersonville .....	Between locks 25-26 .....	239.633	254.333
5	Schoharie Creek .....	Between locks 30-31 .....	283.502	297.232
6	Tokkon Creek .....	Between locks 30-31 .....	282.267	296.997
7	Leonardson's Creek, Yatesville .....	Between locks 30-31 .....	282.322	297.052
8	Lasher's Creek .....	Between locks 30-31 .....	282.250	296.980
9	Plattkill Creek, Sprakers .....	Between locks 31-32 .....	287.825	302.555
10	Canajoharie Creek .....	Between locks 31-32 .....	288.255	302.985
11	Otsquago Creek, Fort Plain .....	Between locks 32-33 .....	296.699	311.429
12	Castle Creek, Indian Castle .....	Between locks 35-36 .....	318.437	333.167
13	Fulmer's Creek, Mohawk .....	Between locks 43-44 .....	390.296	405.026
14	Steele's Creek, Ilion .....	Between locks 43-44 .....	390.289	405.019
15	Moyer's Creek, Frankfort .....	Between locks 44-45 .....	411.090	425.820
16	Ferguson's Creek .....	Between locks 44-45 .....	411.242	425.972



TABLE NO. 24.

## Middle Division—Erie Canal.

## Elevations of Lower Miter Sills of Locks.

LOCK NUMBER.	Distance from Greenbush.	Distance between locks.	BENCH MARKS.		ELEVATION OF LOWER MITER SILL.	
			Number.	Elevation, + Mean tide, New York.	Below bench mark.	Above Mean tide, New York.
Herkmer-Oneida county line.	107.98	.....	.....	.....	.....	.....
45 .....	111.85	5.87	223	431.059	14.174	416.885
47 .....	167.25	65.90	295	431.599	19.440	412.159
48 .....	167.44	0.19	294	420.998	19.096	401.902
49 .....	168.15	0.71	297	410.703	17.974	392.729
50 .....	173.17	5.02	312	411.600	13.907	392.693
51 .....	188.07	14.90	332	411.613	14.570	397.043
52 .....	195.87	7.79	352	404.265	18.652	385.713
South line of Wayne county..	204.96	9.09	.....	.....	.....	.....

TABLE NO. 25.

## Middle Division—Erie Canal.

## Elevations of Crest of Waste-Weirs.

Number.	NAME.	Location.	ELEVATION OF CREST ABOVE	
			Greenbush.	Mean tide, New York.
1	Ballou Creek.....	109.87 miles west of Greenbush.....	411.447	426.177
2	Between Rome and Oriskany..	121.50 miles west of Greenbush.....	414.759	429.489
3	Fort Bull.....	127.86 miles west of Greenbush.....	414.632	429.362
4	Durhamville.....	141.02 miles west of Greenbush.....	414.554	429.284
5	Carpenter Brook.....	184.35 miles west of Greenbush.....	395.072	409.802
6	Weedsport.....	191.25 miles west of Greenbush.....	389.613	404.343

TABLE NO. 26.

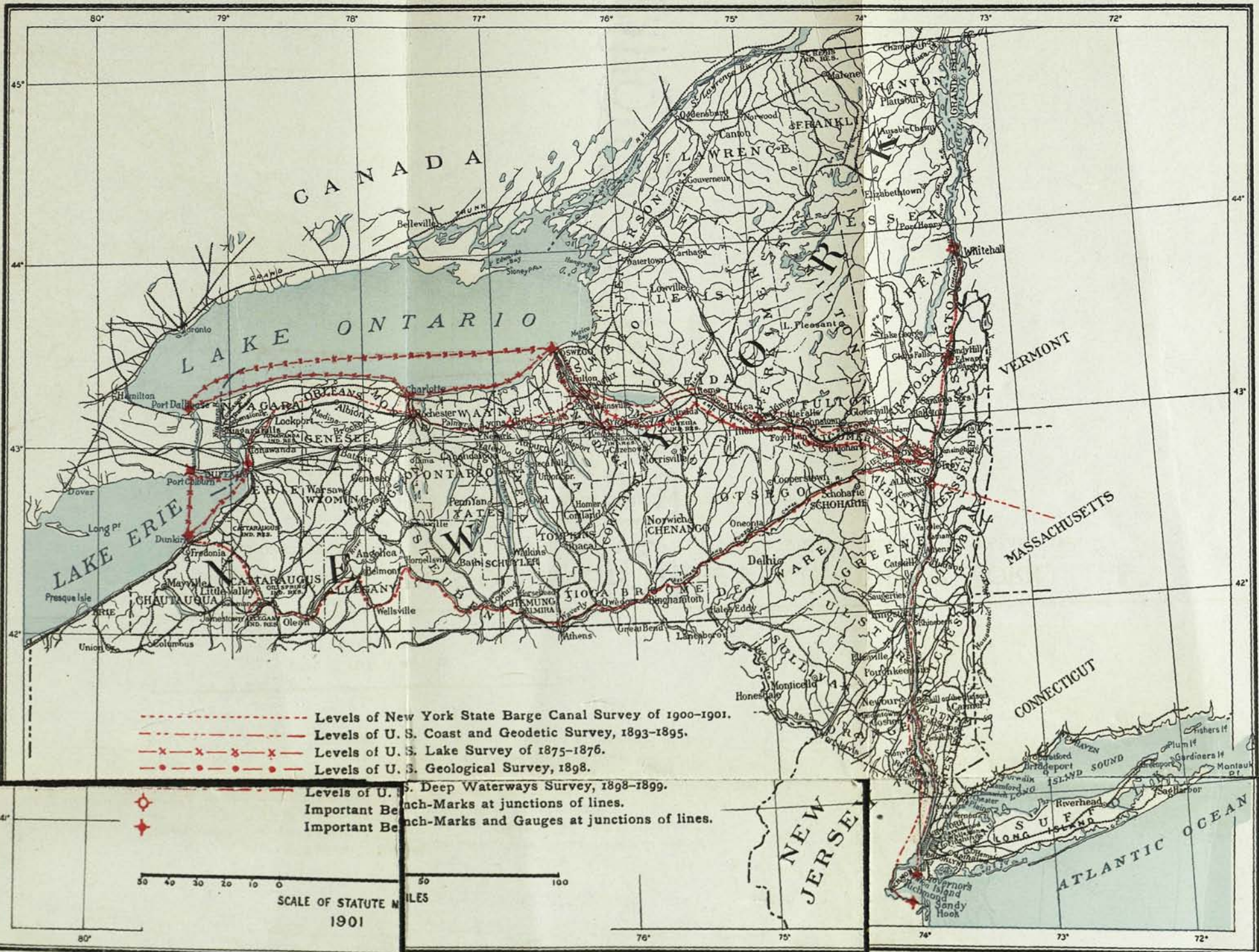
## Middle Division—Erie Canal.

## Elevation of Spillway of Aqueducts.

No.	NAME.	Location.	ELEVATION OF SPILLWAY ABOVE	
			Greenbush.	Mean tide, New York.
1	Sauquoit Creek.....	118.58 miles west of Greenbush .....	415.514	430.244
2	Oriskany Creek.....	117.23 miles west of Greenbush .....	414.429	429.159
3	Cowasselon Creek.....	142.66 miles west of Greenbush .....	414.409	429.189
4	Chittenango Creek .....	152.74 miles west of Greenbush .....	414.588	429.318
5	Limestone Creek .....	160.76 miles west of Greenbush .....	414.616	429.346
6	Butternut Creek .....	162.83 miles west of Greenbush .....	414.903	429.633
7	Nine Mile Creek .....	175.98 miles west of Greenbush .....	394.991	409.724
8	Jordan .....	184.37 miles west of Greenbush .....	395.271	410.001
9	Centerport.....	192.85 miles west of Greenbush .....	389.513	404.243
10	Port Byron.....	195.45 miles west of Greenbush .....	390.203	404.933
11	Crane Brook .....	198.70 miles west of Greenbush .....	379.788	394.518
12	Seneca River .....	200.64 miles west of Greenbush .....	378.361	393.091



3 9077 01217332 7



**MAP SHOWING LINES OF LEVELS IN THE STATE OF NEW YORK,**  
**WITH REPORT ON SPIRIT LEVELS OF THE NEW YORK STATE BARGE CANAL SURVEY OF 1900 AND 1901.**  
 To accompany Annual Report of  
**EDWARD A. BOND, State Engineer and Surveyor,**  
 1901.