Water-Supply and Irrigation Paper No. 115 - Series N, Water Power, 10

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

RIVER SURVEYS AND PROFILES MADE DURING 1903

ARRANGED BY

W. CARVEL HALL AND JOHN C. HOYT

WASHINGTON
GOVERNMENT PRINTING OFFICE
1905

PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

The publications of the United States Geological Survey consists of (1) Annual Reports; (2) Monographs; (3) Professional Papers; (4) Bulletins; (5) Mineral Resources; (6) Water-Supply and Irrigation Papers; (7) Topographic Atlas of the United States, folios and separate sheets thereof; (8) Geologic Atlas of United States, folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

The Professional Papers, Bulletins, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, Hydrographic progress reports.

The following Water-Supply Papers are out of stock, and can no longer be supplied: Nos. 1–16, 19, 20, 22, 29–34, 36, 39–40, 43, 46, 57–65, 75. Complete lists of papers relating to water supply and allied subjects follow. (PP=Professional Paper; B=Bulletin; WS=Water-Supply Paper.)

SERIES I—IRRIGATION.

WS 2. Irrigation near Phoenix, Ariz., by A. P. Davis. 1897. 98 pp., 31 pls. and maps.
WS 5. Irrigation practice on the Great Plains, by E. B. Cowgill. 1897. 39 pp., 11 pls.
WS 9. Irrigation near Greeley, Colo., by David Boyd. 1897. 90 pp., 21 pls.
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WS 13. Irrigation systems in Texas, by W. F. Hutson. 1898. 68 pp., 10 pls.
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WS 32. Water resources of Porto Rico, by H. M. Wilson. 1899. 48 pp., 17 pls. and maps.
WS 43. Conveyance of water in irrigation canals, flumes, and pipes, by Samuel Fortier. 1901. 86 pp., 15 pls.
WS 70. Geology and water resources of the Patrick and Goshen Hole quadrangles, Wyoming, by G. I. Adams. 1902. 50 pp., 11 pls.
WS 71. Irrigation systems of Texas, by T. U. Taylor. 1902. 137 pp., 9 pls.
WS 74. Water resources of the State of Colorado, by A. L. Fellows. 1902. 151 pp., 14 pls.
WS 87. Irrigation in India (second edition), by H. M. Wilson. 1903. 238 pp., 27 pls.
WS 93. Proceedings of first conference of engineers of the reclamation service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1904. 361 pp.

The following papers also relate especially to irrigation: Irrigation in India, by H. M. Wilson, in Twelfth Annual, Pt. II; two papers on irrigation engineering, by H. M. Wilson, in Thirteenth Annual, Pt. III.

SERIES J—WATER STORAGE.

WS 33. Storage of water on Gila River, Arizona, by J. B. Lippincott. 1900. 98 pp., 33 pls.
WS 40. The Austin dam, by T. U. Taylor. 1900. 51 pp., 16 pls.
WS 45. Water storage on Cache Creek, California, by A. E. Chandler. 1901. 48 pp., 10 pls.
WS 46. Physical characteristics of Kern River, California, by F. H. Olmsted, and Reconnaissance of Yuba River, California, by Marsden Manson. 1901. 57 pp., 8 pls.
WS 58. Storage of water on Kings River, California, by J. B. Lippincott. 1902. 100 pp., 32 pls.
WS 68. Water storage in Truckee Basin, California-Nevada, by L. H. Taylor. 1902. 90 pp., 8 pls.
WS 73. Water storage on Salt River, Arizona, by A. P. Davis. 1902. 54 pp., 25 pls.
WS 86. Storage reservoirs on Stony Creek, California, by Burt Cole. 1903. 62 pp., 16 pls.
WS 89. Water resources of Salinas Valley, California, by Homer Hamlin. 1904. 91 pp., 12 pls.
WS 93. Proceedings of first conference of engineers of the reclamation service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1904. 361 pp.

The following paper also should be noted under this heading: Reservoirs for irrigation, by J. D. Schuyler, in Eighteenth Annual, Pt. IV.

[Continued on third page of cover.]

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ERRATA.

[Water-Supply Paper No. 115, United States Geological Survey.]

age 11. Fig. 1 should have had the title "Profile of Catawba River from Marion to Connelly Springs, N. C.," and been placed at page 13.

age 14. Pl. II should have had the title "Profile of Tallulah River below Blalock, Ga.," and been placed at page 18.

age 19. Fig. 2 should have had the title "Profile of Tugaloo River below Tallulah Falls, Ga.," and been placed at page 23.

age 24. Fig. 3 should have had the title "Profile of Savannah River from Andersonville, S. C., to Lisbon, Ga.," and been placed at 29.

age 30. Pl. III should have had the title "Profile of South and Ocmulgee rivers from Constitution to Macon, Ga.," and been placed at page 46.

age 47. Fig. 6 should have had the title "Profile of Alcovy River below Dabney's bridge, Georgia," and been placed at page 56.

age 56. Fig. 8 should have had the title "Profile of upper Chattahoochee River from Nacoochee, Ga., to junction with Chestatee River," and been placed at page 61.

age 62. Fig. 10 should have had the title "Profile of lower Chattahoochee River from West Point to Columbus, Ga.," and been placed at page 71.

age 73. Fig. 12 should have had the title "Profile of Chestatee River below Willow, Ga.," and been placed at page 77.

age 76. Pl. IV should have had the title "Profile of Chippewa River from Reeds Landing, Minnesota, to Flambeau, Wis.," and been placed at page 98.

age 103. Fig. 18 should have had the title "Profile of Buffalo River from Flatwoods to Lobelville, Tenn.," and been placed at page 11.

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ILLUSTRATIONS.

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
HYDROGRAPHIC BRANCH,
Washington, D. C., July 23, 1904.

SIR: I have the honor to transmit herewith a paper entitled "River Surveys and Profiles Made in 1903," which has been arranged by W. Carvel Hall and John C. Hoyt.

This paper contains the results of the cooperative river surveys carried on during 1903 between the topographic and hydrographic branches.

There is a large demand for the data herein presented by engineers and others interested in power development. I therefore recommend that this manuscript be published as a Water-Supply and Irrigation Paper.

Very respectfully,

F. H. NEWELL,
Chief Engineer.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

RIVER SURVEYS AND PROFILES OF 1903.

Arranged by W. C. HALL and J. C. HOYT.

INTRODUCTION.

In order to determine the location of the undeveloped water powers on the various rivers in the United States the United States Geological Survey has from time to time made surveys and profiles of the more important of the rivers on which possible power sites were known to be located. The object of these surveys is to point out localities where power may be developed.

In the determination of the river profiles the general plan of survey adopted was as follows:

The elevations were based upon reliable heights derived from primary or precise levels of the United States Geological Survey. On this datum, with few exceptions, lines of flying levels were carried up the bank of each stream and bench marks were established at intervals of about 1 mile, usually on nails on tree roots. The elevations of the surface of the water at the head and foot of each shoal, rapid, or fall were noted. These levels, with few exceptions, have been tied at both ends. In the case of Broad River primary levels were used instead of flying levels, and regulation bronze tablets left at intervals of 6 miles.

The horizontal control of the survey was by plane table oriented by compass, while the distance was always obtained by means of stadia measurements. To further insure the accuracy of the work, the stadia rod was so divided that one division on it equaled one division of the scale used in plotting.

The field sheets were plotted on the scale of 1 : 22,500, with the exception of the surveys of the Tallulah and Tugaloo rivers, which were on the scale of 1 : 45,000. Several different runs of river were plotted on the same plane-table sheet, the ends of the different sections being so marked that there would be no difficulty in joining them and making one continuous map.

On these sheets were shown the outlines of the river banks, the islands, the positions of rapids, shoals, falls, and existing dams, the

crossings of all ferries and roads, and as much of the culture of the river bottom as could be obtained without leaving the immediate neighborhood of the river. The river banks were contoured carefully and the adjacent river bottoms sketched, all with an interval of 10 feet. On these field sheets are marked in their proper positions the elevations of the various bench marks left, as are also the elevations of the water surfaces wherever obtained.

For each river surveyed, first are given a brief description, a list of the elevations, and a condensed profile of the portion of the river surveyed.

The elevations as given in the original notebooks have been adjusted in accordance with the various primary heights tied to, and the figures herein given are the ones obtained from this adjustment.

On file in the Washington office are the original topographic sheets and profiles on the scale of 1 inch to a mile horizontal and 1 inch to 100 feet vertical.

ACKNOWLEDGMENTS.

In the collection of these data and their preparation for publication special acknowledgment is due to the levelmen and others who carried on the surveys. Acknowledgment is due, also, to Messrs. B. M. Hall and M. R. Hall for suggestions, and to Messrs. C. B. Kendall and D. H. Baldwin, who adjusted the various lines of levels, under the supervision of Mr. S. S. Gannett, geographer.

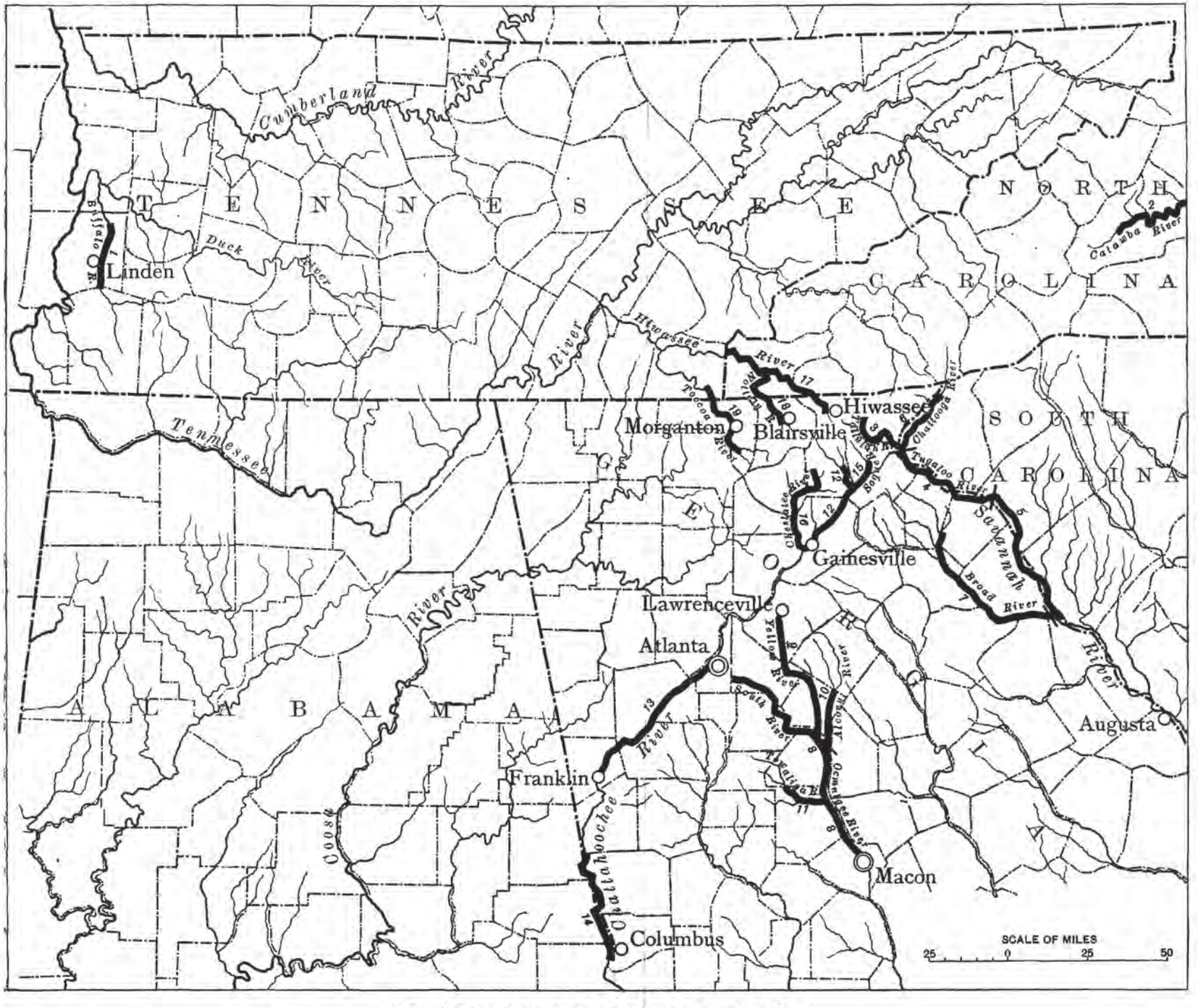
BUFFALO RIVER FROM FLATWOODS TO LOBELVILLE, TENN.

A line of flying levels was run on Buffalo River, Tennessee, from the mouth of Little Opossum Creek, near Flatwoods, to Standing Rock Ford, about 3 miles north of Lobelville—a distance of 47 miles. The plane-table survey was on the scale of 1: 22,500. During the course of the work 28 bench marks on tree roots were marked and 39 water-surface elevations were recorded.

The total fall of that stretch of the river is 109 feet, and is so evenly distributed that there seems to be no power site of any value. There are now two crude dams, one near Linden and the other near Lobelville, supplying power for small gristmills, but at neither place do the conditions warrant the construction of more substantial dams.

The soil near the river is fertile and well adapted to the cultivation of corn, hay, and peanuts.

The elevations in the following list are based upon an assumed elevation of 537.25 feet for the water surface at the mouth of Little Opossum Creek as interpolated from contours sketched on the Mannie sheet. The assumed elevation is probably within 20 feet of correct datum.



MAP SHOWING LOCATION OF SURVEYS IN THE SOUTHERN STATES.

The leveling was done October 4 to 31, 1903, under the direction of Oscar Jones, topographer, by Ralph Hutchins, levelman.

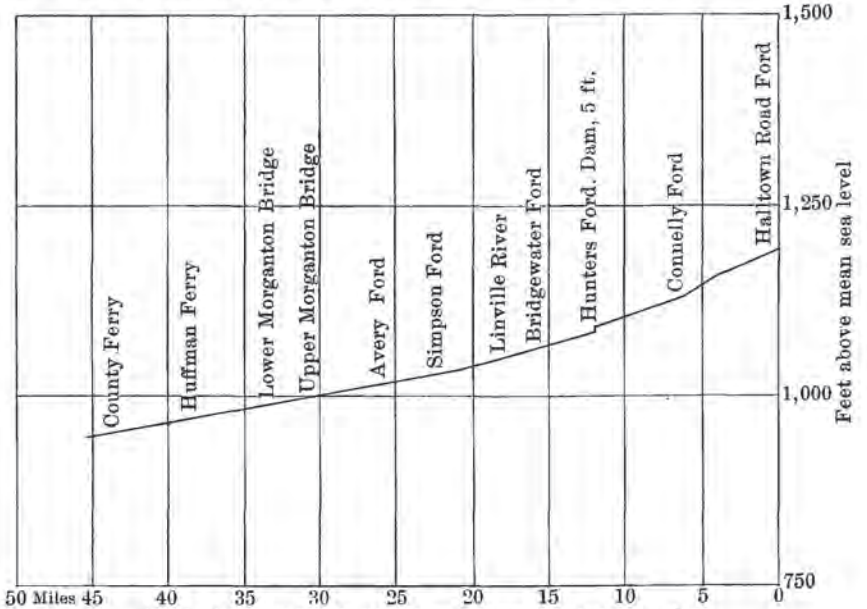


FIG. 1.—Profile of Buffalo River from Flatwoods to Lobelville, Tenn.

Elevations on Buffalo River, Tennessee, from Little Opossum Creek to Standing Rock Ford.

Distance in miles.		Elevation in feet.
0.0	Little Opossum Creek, mouth of; east side of river at ford, hackberry tree, nail in root of	537.25
.0	Surface of water	533
.3	East side of river at ford, nail in root of elm tree	532.26
.6	Ford, east side of, dead sycamore tree, nail in root of	531.59
1.0	Ford, 125 feet north of; east side of river, nail in root of sycamore tree	532.32
1.2	Surface of water	528
2.1	Ford, south side of river, nail in root of sycamore tree	529.06
2.2	600 feet north of ford, surface of water	525
4.1	Sinking Creek, east side of river, maple tree, nail in root of	524.90
4.1	Sinking Creek, mouth of, surface of water	520
6.3	Ford, 275 feet north of, north bank of river, east side of highway, at angle, nail in root of sycamore tree	521.16
6.2	Ford, 650 feet west of; surface of water	512
8.9	50 feet from river, south side of; sycamore tree, nail in root of	510.01
8.9	Surface of water	503
10.6	Ford, east bank of river, sycamore tree, nail in root of	500.70
10.8	Hurricane Creek, mouth of; surface of water	498
11.9	Hurricane Creek, 1.1 miles from; 50 feet east of ford, nail in root of beech tree	504.17

Elevations on Buffalo River, Tennessee, from Little Opossum Creek to Standing Rock Ford—Continued.

Distance in miles.		Elevation in feet.
11.9	Surface of water	494
13.2	At ford, east bank of river, nail in root of willow tree	489.53
13.2	Surface of water	487
15.2	At ford, south bank of river, nail in root of maple tree	484.23
15.2	Ford, 800 feet west of; surface of water	482
15.5	Ford, south bank of river, nail in root of sycamore tree	485.15
16.6	Ford, east bank of river, nail in root of sycamore tree	482.29
16.8	County bridge, west abutment, bolt in base of girder	499.45
17.3	Ford, east bank of, nail in root of sycamore tree	483.03
17.3	Surface of water	477
19.9	Coon Creek Ford, east bank of river, nail in base of willow tree	476.42
19.9	Ford, 350 feet north of, surface of water	471
21.3	Ford, 106 feet west of; west bank of river, nail in base of willow tree	470.04
21.3	Ford, surface of water	467
22.3	Ford, east bank of river, screw in base of sycamore tree	469.70
22.3	Ford, surface of water	465
22.6	Brush creek, east bank of river, nail in root of sycamore tree	467.29
22.6	Surface of water	465
23.7	Above dam, surface of water	464
23.7	Below dam, surface of water	459
24.2	Ford, west bank of river, top of large rock	459.32
24.2	Ford, 600 feet below, surface of water	457
26.1	Ford, west bank of river, top of large rock	454.16
26.1	Surface of water	452
26.6	Beardstown, east bank of river, at ford, nail in root of sycamore tree	454.24
26.6	650 feet below ford, surface of water	451
28.1	Ford, west bank of river, nail in root of sycamore tree	452.90
29.7	Ford, east bank of river, nail in root of hackberry tree	449.51
30.3	Ford, south bank of river, road, south side, nail in root of sycamore tree	445.47
30.3	Ford, 650 feet below, surface of water	441
31.9	Above dam, surface of water	441
31.9	Below dam, surface of water	435
31.9	Ford, south bank of river, road, west side, nail in root of sycamore tree	438.32
34.3	Ford, east bank of river, nail in base of sycamore sapling	434.02
34.3	Surface of water	431
35.4	Dodson Ford, east bank, top of rock	430.51
36.4	Hester Ford, surface of water	426.59
40.9	Logan Ford, south bank, west side of road, nail in base of willow tree	419.08
41.2	Standing Rock Ford, south bank, nail in root of maple tree	420.61

CATAWBA RIVER FROM MARION, N. C., TO CONNELLY SPRINGS, N. C.

Catawba River was surveyed from the Halltown road crossing, near Marion, N. C., down the river to the mouth of Johnsons Mill Creek, near Connelly Springs, N. C.—a distance of 45 miles. A line of flying levels was run in connection with the plane-table stadia traverse, which was on the scale of 1:22,500, based on a permanent bench mark of the United States Geological Survey at Marion, N. C. This flying line is connected with a precise line along the Southern Railway, run by the Geological Survey in 1896, at Bridgewater, Glen Alpine, Morganton, and Connelly Springs, at each of which points there is a permanent bench mark. There were only three temporary bench marks set along the river, but there were 160 water-surface elevations recorded, all of which were adjusted to the mean reading on the gage established at the upper bridge near Morganton. The work was done in July, August, and September, 1903, by R. C. Howard and S. A. Obenshain, under the direction of W. C. Hall, topographer.

In the stretch of river surveyed there is a total fall of 243 feet. At present there is only one crude dam—at John River Road Ford, where there is a fall of 4 feet, supplying power to operate Hunter's gristmill. There is a dam site near Connelly Ford. The combined fall of two shoals about half a mile apart is 12.3 feet and a long, rocky island in the lower part of the shoal would somewhat facilitate the construction of a dam. At this point the river is about 200 feet wide, with rocky cliffs on both banks. The river bottom is very fertile, the principal crops being corn and hay.

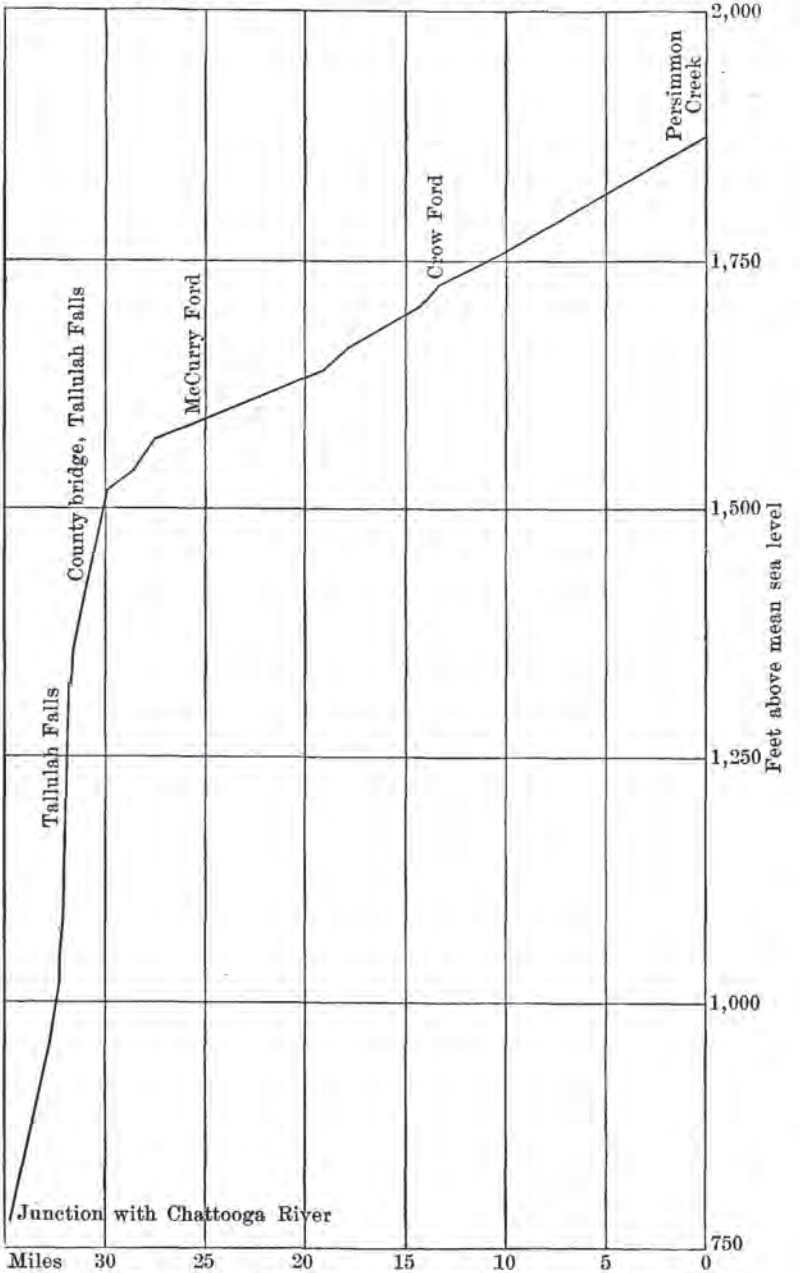
Elevations on Catawba River between Halltown Road and Connelly Springs, N. C.

Distance in miles.		Elevation in feet
0.0	Halltown Road Ford, head of island, head of shoals, surface of water	[a]1,189
.1	Foot of shoals, surface of water	1,187
.2	Head of shoals, surface of water	1,187
.2	Foot of shoals, surface of water	1,184
.5	Head of shoals, surface of water	1,184
.7	Foot of shoals, surface of water	1,179
1.1	Mouth of North Fork, 0.5 mile above, head of shoals, surface of water	1,179
1.1	Foot of shoals, surface of water	1,177
1.3	Head of shoals, surface of water	1,177
1.3	Foot of shoals, surface of water	1,175
1.7	Head of shoals, surface of water	1,174
1.8	Foot of shoals, surface of water	1,172
2.1	Head of shoals, surface of water	1,170
2.3	Foot of shoals, surface of water	1,167

[a] Adjusted to bench mark at Marion; McDowell County court-house; west face, at south end of portico, bronze tablet marked "1438"; elevation, 1,436.857 feet.

Elevations on Catawba River between Halltown Road and Connelly Springs, N. C.—Cont'd.

Distance in miles.		Elevation in feet.
2.4	Head of shoals, surface of water	1,166
3.2	Foot of shoals, surface of water	1,157
3.4	Head of shoals, surface of water	1,156
3.4	Foot of shoals, surface of water	1,154
4	Head of shoals, surface of water	1,153
4.2	North bank of island, foot of shoals, surface of water	1,146
4.4	Head of island, head of shoals, surface of water	1,146
4.4	Foot of island, foot of shoals, surface of water	1,141
4.7	Head of shoals, surface of water	1,140
4.7	Foot of shoals, surface of water	1,137
4.8	Head of shoals, surface of water	1,137
4.8	Foot of shoals, surface of water	1,134
5.1	Head of shoals, surface of water	1,134
5.1	Foot of shoals, surface of water	1,133
5.3	Head of shoals, surface of water	1,133
5.3	Foot of shoals, surface of water	1,131
5.4	Head of shoals, surface of water	1,131
5.4	Foot of shoals, surface of water	1,130
5.7	Connelly Ford, head of shoals, surface of water	1,130
5.8	Foot of shoals, surface of water	1,127
6	Head of shoals, surface of water	1,126
6	Foot of shoals, surface of water	1,126
6.1	Head of shoals, surface of water	1,125
6.1	Small island in shoals, foot of shoals, surface of water	1,124
6.6	Between large islands, head of shoals, surface of water	1,124
6.7	Foot of islands, foot of shoals, surface of water	1,122
6.9	At head of broad flood channel, head of shoals, surface of water	1,122
7	Foot of shoals, surface of water	1,119
7.3	At foot of broad channel, head of shoals, surface of water	1,119
7.3	Foot of shoals, surface of water	1,116
7.5	Head of shoals, surface of water	1,116
7.5	Foot of shoals, surface of water	1,115
7.8	Head of shoals, surface of water	1,115
7.8	Foot of shoals, surface of water	1,114
8.2	Head of shoals, surface of water	1,113
8.5	Foot of shoals, surface of water	1,108
8.5	Head of shoals, surface of water	1,108
8.7	Foot of shoals, surface of water	1,105
9.2	John River Road, head of shoals, surface of water	1,103
9.2	Foot of shoals, surface of water	1,102
9.8	Just below ford, head of shoals, surface of water	1,101
9.8	Foot of shoals, surface of water	1,099



PROFILE OF CATAWBA RIVER FROM MARION TO CONNELLY SPRINGS, N. C.

Elevations on Catawba River between Halltown Road and Connelly Springs, N. C.—Cont'd.

Distance in miles.		Elevation in feet.
10	Head of island, head of shoals, surface of water	1,099
10.2	Foot of shoals, surface of water	1,094
10.8	Head of shoals at head of island, surface of water	1,094
10.9	Foot of island, foot of shoals, surface of water	1,092
11.1	Head of shoals, surface of water	1,092
11.1	Foot of shoals, surface of water	1,089
11.6	Just above dam, surface of water	1,089
11.6	Below ford, foot of shoals, surface of water	1,084
12	Head of shoals, surface of water	1,083
12	Foot of shoals, surface of water	1,079
12.4	Head of shoals, surface of water	1,079
12.4	Foot of shoals, surface of water	1,079
13	Head of shoals, surface of water	1,078
13.1	Foot of shoals, surface of water	1,075
13.3	Head of shoals, surface of water	1,075
13.3	Foot of shoals, surface of water	1,074
13.5	Below head of island, head of shoals, surface of water	1,074
13.7	Foot of two islands, foot of shoals, surface of water	1,070
13.9	Head of shoals, surface of water	1,070
13.9	Foot of shoals, surface of water	1,070
14.4	Head of shoals, surface of water	1,069
14.4	Foot of shoals, surface of water	1,069
14.5	Bridgewater, in front of station, top of north rail	[a]1,095.7
14.5	Head of shoals, surface of water	1,068
14.6	Foot of shoals, surface of water	1,068
15	Head of shoals, surface of water	1,067
15	Foot of shoals, surface of water	1,066
15.1	Just above head of shoals, surface of water	1,066
15.2	Head of shoals, surface of water	1,065
15.2	Foot of shoals, surface of water	1,062
15.4	Head of shoals, surface of water	1,062
15.5	Foot of shoals, surface of water	1,062
15.8	Head of shoals, surface of water	1,061
15.9	Foot of shoals, surface of water	1,061
16.4	Head of shoals, surface of water	1,058
16.8	Foot of shoals, surface of water	1,056
17	Head of shoals, surface of water	1,054
17.2	Foot of shoals, surface of water	1,054
18	Just above head of upper island, head of shoals, surface of water	1,051
18.1	Between island and south bank of river, foot of shoals, surface of water	1,049

[a] Bridgewater, 0.4 mile east of; bridge seat at west end of Muddy Creek Bridge, 2.75 feet south of south rail, copper bolt marked "U. S. G. S., 1091;" elevation, 1,089.549 feet.

Elevations on Catawba River between Halltown Road and Connelly Springs, N. C.—Cont'd.

Distance in miles.		Elevation in feet.
18.2	Mouth of Linville River, below ford, at head of island and south bank, head of shoals, surface of water	1,048
18.4	Between island and south bank, foot of shoals, surface of water	1,046
18.7	Head of small island, head of shoals, surface of water	1,045
18.7	Center of island, foot of shoals, surface of water	1,045
18.9	Head of two small islands, head of shoals, surface of water	1,045
19.1	Foot of shoals, surface of water	1,040
19.6	Long narrow island along north bank, head of short shoal, surface of water	1,039
19.8	Head of shoals, surface of water	1,038
19.8	Foot of shoals, surface of water	1,037
20.1	Above ford, head of shoals, surface of water	1,036
20.3	Head of shoals, surface of water	1,035
20.4	Foot of shoals, surface of water	1,033
20.9	Head of shoals, surface of water	1,032
20.9	Foot of shoals, surface of water	1,031
21.3	Head of shoals, surface of water	1,031
21.3	Foot of shoals, surface of water	1,030
21.5	Head of shoals, surface of water	1,030
21.7	Head of large island, head of shoals, surface of water	1,030
22	250 feet below foot of large island, foot of shoals, surface of water	1,026
22.4	Ford, head of shoals, surface of water	1,026
22.5	Foot of shoals, surface of water	1,025
23.4	Head of shoals, surface of water	1,024
23.7	Head of shoals, surface of water	1,023
23.7	Foot of shoals, surface of water	1,022
24	Head of shoals, surface of water	1,022
24.3	Foot of shoals, surface of water	1,016
25	Avery Ford, 50 feet above, head of shoals, surface of water	[a] 1,015
25	Foot of shoals, surface of water	1,013
25.4	Head of shoals, surface of water	1,013
25.4	Foot of shoals, surface of water	1,012
26.6	Between long island and north bank of river, head of shoals, surface of water	1,009
26.6	Foot of shoals, surface of water	1,007
27.2	Surface of water	1,006
28.1	Head of shoals, surface of water	1,004
28.2	Head of long narrow island, foot of shoals, surface of water	1,003
29	Greenlea Ford, head of shoals, surface of water	1,001
29.1	Foot of shoals, surface of water	1,001

[a] Circuit from White Ford to Avery Ford is adjusted to Glen Alpine, 73.2 feet north of north rail of main track, southeast corner of brick basement of Hennessee & Co.'s store, bronze tablet marked "1215;" elevation, 1,213.944 feet.

Elevations on Catawba River between Halltown Road and Connelly Springs, N. C.—Cont'd.

Distance in miles.		Elevation in feet.
29.4	Between island and mouth, head of shoals, surface of water	1,000
29.6	Foot of island, foot of shoals	998
29.9	Head of shoals, surface of water	998
29.9	Foot of shoals, surface of water	997
30.2	Upper Morganton Bridge, head of shoals under, surface of water	[a] 996
31.7	Fleming Ford, head of islands at, head of shoals, surface of water	992
32	Foot of shoals, surface of water	988
33	Lower Morganton Bridge, under, surface of water	986
33.5	Head of shoals, surface of water	986
34.2	Foot of shoals, surface of water	977
34.4	Head of shoals, surface of water	976
34.8	Below island at mouth of creek on south bank, foot of shoals, surface of water	974
35.5	Mouth of John River, surface of water	972
37.1	Head of shoals, surface of water	969
37.9	Foot of shoals, surface of water	963
38.5	Huffman Ferry, north bank, west side of road, nail in post	974.2
	Huffman Ferry, at east corner of Huffman's house, nail in root of tree at	1,011.75
38.5	Surface of water	961
38.7	Head of shoals, surface of water	959
40.7	At mouth of creek on south, head of shoals, surface of water	957
40.7	Foot of shoals, surface of water	956
41.2	Head of large island, head of shoals, surface of water	955
41.2	Between island and north bank of river, foot of shoals, surface of water	955
41.4	Foot of island, head of shoals, surface of water	955
41.4	Foot of shoals, surface of water	955
41.6	Lovelady Ford, at head of small island between large island and south bank, head of shoals, surface of water	954
41.8	Lovelady Ford, north bank of river, surface of water	953
41.9	Foot of large island at foot of shoals, surface of water	951
43.6	County Ferry, 200 feet south of; west side of road, nail in box alder	968.8
43.6	Surface of water	948
43.8	Head of shoals, surface of water	947
43.8	Foot of shoals, surface of water	947
44.5	Head of shoals, surface of water	947
44.5	Foot of shoals, surface of water	[b] 946

[a] Upper Morganton Bridge line adjusted to Morganton, Burke County court-house, extreme northwest corner of north portico, bronze tablet marked "1182;" elevation, 1,180.774 feet.

[b] Connelly Springs, 142.4 feet north of north rail of main track, James Hudson's brick store, south front, near east corner, bronze tablet marked "1193;" elevation, 1,191.762 feet.

Johnson Mill Creek flows into Catawba 1.6 miles below County Ferry, south side of river.

NOTE.—Water-surface elevations adjusted to mean gage reading 1.8 feet at Upper Morganton Bridge Elevation of 1.8-footmark, 996.3 feet.

TALLULAH RIVER BELOW BLALOCK, GA.

Tallulah River rises in Habersham and Rabun counties, Ga., flows in a southeasterly direction, and joins Chattooga River a little below Tallulah Falls, thus forming Tugaloo River. During August, 1903, this river was surveyed between Tallulah Falls, Ga., and the mouth of Persimmon Creek, near Blalock, Ga. The distance between these points is about 33 miles, and there is a fall of 451 feet. The survey consisted of a line of primary levels based upon the United States Geological Survey bench mark at Tallulah Falls, and a plane-table survey of the course of the river. The field sheets were plotted on a scale of 1:22,500, 30 bench marks were established, and 69 water-surface elevations obtained.

Tallulah River is a typical mountain stream and is subject to sudden freshets. As the Chattooga is of the same character the Tugaloo is a dangerous stream, a rise of 1.6 feet per hour for three consecutive hours being recorded on March 23, 1903, at the Southern Railway bridge near Toccoa, Ga. On this occasion the river rose 15.2 feet in eighteen hours.

Tallulah River crosses the fall line at Tallulah Falls, Ga. In this vicinity is some of the most picturesque and rugged scenery in the Southern States. In 3 miles the river drops from 1,415 to 755 feet above sea level, or a distance of 660 feet. The principal falls, in the order in which they occur, are L'eau D'or, 28 feet; Tempesta, 76 feet; Hurricane, 89 feet; Oceana, 41 feet; Bridal Veil, 17 feet—all in a distance less than three-fourths of a mile. On either bank are precipitous cliffs, rising in some places 500 feet sheer. The gorge continues to the Tugaloo, with the exception of one place about one-half mile long, where it opens up and forms what is known as the Old Valley farm. On either side the country is covered with woods, but not a great deal of merchantable timber appears to be available.

In 2 miles, above Tallulah Falls, the river has a fall of 110 feet. At the head of this fall the bottom widens into a valley which appears to be an excellent basin for storing water. Three and one-fourth miles farther upstream at an unnamed shoal with a 12-foot fall, there is a fair site for a dam. The bottom is rocky, and there are steep hills on either side.

Five miles farther upstream is a shoal with a 25-foot fall, steep hills on either side, and hard rock bottom. Just above Denton Ford is a 23-foot shoal about three-fourths of a mile long where there is a splendid site for a dam.

The fall in the lower Tallulah below the falls is about 250 feet. A large portion of this fall can be used for power without interfering with the resort at Tallulah Falls. By installing an electrical plant at the upper end of Old Valley farm a good power could be obtained.

The elevations in the following list are based upon the elevation of a bronze tablet in rock 70 feet east of the public road and 20 feet south of Tallulah Falls, station marked "1569 Atlanta." This elevation is accepted as 1,568.302 feet above mean sea level in accord with the 1903 adjustment of the precise-level net. The line is corrected to accord with primary work at mouth of river and at Burton.

The leveling was done in 1903, under the direction of Carroll Caldwell, field assistant, by T. B. O'Hagan, levelman.

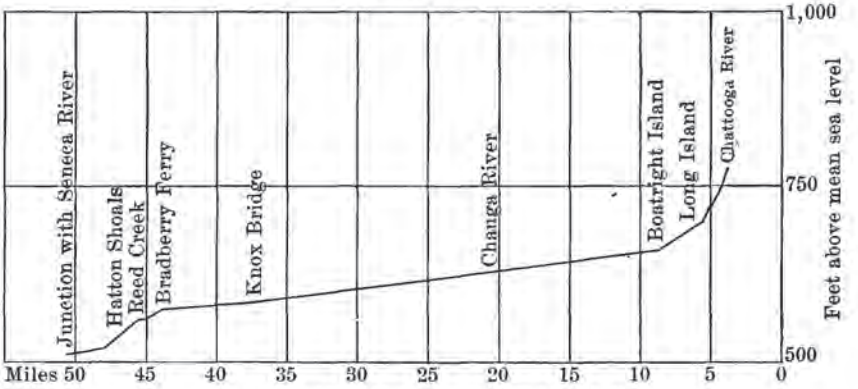


FIG. 2.—Profile of Tallulah River below Blalock, Ga.

Elevations on Tallulah River from mouth, near Tallulah Falls, to near Blalock, Ga.

Distance.		Elevation in feet
0.0	Junction of Chattooga and Tallulah rivers, surface of water	754
.0	100 feet north of junction rivers, edge of river, point on rock	761.29
.0	200 feet north of junction rivers, west side of Tugaloo River, gum tree, nail in root of	762.65
.2	Chattooga River, 500 feet north of, west side of Tallulah River, nail in root of oak stump	769.46
.3	Surface of water	767
.4	Mouth of small stream, surface of water	782
.6	150 feet west of river	799.86
.9	Surface of water	818
1.3	Surface of water	848
1.6	Surface of water	878
1.7	Surface of water	893
1.8	Surface of water	911
2	Foot of rapids, surface of water	935
2.1	Middle of rapids, surface of water	944
2.2	Head of rapids, surface of water	947
2.2	Foot of rapids, surface of water	954
2.25	Surface of water	964

Elevations on Tallulah River from mouth, near Tallulah Falls, to near Blalock, Ga.—Cont'd.

Distance in miles.		Elevation in feet.
2.3	Foot of small falls, surface of water	981
2.35	Foot of rapids, surface of water	987
2.38	300 feet below bend, head of rapids, surface of water	980
2.4	Surface of water	997
2.5	Surface of water	1,008
2.6	Bridal Veil Falls, foot of, surface of water	1,022
2.6	Head of falls, surface of water	1,039
2.65	Surface of water	1,057
2.8	Oceana Falls, foot of, surface of water	1,074
2.85	Head of falls, surface of water	1,115
3.1	Hurricane Falls, foot of, surface of water	1,140
3.1	Head of Hurricane Falls, surface of water	1,229
	Tempesta Falls, foot of, surface of water	1,246
3.1	Tempesta Falls, head of, surface of water	1,322
3.2	L'eau d'or Falls, foot of, surface of water	1,322
3.2	L'eau d'or Falls, head of, surface of water	1,350
3.3	Surface of water	1,379
3.4	Surface of water	1,396
3.6	Clayton Road iron highway bridge, surface of water	1,414
	Tallulah Falls station, 70 feet east of public road, 20 feet south of station, in rock, bronze tablet marked "1569 Atlanta"	1,568.302
3.6	Tallulah Falls, 0.5 mile northeast of; at forks of road, 50 feet south of bridge over river	1,457.92
3.6	Clayton Road iron highway bridge, 0.5 mile north of Tallulah Falls, floor of	1,441.87
	Surface of water	1,419
	Opposite stone pier railroad bridge, surface of water	1,439
	Surface of water	1,449
	On rock, surface of water	1,459
4.9	Foot of falls, surface of water	1,486
4.9	Top of falls, surface of water	1,492
5.1	Surface of water	1,509
5.5	Head of island, surface of water	1,530
5.6	20 feet west of Tallulah Falls Railroad, point on top of rock	1,538.21
5.6	Surface of water	1,529
6	Surface of water	1,538
6.5	Surface of water	1,553
6.6	Surface of water	1,559
7.3	150 feet east of river, in cornfield, dead apple tree, nail in root of	1,579.23
7.3	Surface of water	1,569
8.4	Surface of water	1,573

Elevations on Tallulah River from mouth, near Tallulah Falls, to near Blalock, Ga.—Cont'd.

Distance in miles.		Elevation in feet.
8.6	Surface of water	1,578
8.7	65 feet north of river, in cornfield, walnut tree, nail in root of	1,589.25
8.7	Surface of water	1,578
9.6	Tiger Creek, on point of land between river and creek, burnt poplar tree, nail in side of	1,590.30
9.6	Surface of water	1,584
9.9	Surface of water	1,589
10	5 feet west of river, in footpath, point on sharp rock	1,595.59
10.2	Surface of water	1,592
10.4	Surface of water	1,596
10.5	10 feet west of river, nail in root of beech tree	1,601.32
10.6	Surface of water	1,600
10.9	Surface of water	1,603
11.8	Crane Ford, 150 feet west of, apple tree, nail in root of	1,620.33
11.8	Surface of water	1,607
12.1	Surface of water	1,610
13.3	Dockens Ford, 12 feet west of river, nail in side of dead tree	1,623.06
13.3	Surface of water	1,615
13.8	Ellord Ford, 150 feet east of, at bend of, poplar tree, nail in side of	1,634.36
13.8	Surface of water	1,621
14.4	Surface of water	1,626
14.5	Surface of water	1,628
14.6	Eden Church, 150 feet west of, 150 feet east of river, nail in root of large red-oak tree	1,649.41
15.6	Taylor Shoals, 10 feet west of river, middle of, point on large flat rock	1,644.90
15.6	Surface of water	1,641
16.2	Surface of water	1,648
16.5	Surface of water	1,657
16.6	Surface of water	1,657
17.7	James Smith boat landing, 2 feet west of river, nail in stump	1,670.53
18.4	Fall Creek, mouth of, surface of water	1,669
18.6	Jones Ford, 6 feet south of river, slanting persimmon tree, nail in side of	1,677.33
18.6	Surface of water	1,674.6
19.2	Flat Creek, mouth of, surface of water	1,681
20.6	Surface of water	1,687
20.9	Cliff Creek, mouth of, surface of water	1,690
21.4	Surface of water	1,697
21.5	Denton Ford, 10 feet west of river, nail in root of pine tree	1,703.61
21.5	Surface of water	1,701
21.8	Mouth of small stream, surface of water	1,703
21.9	Seal Creek, mouth of, foot of double shoals, surface of water	1,704

Elevations on Tallulah River from mouth, near Tallulah Falls, to near Blalock, Ga.—Cont'd.

Distance in miles.		Elevation in feet.
22	Surface of water	1,707
22.3	Middle of shoals, surface of water	1,714
22.6	Crow Ford, 100 feet south of, 10 feet south of river, twin hemlock tree, nail in root of	1,725.93
22.6	Surface of water	1,724
22.7	Scarecrow Creek, mouth of, surface of water	1,727
24	George Creek, mouth of, surface of water	1,737
24.5	Bridge Creek, mouth of, surface of water	1,738
25	In shoals, surface of water	1,747
25.1	—— Ford, surface of water	1,749
25.1	At above ford, south edge of river, point on rock	1,750.29
25.6	Rocky Ford, 10 feet south of, dead hemlock tree, nail in root of	1,758.47
25.6	Surface of water	1,756
25.9	Surface of water	1,757
26.2	Kenny Creek, mouth of, surface of water	1,760
26.3	Fuller Ford, surface of water	1,760
26.4	Fuller Ford, 500 feet northwest of, point on rock	1,762.62
27	Surface of water	1,767
27.3	Cannon Ford, 75 feet southwest of, nail in root of white oak	1,781.97
27.3	Surface of water	1,769
28.2	—— Ford, west side of, nail in root of red gum tree	1,777.87
28.2	Surface of water	1,774
28.5	Wildcat Creek, 50 feet southwest of, west side of road, point on rock	1,783.19
28.5	Surface of water	1,776
29.3	Surface of water	1,785
29.5	Surface of water	1,787
29.6	Dicks Creek, surface of water	1,789
30.1	Burton, 12 feet southwest of bridge, nail in root of maple tree	1,794.96
30.1	Floor of bridge	1,806.4
30.1	Surface of water	1,790
30.1	High-water mark	1,804
30.2	Burton, 1,000 feet above bridge, 15 feet east of river, 10 feet west of road, bronze tablet marked "——"	1,795.140
32.1	12 feet west of ford, nail in side of ash tree	1,819.04
32.1	Surface of water	1,813
32.4	Surface of water	1,819
32.7	Murford, 100 feet southwest of, nail in west side of white-oak tree	1,838.05
32.7	Surface of water	1,824
33	Rocky Ford, surface of water	1,829
33.1	Shallow Ford, 500 feet southeast of, in road, point on rock	1,841.48
33.2	Surface of water	1,835.

Elevations on Tallulah River from mouth, near Tallulah Falls, to near Blalock, Ga.—Cont'd.

Distance in miles.		Elevation in feet.
33.6	Deep Ford, 30 feet south of, nail in side of sycamore tree	1,842.39
33.6	Surface of water	1,839
34.3	Popcorn Creek, mouth of, surface of water	1,849
35	Deep Ford, 3 feet east of, nail in side of beech tree	1,862.03
35.8	Persimmon Creek, 75 feet east of river, 30 feet south of creek, nail in side of hickory tree	1,881.67

TUGALOO RIVER BELOW TALLULAH FALLS, GA.

Tugaloo River, which flows in a southeasterly direction between Georgia and South Carolina, is a continuation of Savannah River, and extends from the mouth of Seneca River to the mouth of Chattooga River. The bed of the stream is in Georgia. The survey of this river covered a distance of 50½ miles. It connected with the survey of Savannah River at Andersonville, and extended past the mouth of the Chattooga along the Tallulah as far as Tallulah Falls. The primary levels were based upon the United States Geological Survey bench mark at Parkesville, Ga. Nine bench-mark tablets and 64 temporary bench marks were established, and 98 water-surface elevations were obtained. The plane-table sheets were plotted on a scale of 1:22,500 for that portion of the survey above the mouth of the Chattooga; from that point to Owens Shoals the scale was 1:45,000; between Owens Shoals and Andersonville it was 1:22,500.

From the head of the Tugaloo to a point about one mile above the mouth of Panther Creek the banks are very steep, but are not so marked as along the Tallulah, except in some places where there is a cliff on one side. Below the point above mentioned the bottom is from one-fourth to three-fourths mile wide in most places, the soil being very fertile and in a high state of cultivation. Cotton is the main crop, with corn next, wheat, rye, sugar cane, etc., combined making but a small percentage of the yield. The timber is very scattered.

The elevations in the following list are based on an aluminum tablet marked "1050 M. C." at Washington street entrance to the State capitol at Atlanta, the elevation of which is now accepted as 1,049.546 feet above mean sea level. The initial point upon which these levels depend is a bronze tablet at north side of east entrance at court-house at Clarksville, Ga., marked "1373 Atlanta," the elevation of which is accepted as 1,371.991 feet above mean sea level, in accord with the 1903 adjustment of the precise-level net.

The leveling was done in 1903 under the direction of Carroll Caldwell, field assistant, by T. B. O'Hagan, levelman.

All permanent bench marks are marked with the letters "Atlanta" in addition to the figures of elevation.

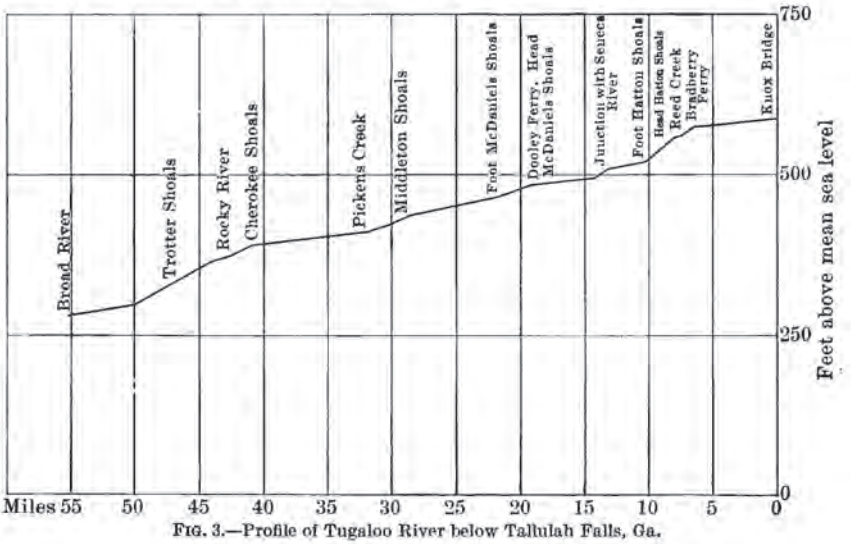


FIG. 3.—Profile of Tugaloo River below Tallulah Falls, Ga.

Elevations from Clarksville, via Turnerville, to Tallulah Falls, Ga.

	Elevation in feet
Clarksville, Habersham County court-house, north side of east entrance, bronze tablet marked "1373 Atlanta"	1,371.991
Clarksville, 0.7 mile southeast of, west side of road, nail in root of oak tree	1,436.353
Clarksville, 2 miles east of, south of track, nail in root of old stump	1,444
Clarksville, 1.5 miles east of station, dogwood tree, nail in root of	1,457.576
Clarksville, 2.5 miles east of, at railroad crossing, south of track, oak tree, nail in root of	1,419.40
Clarksville, 4.5 miles east of, oak stump, nail in root of	1,440.16
Clarksville, 6 miles east of, nail in root of oak tree	1,513.52
Clarksville, 7.5 miles east of, nail in root of oak tree	1,475.66
Turnerville station, 30 feet north of, nail in root of cottonwood tree	1,542.98
Turnerville, 1.9 miles northeast of, south of track, nail in root of oak tree	1,590.48
Turnerville, 3.2 miles northeast of station, nail in stump of gum tree	1,588.65
Turnerville, 4 miles northeast of, at road crossing east of track, nail in root of persimmon tree	1,612.33
Tallulah Lodge, 40 feet east of track, nail in side of hickory tree	1,605.84
Tallulah Falls station, 20 feet south of, 70 feet east of public road, rock, bronze tablet marked "1569 Atlanta"	1,568.302
Tallulah Falls, 0.5 mile north of east of, at forks of road, 50 feet south of bridge over river	1,457.92

Elevation from point 2 miles south of Tallulah Falls south down Tugaloo and Savannah rivers to mouth of Broad River, Lisbon, Ga.

	Elevation in feet.
Turnerville, 3.2 miles east of station, nail in stump of gum tree	1,588.65
Turnerville, 4.3 miles east of, nail in root of oak tree	1,504.20
Turnerville, 4.4 miles east of, nail in root of pine tree	1,386.10
Turnerville, 5.1 miles east of, south of road, point on rock	979.72

Elevations on Tugaloo River below Tallulah Falls.

Distance in miles.		Elevation in feet.
0.0	Junction of Tallulah and Chattooga rivers, 200 feet northwest of, gum tree, west side of Tallulah River, nail in root of gum tree	762.65
.0	Junction of rivers, 100 feet northwest of; edge of river, point on rock	761.29
.0	Junction of Tallulah and Chattooga rivers, water surface	754
.0	Tugaloo River, head of, pine tree, nail in root of	728.86
.7	Island, head of, surface of water	723
.8	Surface of water	711
2	Surface of water	698
2	West side of river, point on rock	698.79
2.1	Surface of water	690
2.4	Surface of water	686
2.8	Hickory tree, nail in root of	690.51
2.8	Surface of water	684
2.9	Surface of water	681
3.1	Small stream, mouth of, surface of water	674
4.4	Panther Creek, mouth of, surface of water	669
4.4	Panther Creek, 600 feet south of mouth and 50 feet west of river, west edge of public road, in large rock, bronze tablet marked "715 Atlanta"	713.793
5.3	Surface of water	667
5.4	Deaton Ford, surface of water	666
5.4	Small bridge, surface of water	664
5.4	Walnut tree, nail in root of	676.45
6.3	Surface of water	659
6.4	Small creek, South Carolina side, mouth of, surface of water	655
7.4	Walnut tree, 100 feet west of river, nail in root of	664.87
7.5	Small boat landing, surface of water	652
8	Big John Creek, mouth of, surface of water	650
8.9	Prather's bridge, 100 feet northwest of river and old bridge, cottonwood tree, nail in side of	659.02
8.9	Surface of water	648
9.9	James Prather homestead, middle step front entrance, bronze tablet marked "728 Atlanta"	726.873

Elevations on Tugaloo River below Tallulah Falls—Continued.

Distance in miles.		Elevation in feet.
10.5	Stream, mouth of, surface of water	646
11.5	Surface of water	644
11.5	Apple tree, 600 feet west of river, nail in root of	657.40
13	Stream, mouth of, surface of water	642
13	Gum tree, 10 feet west of river, nail in root of	658.51
13.8	Gum tree, west edge of river, nail in root of	651.33
13.8	Toccoa Creek, mouth of, surface of water	641
13.9	Jarrett Bridge, surface of water (during flood Mar. 21, 1903)	642.5
15.4	Water oak tree, 4 feet east of river, nail in root of	642.50
15.4	Walnut tree, 50 feet west of railroad bridge, nail in root of	660.52
15.4	Railroad bridge crossing Tugaloo River, west abutment, bronze tablet marked "666 Atlanta"	665.467
15.4	Stream, mouth of, surface of water	640
16.4	Stream, mouth of, surface of water	639
16.5	Sycamore tree, 50 feet south of river, nail in root of	641.09
16.5	Stream, mouth of, surface of water	637
17.5	50 feet east of river, birch tree, nail in root of	646.91
18	Surface of water	636
18	200 feet east of county road, 100 feet west of river, walnut tree, nail in root of	648.60
19	Saw mill, mouth of stream opposite, surface of water	632
19.1	Walnut tree, nail in root of	647.65
20.1	Stream, mouth of, surface of water	630
21.3	Swamp bush, 3 feet northwest of river, nail in top of	634.60
21.7	Rock Creek, 10 feet south of, walnut tree, nail in root of	640.35
21.7	Surface of water	624
22	Jenkins Ferry, 400 feet northwest of, 200 feet west of river, walnut tree, nail in root of	638.10
22	W. J. Perkins homestead, north side of house, in chimney, 2 feet above ground, bronze tablet marked "732 Atlanta"	[a] 730.754
22	Surface of water	624
22	High water	638
22.3	Stream, mouth of, surface of water	622
22.4	Walnut tree, nail in stump	635.56
22.6	Walnut tree, 40 feet west of river, nail in root of	634.32
23.2	Birch tree, on edge of small stream, nail in root of	629.55
24.5	Surface of water	618
24.5	Small tree, 4 feet west of river, nail in root of	619.47
25.1	Surface of water	616
25.5	Pine tree, 50 feet west of river, nail in root of	625.12
25.7	Surface of water	614

[a] The above is on a single spur line.

Elevations on Tugaloo River below Tallulah Falls—Continued.

Distance in miles.		Elevation in feet.
26.1	Old stump, 41 feet west of river, nail in	615.42
26.3	Head of Shelor Shoals, surface of water	610
27.6	Walnut tree, 10 feet north of river, nail in root of	614.54
27.6	Surface of water	607
27.9	Surface of water	605
28.1	Large creek, mouth of, surface of water	604
29.1	Pine tree, 5 feet northeast of river, nail in top of	623.27
29.3	Shelor Ferry, water oak tree, 10 feet northeast of river, nail in root of	606.46
29.3	Surface of water	600
29.3	Shelor Ferry, 0.3 mile southwest of; 100 feet northwest of I. E. Martin's house, 10 feet north of road, in large rock, bronze tablet marked "630 Atlanta"	628.875
30.1	Stream, mouth of, surface of water	599
30.3	Sycamore tree, 10 feet north of river, nail in root of	601.17
30.3	Mouth of stream, near bend in river, surface of water	597
30.4	Water oak stump, 10 feet north of river, nail in root of	598.10
30.4	Surface of water	595
31.8	Gum Log Creek, mouth of, surface of water	592
32.3	Near Middle Branch, apple tree, nail in root of	597.79
32.4	Surface of water	590
33.1	Surface of water	588
33.6	Knox Bridge, 100 feet west of, in fork of road, maple tree, nail in root of	602.73
33.6	Knox Bridge, 200 feet west of S. A. Glenn's house, in chimney, bronze tablet marked "613 Atlanta"	612.241
33.6	Surface of water	588
34.3	Surface of water	587
34.3	25 feet northwest of Shoal Creek, dead stump, nail in top of	598.34
35.3	Shoal Creek, mouth of, surface of water	586
35.3	Pine stump, 200 feet north of river, nail in top of	601.72
35.4	Knox Branch, mouth of, surface of water	586
36.1	Oak tree, 900 feet north of river, nail in root of	591.83
36.5	Burton Branch, mouth of, surface of water	582
37.5	South side of river, point on bottom of cliff	588.07
37.8	Pullins Ferry, 250 feet south of, 10 feet north of road, red oak tree, nail in root of	596.59
37.8	Pullins Ferry, surface of water	581
38.4	Cleveland Shoals, head of, surface of water	578
39.6	Averys Ferry, sycamore tree 10 feet north of river, nail in root of	584.36
39.6	Foot of shoals, surface of water	578
39.8	Bottom of cliff, 2 feet south of river, point on rock	581.95

Elevations on Tugaloo River below Tallulah Falls—Continued.

Distance in miles.		Elevation in feet.
39.8	Averys Ferry, 20 feet south of river, top of cliff, in rock, bronze tablet marked "588 Atlanta"	587.443
40.3	Bradberrys Ferry, walnut tree 100 feet south of river, nail in root of	581.95
40.3	Chandlers Shoals, head of, surface of water	575
40.7	Bottom of cliff, 1 foot south of river, point on rock	577.26
40.8	Beech tree, 1 foot south of river, nail in root of	572.24
40.8	Surface of water	570
40.9	Reed Creek, mouth of, surface of water	564
41.1	Foot of Chandlers Shoals, surface of water	562
41.4	Reed Creek, 900 feet east of 10 feet south of river, nail in stump	566.95
41.7	Boat landing, birch tree, nail in root of	563.72
42.3	Hatton Shoals, head of, surface of water	560
42.8	North edge of river, F. Clark's house, 1,000 feet south of, nail in root of maple tree	556.79
42.8	Surface of water	555
43.3	Big Beaverdam Creek, 25 feet east of, nail in root of beech tree	554.01
43.3	Surface of water	546
43.7	Large pine tree, 25 feet east of small stream, 5 feet north of river, nail in root of	537.07
43.7	Surface of water	535
44.2	Hatton Ford, bottom of cliff, point on rock	526.91
44.2	Surface of water	525
44.5	Mouth of branch, surface of water	522
44.7	Mouth of branch, surface of water	519
45.3	Water oak tree, 30 feet northeast of river, nail in root of	529.36
46.3	Beech tree, 15 feet east of river, nail in root of	525.17
46.3	Surface of water	519
46.6	Burnt stump, 40 feet east of river, nail in top of	524.70
46.6	Surface of water	518
47.7	Andersonville, S. C., 0.5 mile north of, twin beech tree 15 feet north of river, nail in root of	522.27
47.8	Mouth of branch, surface of water	516
48.2	Foot of rapids, surface of water	511
48.2	Andersonville, S. C., east side of road, 200 feet east of river, northwest of Little Broadway Creek, in rock, bronze tablet marked "538 Atlanta"	537.519
48.2	"Brouris" Ferry, surface of water	510
48.2	20 feet west of river, point on rock	514.45

SAVANNAH RIVER FROM ANDERSONVILLE, S. C., TO LISBON, GA.

Savannah River, which flows between Georgia and South Carolina, is formed by the junction of Seneca and Tugaloo rivers at Andersonville, Anderson County, S. C. Tugaloo River is in turn formed by the junction of Tallulah and Chattooga rivers at a point about 3 miles below Tallulah Falls, Georgia.

Savannah River proper flows in a southeasterly direction through a rather hilly country, which is chiefly devoted to the production of cotton and corn. On the lowlands these crops are sometimes damaged by high water. The river contains many small islands, some of which are in a high state of cultivation.

During April and May, 1903, a survey of Savannah River between Andersonville, S. C., and the mouth of Broad River, near Lisbon, Ga., a distance of 42 miles, was made by Carroll Caldwell, field assistant. In the above distance there is a fall of 219 feet. The primary levels for this survey were based on the United States Geological Survey bench mark at Andersonville, S. C. Field sheets were plotted on the scale of 1:22,500, and during the course of the survey 7 tablets and 62 temporary bench marks were established, 91 water-surface elevations determined, and the following possible powers noted.

The first shoal of importance is the McDaniels Shoal, where there is a fall of 19 feet in 2½ miles. Half a mile above the foot of the shoal and at the head of Harper Island is an excellent site for a dam about 700 feet long.

At Turners Shoals there is a fall of 17 feet in about 2½ miles. These shoals begin at Kenly Ferry and extend to Craft Ferry. The river widens considerably about a mile below Kenly Ferry and has several good sites, one being on Craft Island. These shoals could be developed only at considerable expense, as a dam would have to be 1,000 feet long.

Half a mile below, the Middleton Shoals have a fall of 11 feet in 1¼ miles and offer an excellent site for a dam. The bottoms and sides are of rock.

One mile below are Gregg Shoals with a 7-foot fall in about a mile. Here the river runs between steep hills and a dam would be about 900 feet long.

Half a mile below Moseley Ferry are the Cherokee Shoals, having a fall of 18.9 feet in less than 3 miles. This is a very fine power site, as the river runs between steep hills. A dam would be about 1,000 feet long and would be placed one-fourth of a mile above the Seaboard Air Line bridge.

One and one-fourth miles below the bridge are Trotters Shoals with a fall of 69 feet in 6 miles. These are considered the finest shoals

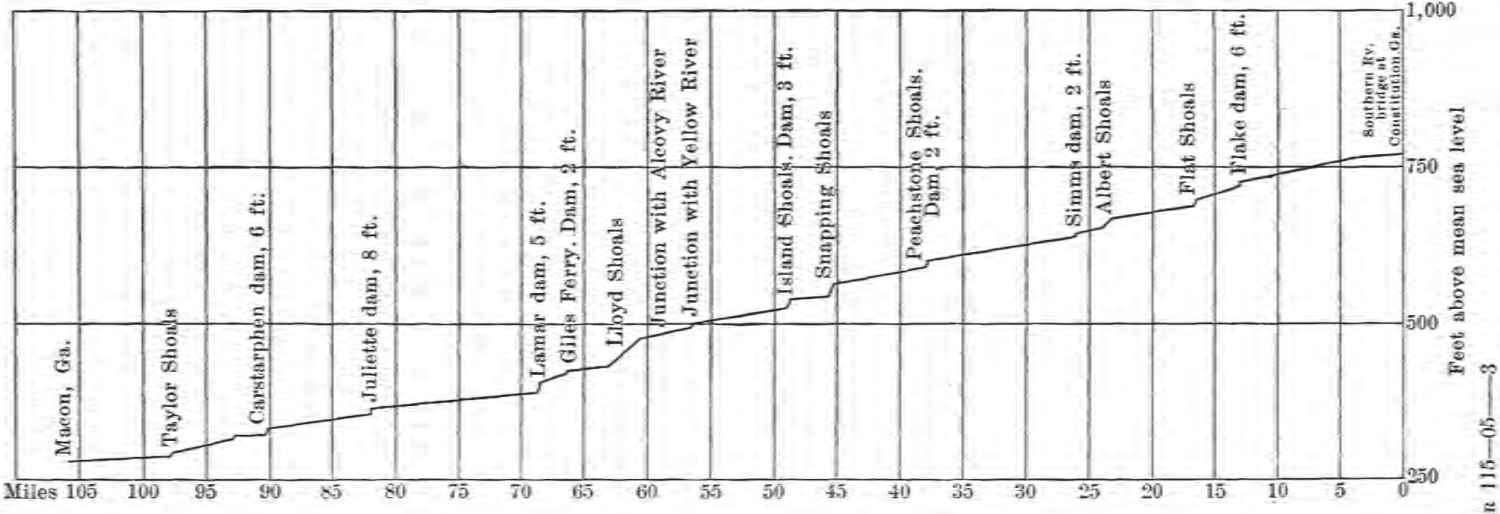
on the river. They commence at the foot of Watkins Island and run below Tates mill to Coffee Creek. In this distance there are numerous rocky bluffs where there are excellent dam sites.

From the foot of Trotters Shoals to the mouth of Broad River, the end of the survey, there is a uniform fall of 3 feet per mile.

Elevations on Savannah River from Andersonville, S. C., to Lisbon, Ga.[a]

Distance in miles.		Elevation in feet.
48.2	Andersonville, S. C., east side of road, 200 feet east of river, northeast of Little Broadway Creek, bronze tablet marked "538 Atlanta"	537.519
48.7	Seneca River, mouth of, surface of water	505
48.7	Small pine tree, nail in root of	512.60
49.3	Branch, mouth of, surface of water	501
49 3	Sycamore tree on edge of branch and river, nail in root of	502.78
50.5	Creek, mouth of, surface of water	497
50 6	Opposite island, 50 feet west of river, willow stump, nail in top of	503.38
50.7	Branch, mouth of, surface of water	493
51.4	In footpath, 10 feet west of river, large red oak tree, nail in root of	499.76
51.4	Lightwood Log Creek, 400 feet west of river, tripple water oak tree	507.28
52.3	Carters Ferry, surface of water	492
52.3	High water	516
52.3	Lightwood Log Creek, mouth of, surface of water	491
52.8	60 feet west of river, large walnut tree, nail in root of	501.09
53.3	Browns Ferry, 40 feet west of, double water oak tree, nail in root of	497.79
53.3	Surface of water	488
53.3	High water	499
53.3	Browns Ferry, 1,200 feet northeast of O. C. Brown's house, in brick and stone abutment at rear of, northwest corner, bronze tablet marked "518 Atlanta"	516.891
54.6	Powderbag Creek, mouth of, surface of water	487
54.8	Creek, 520 feet south of, 30 feet west of river, box elder tree, nail in root of	491.88
55	Dooley Ferry, 114 feet west of river, poplar tree, nail in root of	492.64
55	Surface of water	486
55.7	Craft Island, opposite, hanging over edge of river, maple tree, nail in root of	485.13
55.7	Surface of water	485
55.7	Long Branch, mouth of, surface of water	484
56.1	30 feet south of river, large poplar tree, nail in root of	487.61
56.1	Surface of water	482
56.1	McDowells Shoals, head of, surface of water	477
56.1	High-water mark	487
56.8	70 feet southwest of river, pine tree, nail in root of	483.26
56.8	Surface of water	474

[a] Continued from Tugaloo River elevations. See p. 28.



PROFILE OF SAVANNAH RIVER FROM ANDERSONVILLE, S. C., TO LISBON, GA.

Elevations on Savannah River from Andersonville, S. C., to Lisbon, Ga.—Continued.

Distance in miles.		Elevation in feet.
57.3	Turner Creek, mouth of, southwest of river, birch tree, nail in root of	473.43
57.3	Surface of water	471
57.5	20 feet southwest of river, birch tree, nail in root of	476.13
57.5	Surface of water	470
58	Harper Island, 0.1 mile west of, red oak tree bending over edge of river, nail in root of	472.57
58.7	Surface of water	466
59.1	Parks Ferry, 0.2 mile above, west side of ferry road, opposite colored house, foot of steep hill, in cliff, bronze tablet marked "495 Atlanta"	494.435
59.3	Parks Ferry, 15 feet west of river, large red oak tree, nail in root of	468.53
59.3	Surface of water	461
59.5	Surface of water	460
60.5	Mulberry tree stump, west side of river, nail in root of	462.42
60.5	Surface of water	458
60.8	Saddlers Old Ferry, 40 feet west of river, rock cliff, point on rock	466.598
60.8	Surface of water	458
60.9	60 feet south of river, hickory tree, nail in root of	471.27
60.9	Surface of water	457
61.5	Cedar Creek, 500 feet north of river, large black oak tree, nail in root of	460.66
61.5	Cedar Creek, mouth of, surface of water	455
62.3	Kinleys Ferry, 0.1 mile southwest of; 10 feet west of river, white ash tree, nail in root of	457.68
62.3	Surface of water	454
62.4	Turners Shoals, head of, surface of water	453
62.5	McMullins Branch, mouth of, surface of water	450
64.2	50 feet south of river, small hickory tree, nail in root of	456.55
64.3	Shoals, surface of water	450
65.8	200 feet west of river, black oak tree, nail in root of	459.62
65.9	Surface of water	443
66.2	25 feet west of river, black oak tree, nail in root of	445.80
66.2	Surface of water	440
66.9	Craft Ferry, 10 feet west of river, red oak tree, nail in root of	443.67
66.9	Creek, mouth of, surface of water	437
66.9	Craft Ferry, 125 feet west of boat landing, 60 feet west of river, in rock, aluminum tablet marked "450 Atlanta"	449.306
66.9	Foot of Turners Shoals, surface of water	437
68.1	Middleton Shoals, head of, surface of water	435
68.5	Barnes Island, opposite, 125 feet west of river, small black oak tree, nail in root of	443.11
68.5	Surface of water	431
68.7	300 feet west of river, on top of cliff, dogwood tree, nail in root of	457.46

Elevations on Savannah River from Andersonville, S. C., to Lisbon, Ga.—Continued.

Distance in miles.		Elevation in feet.
69.5	West edge of river, willow stump, nail in root of	428.03
69.8	Middleton Shoals, foot of, surface of water	424
69.8	20 feet west of river, post-oak tree, nail in root of	432.50
70.2	Powells Ferry, 20 feet west of river, water oak tree, nail in root of	435.23
70.2	Powells Ferry, surface of water	422
70.9	Surface of water	419
71	Powells Ferry, 0.8 mile south of, 150 feet west of river, white ash stob, nail in top of	439.30
71.3	Gregg Shoals, head of, surface of water	418.7
72.4	Black Ferry, 25 feet west of river, nail in root of birch tree	421.677
72.4	Black Ferry, surface of water	410.3
72.8	350 feet east of river, octagon burnt tree stump, nail in root of	431.08
73.2	Creek, mouth of, surface of water	409
73.4	350 feet east of river, persimmon tree stump, nail in root of	419.39
73.7	Branch, mouth of, surface of water	407
73.7	Mill, opposite, surface of water	406
73.8	Coldwater Creek, mouth of, surface of water	406
74.3	350 feet east of river, 140 feet southwest of small branch, persimmon tree, nail in root of	414.39
75.8	Allens Creek, mouth of, surface of water	404
76.2	Harper Ferry, 20 feet east of river, southside of road, water oak tree, nail in root of	412.26
76.2	Surface of water	403
76.2	High-water mark	416
76.4	250 feet southeast of W. J. Taylor's house, side of brook, in limestone rock, bronze tablet marked "420 Atlanta"	419.146
77	Branch, mouth of, surface of water	402
77.3	Ruckers and Tuckers Ferry, 40 feet southeast of and 5 feet west of river, willow tree, nail in side of	405.49
77.3	Surface of water	401
77.3	High-water mark	418
77.6	Surface of water	400
78.1	Surface of water	399
78.4	English Creek, 60 feet west of, 50 feet north of river, white hickory stump, nail in root of	417.13
78.4	English Creek, mouth of, surface of water	398
78.9	McCauleys Island, 900 feet south of head of, surface of water	397
79.2	McCauleys Ferry, 40 feet west of river, ash stump, nail in root of	407.19
79.2	Surface of water	397
79.6	Surface of water	396
79.6	150 feet north of river, beech tree, nail in root of	407.39
80.5	Branch, mouth of, surface of water	395
80.8	Surface of water	394

Elevations on Savannah River from Andersonville, S. C., to Lisbon, Ga.—Continued.

Distance in miles.		Elevation in feet.
80.8	50 feet east of river, walnut tree, nail in root of	398.77
81	Moseley Ferry, 50 feet east of river, walnut tree, nail in root of	400
81	Surface of water	392
81.3	Surface of water	392
81.6	Surface of water	391
81.7	Large falls, head of, surface of water	390
81.8	50 feet east of river, twin pine tree, nail in root of	399.23
81.9	Cherokee Shoals, surface of water	388
82.6	Surface of water	379
82.6	125 feet east of river, oak tree, nail in root of	385.75
83.2	Surface of water	374
83.3	Carter Island, ferry, 40 feet west of river, white oak tree, nail in root of	382.52
83.5	Surface of water	373
83.7	Rocky River, mouth of, surface of water	372
84.2	Surface of water	371
84.2	Seaboard Air Line bridge, abutment, east side of bridge, bronze tablet marked "383 Atlanta"	382.161
85.1	Watkins Island, lower end of, 15 feet north of river, oak tree, nail in root of	375.7
85.2	Watkins Island, 150 feet southwest of, on mainland, dead stump, nail in side of	374.59
85.2	Trotter's shoals, head of, surface of water	367
85.5	Shoals, surface of water	364
85.7	Head of island, surface of water	362
85.9	Surface of water	358
86	75 feet west of river, nail in stub	367.4
86.2	Calhoun Island, end of, surface of water	356
86.3	60 feet southwest of river, black ash tree, nail in root of	365.01
86.3	Trotters Shoals, in, surface of water	353
86.6	Surface of water	351
86.6	Cliff, bottom of, on rock, point	354.27
87.1	Calhoun Ferry, triple cedar tree, 75 feet west of river, nail in root of	348.39
87.1	Surface of water	340
87.5	Surface of water	336
87.6	50 feet southwest of river, in path, pine tree, nail in root of	341.32
88.1	Creek, mouth of, surface of water	329.7
88.3	Surface of water	328
88.6	10 feet southeast of road, Spanish oak, 400 feet west of river, nail in root of tree	338.61
88.9	Surface of water	325
89.2	Surface of water	322

Elevations on Savannah River from Andersonville, S. C., to Lisbon, Ga.—Continued.

Distance in miles.		Elevation in feet.
89.2	200 feet west of river, on top of steep hill, in footpath, hickory tree, nail in root of	360.67
89.7	Calhoun Ferry, 2.5 miles southeast of, 50 feet west of river, in large bronze tablet marked "320 Atlanta"	319.252
89.4	Surface of water	318
89.7	Surface of water	313
90.1	Surface of water	308
90.2	Surface of water	304
90.3	10 feet west of river, 300 feet north of old mill, water oak, nail in root of	305.90
90.3	Surface of water	301
90.4	Surface of water	299
91.3	Branch, mouth of, surface of water	292
91.3	10 feet west of river, dead birch tree, nail in root of	300.21
91.8	Surface of water	291
92.3	Creek, surface of water	289
92.8	Clarks Ferry, 200 feet west of river, water oak, copper tack in root	309.13
92.8	Surface of water	287
92.8	High-water mark	307
93.7	Creek, 1,500 feet below, surface of water	285
93.9	50 feet west of river, gum tree, copper tack in side of	299.66
94.2	Surface of water	284
96.1	Petersburg Ferry, east side of road, dead black gum, nail in root of	293.41
96.1	Broad River, mouth of, surface of water	281
96.2	South side of ferry road, water oak, nail in root of	295.77
96.4	Lisbon, in brick wall of R. L. Cade's store, bronze tablet marked "328 Atlanta"	327.85

CHATTOOGA RIVER BELOW RUSSELL, S. C.

Between July 19 and August 10, 1903, Chattooga River was surveyed from its mouth, near Tallulah Falls, Georgia, to Russell Bridge, near Russell, S. C., a distance of 30 miles. In that distance there is a fall of 809 feet. A line of secondary levels was run, based on a primary bench mark of the United States Geological Survey 3 miles below Tallulah Falls. The field sheets were plotted on the scale of 1:22,500, and during the course of the survey 23 bench marks were established and 97 water-surface elevations were noted.

Chattooga River contains many available undeveloped power sites. From its mouth to War Woman Creek, a distance of 22 miles, the river runs through a wild, rugged country, almost uninhabited. It

flows in a gorge almost the entire distance and is very narrow and swift. There are numerous dam sites in this section, as the river is almost one continuous shoal and has an average fall of 33 feet to the mile, with a fine rock bottom and cliffs on either side. The rock is excellent for building purposes.

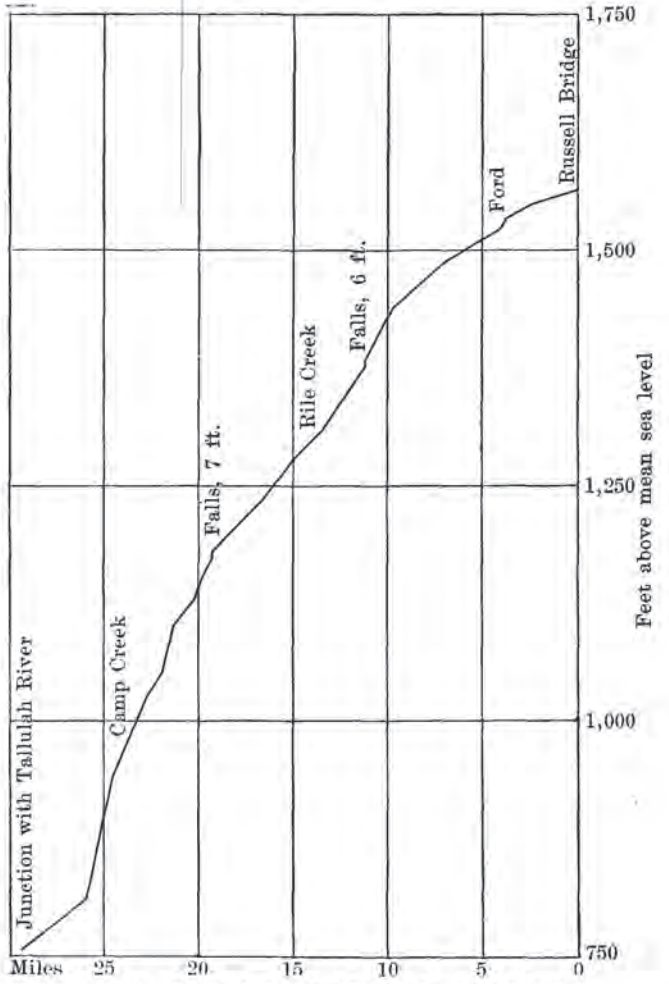


FIG. 4.—Profile of Chattooga River below Russell, S. C.

From War Woman Creek to Lone Bottom Ford, a distance of 5 miles, the bottoms widen considerably, and there are a few cultivated farms. Halfway, at Laurel Branch, there is an excellent site for a 12-foot dam, which would back water one-half mile without damage to cultivated lands. Here there is a good rock bottom and rocky bluffs on each side. From a half mile above Laurel Branch to Russell Bridge,

the end of the survey, the bottoms are considerably wider and mostly cultivated.

The elevations in the following list are based on an aluminum tablet marked "1050 M C" at Washington street entrance to the State capitol at Atlanta, the elevation of which is now accepted as 1,049.546 feet above mean sea level. The initial point upon which these levels depend is a bench mark of primary levels of Tugaloo and Savannah River surveys at the mouth of Chattooga River. The elevations accord with the 1903 adjustment.

The leveling was done under the direction of Carroll Caldwell, field assistant, by Thomas B. O'Hagan, levelman.

Elevations on Chattooga River from its mouth to Russell Bridge, Ga., 0.7 mile north of Russell, S. C.

Distance in miles.		Elevation in feet.
0.0	Tallulah and Chattooga rivers, 100 feet north of junction, point on rock	761.29
.0	Tallulah and Chattooga rivers, white oak tree 75 feet west of junction of, 25 feet north of Tallulah River, nail in root of oak tree	762.21
.0	Surface of water	754
.2	Surface of water	759
.7	Mouth of stream, surface of water	763
1	Worse Creek, mouth of, surface of water	765
1.2	Surface of water	766
1.9	Small stream on north edge of river, Spanish oak, nail in root of	776.27
1.9	Surface of water	772
2.1	Surface of water	775
2.6	North side of river, point on rock	788.63
3	Surface of water	779
4	East side of river, point on rock	851.51
4	Surface of water	849
4.1	Surface of water	869
4.5	Creek, mouth of, surface of water	892
4.7	Surface of water	899
4.9	East side of river, point on rock	918.27
4.9	Surface of water	919
5	Surface of water	929
5.1	Surface of water	939
5.2	Surface of water	949
5.3	Mouth of stream, head of shoals, surface of water	954
5.6	Camp Creek, mouth of, surface of water	961
5.6	Trail Ford, point on rock 20 feet east of river	967.50
5.6	Trail Ford, surface of water	962
5.8	Surface of water	969

Elevations on Chattooga River from its mouth to Russell Bridge, Ga., 0.7 mile north of Russell, S. C.—Continued.

Distance in miles.		Elevation in feet.
6.1	Surface of water	979
6.3	Surface of water	989
6.7	Surface of water	999
7	Surface of water	1,000
7.2	Surface of water	1,029
7.4	Cliff Creek, mouth of, surface of water	1,035
7.4	Cliff Creek, 500 feet above, east side river, point on rock	1,045.26
7.5	Surface of water	1,039
7.6	Chechero Creek, mouth of, surface of water	1,049
7.8	Surface of water	1,059
8	Surface of water	1,069
8.2	Surface of water	1,079
8.4	Surface of water	1,089
8.5	Surface of water	1,099
8.6	Surface of water	1,109
9	Surface of water	1,119
9.5	Surface of water	1,129
9.8	Surface of water	1,149
10	East side of river on edge of bank, point on rock	1,152.43
10	Surface of water	1,159
10	Iron bridge, South Carolina side, iron bar under bridge, point on	1,168.95
10	Iron bridge, surface of water	1,166.3
10	High water	1,177
10.5	Surface of water	1,169
10.6	Mouth of creek, surface of water	1,173
10.6	Head of falls, surface of water	1,179
10.8	Mouth of stream, surface of water	1,183
11	Surface of water	1,189
11.4	Surface of water	1,199
11.7	Mouth of stream, surface of water	1,204
12	Surface of water	1,209
12.5	50 feet south of island, east side of river, 10 feet from bank, point on rock	1,217.86
12.7	Surface of water	1,219
12.9	Surface of water	1,223
13	Surface of water	1,229
13.2	Stream, mouth of, surface of water	1,232
13.6	Surface of water	1,239
13.8	South Carolina side of river, at large cliff, point on rock	1,245.53
14	Surface of water	1,249
14	Mouth of Fall Creek, surface of water	1,262

Elevations on Chattooga River from its mouth to Russell Bridge, Ga., 0.7 mile north of Russell, S. C.—Continued.

Distance in miles.		Elevation in feet.
14.5	Surface of water	1,268
14.7	Surface of water	1,279
15	Surface of water	1,289
15.7	Surface of water	1,296
16	Surface of water	1,299
16.6	Rich Creek, mouth, surface of water	1,308
16.8	Surface of water	1,309
16.9	South Carolina side of river, point on rock	1,310.4
17	Surface of water	1,319
17.4	Surface of water	1,329
17.8	Sandy Bottom, 1,000 feet below, east side of river, point on rock	1,332
18	Surface of water	1,340
18.7	Surface of water	1,359
18.7	East side of river, point on rock	1,366.45
18.9	Surface of water	1,360
19.1	300 feet below falls, at bend in river, point on rock	1,376.19
19.2	Foot of falls, surface of water	1,375
19	Head of falls, surface of water	1,381
19.7	Surface of water	1,399
19.8	Rock Creek, mouth of, surface of water	1,406
20	Sandy Ford, surface of water	1,411
20	Sandy Ford, 75 feet north of, 15 feet east of river, nail in root of white oak tree	1,416.55
20.2	Surface of water	1,419
20.6	Surface of water	1,429
20.7	Dick Creek, mouth of, surface of water	1,439
20.8	Surface of water	1,449
21	East side of river, point on rock	1,452.91
21.2	Surface of water	1,459
22	Surface of water	1,469
22.1	Surface of water	1,473
22.3	4 feet east of river, nail in root of large pine tree	1,481.86
22.7	Surface of water	1,479
23	Earl Ford, 100 feet below ford, east side of river, point on rock	1,486.74
23	Surface of water	1,486
23	War Woman Creek, mouth of, surface of water	1,486
23.8	South side of river, point on rock	1,494.13
23.8	Surface of water	1,492
24.8	Surface of water	1,499
25.2	West side of river, point on rock	1,510.51
25.2	Surface of water	1,505

Elevations on Chattooga River from its mouth to Russell Bridge, Ga., 0.7 mile north of Russell, S. C.—Continued.

Distance in miles.		Elevation in feet.
26	Horseback Ford, surface of water	1,518
26.3	Surface of water	1,519
26.4	Ford, 65 feet above, north side of river, nail in live stub (white oak tree)	1,522.66
26.4	Surface of water	1,521
26.8	Surface of water	1,529
27.1	Surface of water	1,539
27.9	Barlow Stream, center of river, point on rock	1,547.26
28	Surface of water	1,549
28.7	Long Bottom Ford, east side, nail in fork of sugar maple tree	1,557.68
29.7	Small stream, mouth of river at, surface of water	1,554
30.6	West Fork, mouth of, surface of water	1,563
30.6	Wooden bridge, above Russell, S. C., southwest side of bridge, point on bolt	1,584.84
30.6	Bridge, surface of water	1,564

BROAD RIVER BELOW CARNESVILLE, GA.

Between June 9 and July 16, 1903, Broad River was surveyed from its mouth, near Lisbon, Ga., to Harrison Bridge, near Carnesville, Ga., a distance of 64½ miles. In that distance there is a fall of 316 feet. The field sheets were plotted on the scale of 1:22,500, and the survey was accompanied with a line of secondary levels based on the primary bench mark of the United States Geological Survey at Lisbon, Ga. During the course of the survey 54 bench marks were established and 109 water elevations determined.

The flow is very gradual from the mouth to Milford Shoals, a distance of 2 miles. These shoals have a fall of 8 feet in a distance of one-third of a mile, and are about 500 feet wide. The river bottoms are wide up to the foot of Anthony Shoals, 5¼ miles from the mouth of the river. Here is the finest power site on the river, there being a fall of 58 feet in 1¾ miles, with rock bottom and rock bluffs on each side. A dam at this point would have to be 1,000 feet long. The rock is granite and would furnish excellent material for building purposes. At the end of these shoals, on the Elbert County side, are the remains of a wing dam which furnished power for a cotton mill now in ruins.

From here to Fishdam Shoals, 9¼ miles, the river has a fall of 9 feet, with wide, cultivated bottoms on either side for most of the distance. At Fishdam there is a 3-foot dam about 250 feet long which furnishes power for a grist and saw mill.

From Fishdam to the mouth of South Broad River, 15½ miles, there is a fall of 23 feet with no shoal of any consequence. The bottoms are wide in most places and are in a high state of cultivation.

One mile above South Broad River are the Detwiler Shoals, with a fall of 7 feet in half a mile. A dam at this point would be about 300 feet long. A mile and a half farther are the lower Moore Shoals, with a fall of 6 feet in a quarter of a mile, and good outcrop of hard rock on both sides. A dam here would be about 350 feet long.

Five miles farther up are the Payton Shoals, with a fall of 4 feet in a quarter of a mile. Here the steep banks show granite on the southeast side.

Two and one-half miles upstream are the Cowpen Shoals, with a fall of 8 feet. This is an excellent site for a dam, having rock bottom and sides. Two miles upstream are Moore Shoals, with a fall

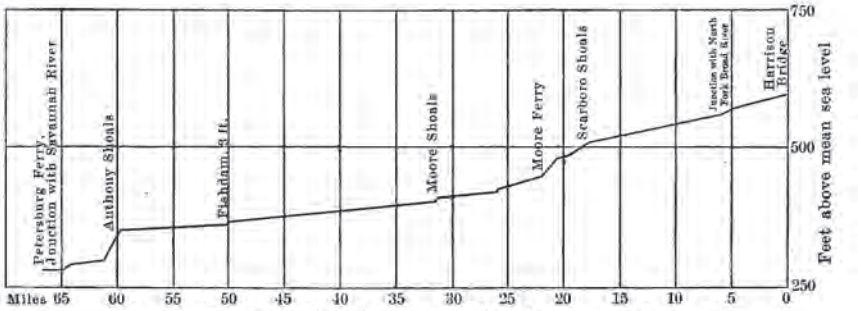


FIG. 5.—Profile of Broad River below Carnesville, Ga.

of 19 feet in three-fourths of a mile. The river here is about 400 feet wide, with solid rock bluffs on either side.

One-half mile beyond are Brown Shoals, with a 10-foot fall in one-third of a mile. A dam here would be about 400 feet long and would have an excellent foundation. One and three-fourths miles upstream are the Bryant Shoals, with a fall of 20 feet in 1¼ miles. This is an excellent site for a dam, having good bottoms and rock sides.

For 12 miles upstream to Double Bridge the shoals are small and do not seem important. From Double Bridge to Harrison Bridge, at which point the survey ended, a distance of 6 miles, the river is very narrow and shoaly, but the volume of water is small.

The elevations in the following list are based on a bronze tablet in a brick wall of R. L. Cade's store at Lisbon, Ga., marked "Atlanta 328," the elevation of which is accepted as 327.850 feet above mean sea level. They accord with the 1903 adjustment of the precise-level net.

The leveling was done under the direction of Carroll Caldwell, field assistant, by T. B. O'Hagan, levelman.

Elevations on Broad River from mouth to Harrison Bridge, 3 miles southwest of Carnesville.

Distance in miles.		Elevation in feet.
0.0	Lisbon, mouth of Broad River, 870 feet northwest of, south side of ferry road, nail in twin water oak	295.77
.0	Broad River, mouth of, surface of water	280
.0	Broad River, 870 feet northwest of mouth, high-water bench mark	300
.6	Small stream, near, surface of water	281
1.4	Mill Ford Shoals, foot of, surface of waters	281
2.1	Mill Ford Shoals, middle of, surface of water	288
2.4	Mill Ford Shoals, head of, surface of water	289
2.4	Mill Ford Shoals, 200 feet east of river, near 5-inch elm tree, nail in live stob	304.9
2.7	Center of bend, surface of water	291
3.4	Dubose Ferry, 300 feet above, surface of water	292
4.7	Anthony Shoals, foot of, surface of water	293
5	Anthony Shoals, surface of water	295
5.2	Anthony Shoals, at large bend in river, surface of water	307
5.2	Anthony Shoals, at rock cliff, surface of water	310
5.2	Anthony Shoals, at rock cliff, point on rock, 1 foot west of river	311.57
5.4	Anthony Shoals, surface of water	319
5.6	Anthony Shoals, surface of water	329
5.8	Anthony Shoals, in front of old factory, surface of water	339
6	Anthony Shoals, at old dam, east edge of river, nail in root of birch tree	347.77
6	Anthony Shoals, surface of water	351
6.4	Anthony Shoals, head of, surface of water	355
6.5	Burton Ferry, 6 feet south of river, nail in root of Spanish oak tree	361.44
6.5	Surface of water	355
6.5	Burton Ferry, high water	364
7.1	Surface of water	355
8.7	Mouth of creek, surface of water	356
8.7	60 feet south of river, 25 feet east of creek, nail in sweet gum tree	367.59
10	Surface of water	356
10.9	Bakers Ferry, small shoals, surface of water	356
11	Bakers Ferry, 20 feet southwest of river, nail in root of large birch tree	364
11	Bakers Ferry, surface of water	357
11.8	Wahache Creek, mouth of, surface of water	360
13.8	Bells Bridge, north side, nail in joist	373.69
13.8	Bells Bridge, surface of water	360
13.8	Bells Bridge, high water	386
13.8	Bells Bridge, floor of	393.2
15	Bells Bridge, 250 feet north of river, large pine tree near path to river, nail in tree	375.34
15.4	Mouth of small stream, surface of water	361
15.6	Falling Creek, mouth of, surface of water	362

Elevations on Broad River from mouth to Harrison Bridge, 3 miles southwest of Carnesville—Continued.

Distance in miles.		Elevation in feet.
16	Foot of shoals, surface of water	363
16.4	Fishdam, foot of, surface of water	365
16.4	Fishdam, head of, surface of water	368
16.4	Fishdam Ferry, north side river, nail in root of large water oak tree	374.35
16.4	Fishdam Ferry, surface of water	368
16.4	Fishdam Ferry, south side of, nail in root of gum tree	374.87
17.7	Surface of water	368
18.9	North of river, point on rock	386.66
18.9	Surface of water	370
20	Grimes old ferry, edge of river, nail in root of white oak tree	375.51
20	Grimes old ferry, surface of water	371
21.3	500 feet south of river, river road, 25 feet south of, nail in root of Spanish oak	388.89
22.1	Mouth of large creek, surface of water	372.8
22.5	Pinegrove, 400 feet north of river, 900 feet west of large creek, nail in root of pine tree	398.51
23.1	Mattox Bridge, north side, nail in plank	401.35
23.1	Mattox Bridge, surface of water	374
23.1	Bridge floor	404
23.1	High water	400
24.8	Rock cliff, near, 40 feet south of river, nail in root of gum tree	397.88
24.8	Surface of water	377
25.2	Jones Ferry, east side, nail in root of water oak tree	393.43
25.2	Jones Ferry, surface of water	377
25.2	High-water mark	401
25.5	Jones Ferry, 0.3 mile above, 40 feet west of river, nail in white oak tree	394.38
26	Surface of water	380
26.7	Millstone Creek, mouth of, 60 feet east of, 25 feet south of river, nail in side of box elder	392.64
26.7	Millstone Creek, mouth of, surface of water	381
28	Gold Mine Cliff, surface of water	384
28.5	Horseshoe Bend, head of, 150 feet south of river, in cornfield, nail in Spanish oak	405.67
28.5	Dove Creek, mouth of, surface of water	386
28.6	Bend in river, surface of water	396.4
28.6	Surface of water	386
30	260 feet north of river, nail in root of pine tree	411.3
30.9	Surface of water	391
31	Martins old ferry, near spring, point on rock	420.14
31.3	Junction South Fork and Broad River, southeast point of rivers, nail in side of birch tree	395.86
31.3	Surface of water	391

Elevations on Broad River from mouth to Harrison Bridge, 3 miles southwest of Carnesville—Continued.

Distance in miles.		Elevation in feet.
32.4	Detwiler Ferry, foot of shoals, surface of water	395
32.9	Detwiler Ferry, east side, edge of water, slanting Spanish oak, nail in	406.07
32.9	Detwiler Ferry, head of shoals, surface of water	402.1
32.9	Detwiler Ferry, high water	423.6
33.4	Seaboard Air Line bridge, abutment, east side of river, 350 feet from	420.28
33.4	Seaboard Air Line bridge, surface of water	402
34	Moore Shoals, surface of water	404
34.4	Old mill, 25 feet east of river, point on rock	416.23
34.4	Old mill, mouth of stream, surface of water	409
34.4	Moore Shoals, head of, surface of water	411
34.7	Bells Ferry, edge of river, 2 feet from road, overhanging Spanish oak, nail in	418.87
34.7	Bells Ferry, surface of water	412.3
34.7	Bells Ferry, high water	430
35.9	Harpers Ferry, north side of river, east side ferry, nail in root of black gum tree	422.54
35.9	Harpers Ferry, surface of water	414
35.9	Harpers Ferry, high water	432
36.8	Holly Branch, mouth of, surface of water	416
37.5	Moon Ferry, east of ferry, nail in side of white oak tree	423.19
37.5	Moon Ferry, surface of water	418
37.8	Surface of water	419
37.9	Mouth of creek, surface of water	420
38.6	Payton Shoals, foot of, surface of water	422
39	Payton Shoals, east side of river, nail in sycamore tree	428.57
39	Payton Shoals, head of shoals, surface of water	425
39.1	South Payton Ferry, 25 feet from river, east side of ferry, nail in side of dead willow tree	431.35
39.1	Payton Ferry, high water	449
39.1	Payton Ferry, surface of water	427
39.1	Payton Ferry, high water	449
39.4	Payton No. 2, head of shoals, surface of water	429
39.8	Victory Ferry, overhanging birch tree, nail in side of	432.17
39.8	Victory Ferry, surface of water	430
39.8	High water	450
40.4	Moon Ferry, nail in root of white oak tree	442.62
40.4	Moon Ferry, foot of shoals, surface of water	431
40.5	Moons Shoals, head of, surface of water	433
41.1	Bend in river, 1,500 feet east of Mill Creek, east side river, point on rock	443.14
41.1	Surface of water	438

Elevations on Broad River from mouth to Harrison Bridge, 3 miles southwest of Carnesville—Continued.

Distance in miles.		Elevation in feet.
41.4	Mill Shoal Creek, mouth of, surface of water	439
41.4	Surface of water	441
42.2	Head of shoals, surface of water	450
42.7	Moore Ferry, west side of, large spruce oak tree, nail	455.77
42.7	Moore Ferry, surface of water	450
42.7	High water	460
43.0	Moore Shoal, at spring, foot of shoals, surface of water	454
43.3	Shoals, surface of water	462
43.3	Moore Shoals, near head of, point on rock	470
43.8	Browns Ferry, burnt stump northeast of river, nail in	482.09
43.8	Browns Ferry, near head of Moors shoals, surface of water	471
44.2	Moore Shoals, head of, surface of water	482
44.6	Dudleys Shoals, east bank of river, point on rock	489.28
44.6	Surface of water	482
45.5	Dudley Ferry, black gum tree north side of ferry, nail in root	502
45.5	Dudley Ferry, surface of water	487
45.5	High-water mark	504
45.6	Bryant Shoals, foot of, surface of water	489
46.2	Bryant Shoals, head of, surface of water	496
46.5	Sawmill, Spanish oak tree, 50 feet from river, nail in root of	506.65
46.5	Surface of water	502
46.5	Head of shoals, surface of water	506
47.7	Bluestone Creek, north side river, 1.2 miles below Bluestone Creek, point on rock	518.38
47.7	Surface of water	512
48.9	Mouth of Bluestone Creek, surface of water	617
49.6	Surface of water	521
50.4	New Lattice Bridge, east side of river, nail in floor of	546.44
50.4	Bridge floor	548.8
50.4	Bridge, surface of water	523
50.4	High-water mark	548.1
51.2	Mouth of stream, foot of shoals, surface of water	523.7
51.6	Head of shoals, surface of water	526
52.3	Winters Creek, just below bend in river, surface of water, temporary bench mark	545
52.4	Winters Creek, mouth of, head of shoals, surface of water	529
53.2	Surface of water	532
53.9	Mouth of stream, surface of water	535
54.7	Bragg Ferry, 2 feet from river, nail in root large red oak tree	541.75
54.7	Bragg Ferry, mouth of Hudson River, surface of water	537
54.7	High-water mark	567

Elevations on Broad River from mouth to Harrison Bridge, 3 miles southwest of Carnesville—Continued.

Distance in miles.		Elevation in feet.
55.2	Surface of water	541
55.7	Dove Bridge, southeast corner of, nail in side of white oak tree	561.78
55.7	Dove Bridge, surface of water	542
55.7	High water	569
57.2	Foot of shoals, surface of water	548
57.3	Head of shoals, surface of water	552
57.6	Surface of water	554
57.7	Creek, 60 feet southeast of mouth of, nail in white oak	563.30
57.7	Creek, mouth of, surface of water	556
58.1	Mouth of stream, surface of water	556
58.8	Middle Broad and Broad rivers, forks of, walnut tree 75 feet west of fork, nail in side	575.16
58.8	Surface of water	557
59.1	Double Bridge, northwest side of, nail in plank	581.11
59.1	Surface of water	563
59.1	High-water mark	576
59.1	Bridge floor	584
59.7	Head of shoals, surface of water	570
59.9	Surface of water	573
60.6	Corey Creek, 0.6 mile below, large rock projecting out from bank point on	581.02
60.9	Small shoals in river, surface of water	580
60.9	Corey Creek, mouth of, surface of water	581
61.5	Bend, on east side river, point on rock	591.15
61.5	Surface of water	584
62.1	Fish dam, surface of water	586
62.2	Surface of water	588
62.3	Bend in river, east side, point on rock cliff	598.59
62.8	Philip Shoals, head of, surface of water	591
63.2	Stephens Creek, mouth of, surface of water	592
63.4	Ford, oak tree 75 feet north of, nail in north side of	603.49
63.4	Surface of water	593
63.4	Surface of water	594
64.6	Harrison Bridge, east of, north of river, nail in root of Spanish oak tree	607.07
64.6	Surface of water	596
64.6	Bridge floor	613.7
64.6	High-water mark	612

SOUTH AND OCMULGEE RIVERS, FROM CONSTITUTION TO MACON, GA.

South and Ocmulgee rivers were surveyed from Constitution to Macon, Ga. For the first 28 miles the topography was plotted on the scale of 1:45,000, but subsequently on the standard scale of 1:22,500. The levels are secondary levels based on the United States Geological Survey permanent bench mark at Constitution, Ga. Eighty-six bench marks were established and 200 water-surface elevations were recorded.

South River rises in the city of Atlanta and flows in a southeasterly direction for 56½ miles and then joins Yellow River to form the Ocmulgee. For 11 or 12 miles below Constitution, the beginning of the survey, the river is narrow, being about 15 feet wide at places. All along the north side of the river in this stretch are extensive beds of clay, which at certain points are being used for brickmaking.

Flakes' mill, 11 miles from Constitution, is the first power now utilized on the river. At this point the dam is 6 feet high. Below for 6 miles the river remains shoaly and narrow until Flat Shoal is reached, where there is a fall of 12 feet with a small gristmill using a little of the power. Near here the river is very crooked and incloses in its large loops flat, sandy stretches of country, which are very fertile. Near Flat Shoal is Littlestone Mountain, with valuable granite quarries.

At Albert Shoals, 7 miles farther down, there is a fall of 16 feet in half a mile. The river is here about 125 feet wide and the volume is much increased by a number of tributary streams. The banks are sloping, with no rock visible. The power site has recently been purchased by a company which proposes to develop it.

At Simm's mill, 3 miles below, is a small 2-foot dam. From here to Peachstone Shoals, a distance of 11 miles, there is a fall of 32 feet, the river winding through good bottom lands. Camp and Honey creeks enter the river in this stretch and add a large amount of water. At Peachstone Shoals is a 2-foot dam which backs the water for one-half mile, and with a canal about 400 feet long develops a head of about 9 feet, the power from which drives several turbines operating a grist and a saw mill. Soft rock is visible on the west bank, while the east bank is a flat sand bar.

About 8 miles below are the Snapping Shoals, where there is a fall of 20 feet in a distance of 300 yards. Near the lower end of the rapids several small islands divide the channel into several parts. Solid rock is close to the surface on both sides of the river. A portion of the power at this point is used in operating a large roller flour mill and sawmill. Mr. DeLoach, the owner, is taking steps

to develop all the power and intends erecting a large cotton factory at this point.

Three miles below here is Island Shoal, with a fall of 10 feet in 250 yards. Here there is a flour mill and a furniture factory, both operated by a 3-foot dam with a canal 1,200 feet long. The head could be increased by adding 5 feet more to this dam without materially damaging any property above. This site is an excellent location for power development, as the banks are high and solid and the length of the dam would probably not exceed 250 feet.

Eight miles farther down is the Barnes Shoal, at the mouth of Yellow River. A dam here would be about 700 feet long. There are excellent foundations and about a 9-foot fall.

Farther down the stream are Keys Shoals, with a 3-foot fall and several minor riffles to Lloyds Shoals, which has a fall of 43 feet in about 2½ miles, at the lower end of which there is a good dam site. The river at this point is only about 350 feet wide, with solid rocky banks rising 50 feet on either side. A 45-foot dam at this point would do a trifling amount of damage to property above.

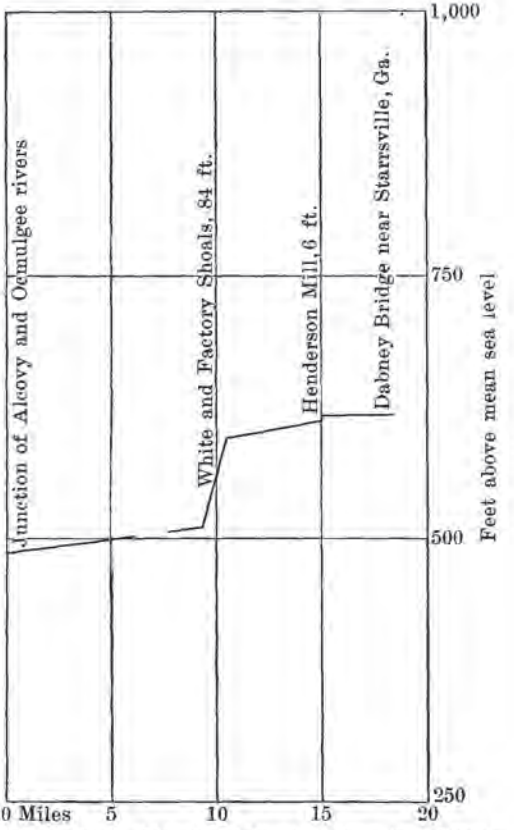


FIG. 6.—Profile of South and Ocmulgee rivers from Constitution to Macon, Ga.

Ten miles downstream is Smith Shoal, with a fall of 12 feet, where a 2-foot dam and a long canal at present run Smith's gristmill. At Lamars Shoals, 2 miles below, there is a fall of 19 feet in 1 mile with a 5-foot dam and a canal running a flour mill. The river is here about 1,000 feet wide, with high, rocky banks, and has a number of small islands and large rocks scattered all through it. Twelve miles farther down, at Juliette, Ga., is an important shoal which has been developed by Doctor Glover. There is a 15-foot fall in one-half mile, which has been developed by an 8-foot dam with a short canal,

and runs the Glover cotton mills and the Juliette Milling Company's plant.

Twelve miles below are Dames Shoals, with an 8-foot fall in 600 feet. A 6-foot dam at this point supplies Carstarphens gristmill, which is a large wholesale plant. The bed of the river here is solid rock, but a higher dam would flood valuable bottom lands above.

Popes Shoals have a 5-foot fall in a quarter of a mile, and Taylor's shoals have a 5-foot fall within a few hundred yards.

The elevations in the following lists are based upon an aluminum tablet at the Washington street entrance of the State capitol building at Atlanta marked "1050 M C," the elevation of which is accepted as 1,049.546 feet above mean sea level. The leveling on South and Ocmulgee rivers is adjusted to accord with elevations of precise level bench marks at Constitution, Holton, and Macon, Ga., by the 1903 adjustment.

The leveling was done in 1903, under the direction of F. A. Franck, field assistant, by Joseph Palmer, level man.

Elevations on South River from Constitution to junction with Yellow River (head of Ocmulgee River) near Worthville.

Distance in miles.		Elevation in feet.
0.0	Constitution, 25 feet south of Southern Railroad, 4 feet east of sign-board, iron post marked "847 Morehead 1898"	847.006
.0	Surface of water	772
2	Intrenchment Creek, mouth of, nail in root of black gum	773.77
2	Surface of water	770
2.8	McNeals Bridge, nail in root of sycamore tree	769.57
2.8	Surface of water	768
7	Kellers Bridge, north end, iron bolt	751.92
7	Surface of water	750
10	Shoal Creek bridge, surface of water	737
12.6	Flake's mill, nail in root of birch tree	733.26
12.6	Surface of water	728
16.3	Flat Shoal Bridge, south side of river, east side of approach, on stone abutment	708.71
16.3	Surface of water	698
	Foot of shoal	686
20.6	Parkers Bridge, nail in root of sweet-gum tree	678.76
20.6	Surface of water	672
23.6	Daniels Bridge, lower side, right end of, point of stone pier	667.97
23.6	Surface of water	649
25.3	Simms Bridge, surface of water	635
26.4	Knight Creek, 50 feet above mouth, on root of sycamore, nail	639.28
26.4	Surface of water	629

Elevations on South River from Constitution to junction with Yellow River (head of Ocmulgee River) near Worthville—Continued.

Distance in miles.		Elevation in feet.
31	Oglesbys Bridge, 25 feet above, nail in root of oak tree	622.02
31	Surface of water	614
36	Peachstone Falls, nail in root of water oak	605.71
36	Peachstone Shoals, head of, surface of water	597
	Peachstone Shoals, foot of, surface of water	589
41	Butler Bridge, 30 feet below, nail in root of red-oak tree	587.15
41	Surface of water	569
43	Snapping Shoals, head of, surface of water	562
43.1	Snapping Shoals Bridge, 40 feet from north approach, on root of water oak	559.66
	Snapping Shoals, foot of, surface of water	542
	Island Shoals, head of, surface of water	536
45.3	Island Shoals Bridge, near south approach of, nail in root of white oak	534.89
45.3	Surface of water	525
50.8	Manns Bridge, on south side of river, 20 feet below, nail in root of hickory tree	518.49
50.8	Surface of water	503
52.1	Yellow River, mouth of, opposite, nail in root of pine tree	506.94
52.1	Surface of water	498

Elevations on Ocmulgee River from head, at junction of South and Yellow rivers, near Worthville, to Macon.

Distance in miles.		Elevation in feet.
0.0	Yellow River, opposite mouth of, nail in root of pine	506.94
.0	Surface of water	498
	Alcovy River, opposite mouth of, nail in root of large white oak	494.27
	Surface of water	484
4.1	Tusahaw Creek, mouth of, head of Lloyds Shoals, nail in root of water oak	482.12
4.1	Surface of water	472
6.4	Lloyds Shoals, foot of, surface of water	429
7.4	Pittmans Ferry, near south side of, nail in root of beech tree	434.96
7.4	Surface of water	425
7.9	Yellow Water Creek, 30 feet above mouth of, nail in root of hickory tree	433.97
7.9	Surface of water	422
9.2	Giles Ferry, nail in root of pine tree	430.01
9.2	Surface of water	420

Elevations on Ocmulgee River from head, at junction of South and Yellow rivers, near Worthville, to Macon—Continued.

Distance in miles.		Elevation in feet.
9.2	Smiths Shoals, head of, surface of water	420
10.7	Smiths Shoals, foot of, surface of water	408
10.9	Smiths Ferry, on south side, 20 feet above landing, nail in root of ash tree	410.44
10.9	Surface of water	407
11.9	Lemars Shoals, head of, surface of water	406
11.9	Lemars Shoals, foot of, surface of water	387
14.1	Goodmans Ferry, south side of river, nail in root of large red oak tree	400.74
14.1	Surface of water	382
17.8	Wards Ferry, south side of river, nail in root of water oak	392.69
17.8	Surface of water	375
19.4	Big Sandy Creek, Southern Railway bridge over, 4 feet south of rail, 2 feet from east end bridge, point on stone pier	399.45
19.4	Surface of water	374
22.5	Bridges Ferry, south side of river, nail in root of large water oak tree	382.82
22.5	Surface of water	370
22.9	South bank river, 10 feet from water, nail in root of large oak tree	388.15
22.9	Surface of water	368
24.4	Towaliga River, south bank at mouth of, nail in root of red oak	379.34
24.4	Surface of water	368
25.4	Glovers Shoals, head of, surface of water	366
25.9	Glovers Shoals, foot of, surface of water	351
27.3	Glovers Ferry, 10 feet south of west approach, nail in root of beech tree	361.10
27.3	Surface of water	346
28.5	Mitchells Ferry, 10 feet south of west end, nail in root of red oak tree	361.74
28.5	Surface of water	344
32.4	25 feet from river, opposite milepost, nail in root of thunderwood tree	340.79
32.4	Surface of water	330
33.9	Danns Ferry, 10 feet south of west end of, nail in root of ash tree	335.63
33.9	Surface of water	328
34.9	Carstarphens Shoals and dam, head of, surface of water	328
	Foot of dam, surface of water	322
35	Foot of shoals, surface of water	320
36.4	Rum Creek, north abutment west end of Southern Railway bridge over	347.32
36.4	Surface of water	318
36.9	Popes Station, in front of, top of west rail	348.23
36.9	Popes Ferry, south end of, nail in root of water oak	326.88
36.9	Surface of water	318
37.9	Head of shoals, surface of water	317
37.9	Foot of shoals, surface of water	312

Elevations on Ocmulgee River from head, at junction of South and Yellow rivers, near Worthville, to Macon—Continued.

Distance in miles.		Elevation in feet.
41.9	Holton, 35 feet north of station: 29 feet west of center of track, iron post marked "339 Morehead 1898"	338.733
41.9	Surface of water	299
47.7	Virgin, west rail of upper switch of Southern Railway at	322.52
47.7	Surface of water	282
49.9	Macon waterworks, just below, 30 feet east of track, 100 feet below mouth of small creek on south side of river, nail in root of pine tree	301.88
49.9	Surface of water	278
54.9	Macon, post-office building, at corner of Mulberry and Third streets, at left of Mulberry street entrance, in water table, aluminum tablet marked "334 Morehead 1898"	333.942

YELLOW RIVER BELOW YELLOW RIVER, GA.

Yellow River was surveyed from its mouth, near Worthville, Ga., upstream to Simmons's mill, near Yellow River, Ga., a distance of 57 miles. The scale upon which the field work is plotted is 1:22,500. During the course of the survey 54 bench marks were established and 103 water-surface elevations obtained.

Yellow River flows in a southeasterly direction and contains some valuable power sites, both developed and in a natural condition. One-half mile above its mouth are the Indian Fishery Shoals, where there is a fall of 12 feet in about 200 feet. The river is here about 300 feet wide, but a narrow neck projecting just below the shoals and several rocky islands considerably reduce the probable expense of construction. There is a gristmill and a cotton gin in operation here, using perhaps nine-tenths of the available power.

For 18 miles above the river runs between high banks, alternating with low bottoms to Langdon Shoals, without any marked shoals except at Lees, where there is a fall of 2½ feet, and Flat Shoals, with a 1-foot fall. Langdon Shoals have only a 4-foot fall.

Three miles above, at Porterdale, is the finest power site on the river, where extensive developments have been made by the Bibb Manufacturing Company, which has a large cotton and twine factory at this point. Here there is a fall of 67 feet in half a mile, with a 12-foot dam at the upper end of the shoal. The banks at the foot are very high, but gradually become lower until just above the dam large bottoms begin and continue for 5 miles. Five miles above the Georgia Railroad is the next power, McDaniels Shoals, where there is a 7-foot fall in a very short distance, and a 6-foot dam operating a gristmill. The north bank is solid rock, sloping gently, but

the south bank shows no outcrop. The power developed by this dam could be much increased with small cost.

Above this point the bottoms become narrower and the river banks more rugged and higher until at Milstead, Ga., 4½ miles above, there is a fall of 45 feet in half a mile. A 15-foot dam, with canal, is completed here, and two large cotton factories are being constructed. Railroad facilities have recently made this a valuable site for mills, and a large granite quarry has been opened up at the same point.

Eleven miles above are Anniestown Shoals, with a 23-foot fall, where there is an 11-foot dam, which formerly supplied power used to operate a cotton mill of the old type. The banks here are all hard, unseamed rock, and the site could be developed into valuable property.

Two and one-half miles above are some shoals with a 14-foot fall in half a mile. The power is undeveloped, but is in a rather inaccessible

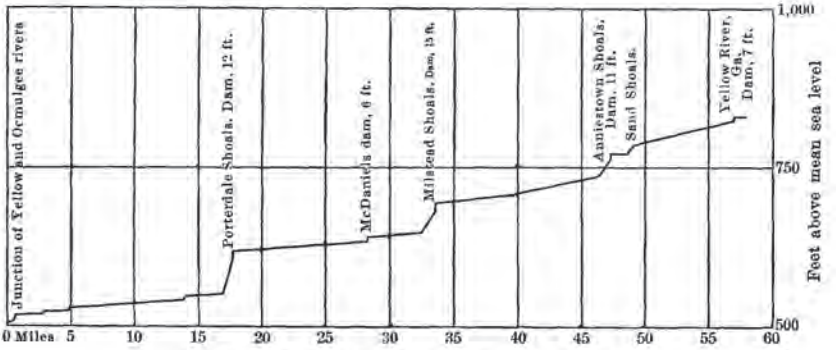


FIG. 7.—Profile of Yellow River below Yellow River, Ga.

section of the country. Above this point the river flows through a very rough country for 10 miles, passing no important shoals until the next power is reached, at Yellow River, Ga., the end of the survey. Here is a dam 7.3 feet high, which operates the Simmons roller mills. The lower reaches of the river are thickly settled, cotton and grain being the principal crops, but the upper part of the river is almost entirely in timber land.

The elevations in the following list are based on an aluminum tablet at the Washington street entrance of the State capitol building at Atlanta, marked "1,050 M C," the elevation of which is accepted as 1,049.546 feet above mean sea level. The initial point of this list is a bench mark of flying levels on Ocmulgee River.

The leveling was done in 1903, under the direction of F. A. Franck, field assistant, by Joseph Palmer, levelman.

Elevations on Yellow River from mouth near Worthville to Yellow River, Ga.

Distance in miles.		Elevation in feet.
0.0	Yellow River, mouth of, opposite, nail in root of pine tree	506.94
.0	Surface of water	500
.5	Indian Fishery Shoals, 10 feet of from water, nail in root of ash tree	517.24
.5	Foot of shoals, surface of water	504
.0	Head of Indian Fishery Shoals, surface of water	516
2.5	Allens bridge, east bank, 20 feet from river, nail in root of maple tree	528.49
2.5	Surface of water	517
4.7	Lees Shoals, foot of, west bank, nail in root of ash tree	528.49
4.7	Surface of water	520
	Lees Shoals, head of, surface of water	523
6.2	Pickett Bridge, on east bank, nail in root of white oak	539.23
6.2	Surface of water	526
10.7	Flat Shoal Bridge, west bank, nail in root of white oak	551.24
10.7	Surface of water	534
13.8	Langdons Shoals, west bank, 15 feet from river, nail in root of white oak	549.69
13.8	Surface of water	539
	Langdons Shoals, head of, surface of water	543
16.9	Porterdale Shoals, foot of, 10 feet from river, west bank, nail in root of white oak	561.05
16.9	Surface of water	549
	Porterdale dam, foot of, surface of water	604
	Porterdale dam, head of, surface of water	616
17.7	Porterdale, 30 feet from dam, 20 feet from south approach, nail in root of white oak	618.38
17.7	Surface of water	616
17.7	Wagon bridge, east side of river, at extreme south end of bridge, top of steel post of railing	627.81
20.8	Browns Bridge, 60 feet above, 10 feet from river, on root of gum tree	622.81
20.8	Surface of water	611.6
22.8	Tin Bridge, on west bank river, nail in root of poplar tree	627.49
22.8	Surface of water	617
23	Georgia Railroad bridge, west side of river, on top of rock, chisel mark	642.05
23	Surface of water	617
24.3	Hendricks Bridge, north bank of river, nail in root of water oak	639.11
26	Haynes Creek, opposite mouth of, nail in root of water oak	632.26
26	Surface of water	624.6
28.2	McDaniels Bridge, west bank of river, nail in root of large water oak	644.17
28.2	Surface of water	632
	McDaniels dam, head of, surface of water	641
30.5	West side of river, Pine Log Bridge, 10 feet below, nail in root of pine	650.55
30.5	Surface of water	641

Elevations on Yellow River from mouth near Worthville to Yellow River, Ga.—Continued.

Distance in miles.		Elevation in feet.
32.2	Botosh Creek, 100 yards above mouth of, left bank of river, nail in root of pine	653.96
32.2	Surface of water	644
32.8	Foot of Milstead Shoals, west bank, nail in pine tree	657.41
32.8	Surface of water	647
33	Milstead, foot of dam, surface of water	677
33	Milstead, top of dam, surface of water	692
33	40 feet above wagon bridge, on south side of river, nail in root of large white oak	701.33
33	Surface of water	692
35.4	Irvins Bridge, 20 feet above, left bank of river, nail in root of hickory tree	697.83
35.4	Surface of water	692
36.5	Right bank, nail in root of water oak	700.62
36.5	Surface of water	694
39.4	Johnsons Bridge, east end of, top of bolt	717.53
39.4	Surface of water	702
40.2	Surface of water	705
40.3	Surface of water	707
40.8	Surface of water	709
40.9	Surface of water	711
40.9	Old dam, west side, on point in stone masonry	722.88
40.9	Surface of water	712
41.3	Foot of shoals, surface of water	714
	Head of shoals, surface of water	715
41.9	Opposite shoals, right bank, 20 feet from stream, nail in root of white oak	730.91
41.9	Surface of water	715
42.4	Mountain Creek, opposite, nail in root of white oak	727.91
42.4	Surface of water	720
43.2	Rock Bridge, on left bank, top of stone pier of	740.60
43.2	Surface of water	724
44	West bank, 10 feet from river, nail in root of ash tree	728.48
44	Surface of water	727
45.5	Opposite foot of shoals, nail in root of hickory tree	748.83
45.5	Surface of water	729
	Anniestown Shoals, foot of, surface of water	737
	Anniestown dam, foot of, surface of water	760
	Head of dam, surface of water	771
47.2	Anniestown, east bank of Haydens Branch, nail in root of large birch tree	777.64
48.6	Old mill, on large rock opposite, chisel mark	788.55

Elevations on Yellow River from mouth near Worthville to Yellow River, Ga.—Continued.

Distance in miles.		Elevation in feet.
48.6	Surface of water	772
	Head of shoals, surface of water	786
50.5	Sextons Bridge, on stone pier at, top of iron bolt	809.94
50.5	Surface of water	791
51.7	Opposite shoals, nail in root of pine	808.42
51.7	Surface of water	793
	Foot of shoals, surface of water	797
	Head of shoals, surface of water	802
53	Head of shoals, nail in root of hickory tree	818.17
53	Surface of water	804
54	Surface of water	807
55	Yellow River Bridge, left bank, nail in root of oak	825.41
55	Surface of water	815
55.7	Yellow River, east bank, 100 yardsa bove Simmons's mill, nail in root of large water oak	834.86
	Simmons's mill, below dam, surface of water	819
	Simmons's mill, head of dam, surface of water	826

ALCOVY RIVER BELOW DABNEY'S BRIDGE, GEORGIA.

In connection with this survey 17 bench marks were established and 26 water elevations were recorded. The total fall in the distance surveyed is 231 feet, but at only two points, namely, White and Factory shoals and Henderson Shoals, is the fall considerable. The remainder of the river is mostly sluggish, and tree trunks, driftwood, and other débris greatly retard the flow, so that during the rainy season the river is slow to discharge, causing the water to rise higher or spread out wider than is usually the case with rivers in this section of Georgia. The average width of the river is about 125 feet, except where shoals occur, at which points it sometimes widens to 300 feet. Very wide and low bottom lands are on each side for the first 7 miles upstream from its mouth. Then the topography suddenly changes and is much more abrupt and broken for several miles.

At the mouth of Bear Creek, which enters from the east 8 miles above the mouth of the Alcovy, is the beginning of White and Factory shoals, which form one continuous series with a fall of 83 feet in one-half mile. Here the river is in a gorge 300 feet wide, with banks over 100 feet high at several places, and midway of this shoal is an excellent site for a dam. Granite, apparently free from seams, is exposed at the surface on both sides of the river, while the river bed itself is solid rock. A dam at this point would be approxi-

mately 250 feet long. At the upper end of the shoals is another good site with the same character of bottom. A dam would have to be about 325 feet in length, and a large volume of water could be stored through the dry season, as the valley widens just above the dam site. A dam at either site would require a canal from the dam to the foot of the shoals. An old corn mill at this point uses a small wooden dam to divert the water into its flumes. Many years ago a large cotton factory stood on this site, but it was burned and never rebuilt.

Six miles above these shoals are Henderson Shoals, with a fall of 2 feet. A 6-foot dam has been erected here to supply power for a large gristmill, the back water from which extends to Dabney's bridge, 4 miles above.

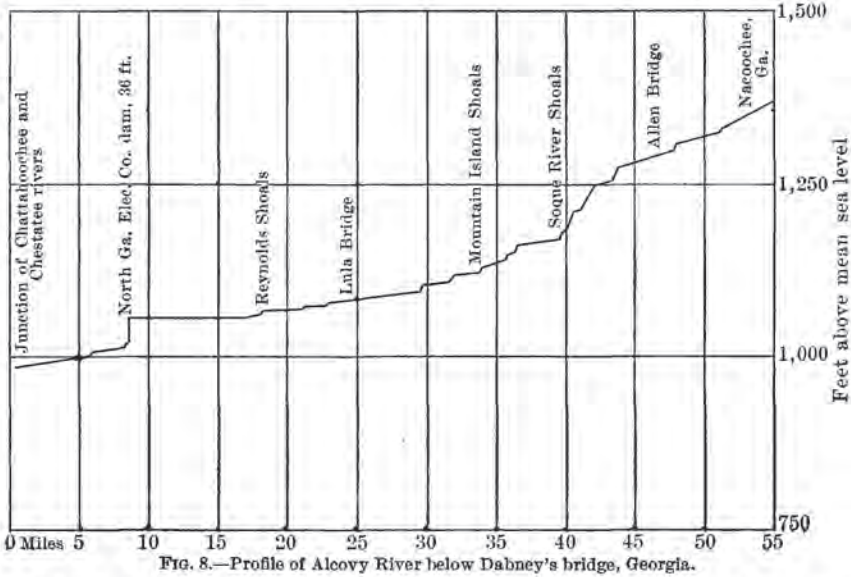


FIG. 8.—Profile of Alcovy River below Dabney's bridge, Georgia.

The construction of dams at any other points than those described would result in the sacrifice of much valuable bottom land.

The soil is very fertile, and splendid crops of cotton on the high lands and corn in the bottoms are grown on both sides of the river. With better drainage, however, a much larger amount of land could be reclaimed and made valuable for cultivation.

The elevations in the following list are based upon an aluminum tablet at the Washington street entrance of the State capitol building at Atlanta marked "1050 M C," the elevation of which is accepted as 1,049.546 feet above mean sea level, as determined by the 1903 adjustment. The initial point of this list is a bench mark of flying levels on Ocmulgee River.

The leveling was done in 1903, under the direction of F. A. Franck, field assistant, by Joseph Palmer, levelman.

Elevations on Alcovy River, from mouth, near Worthville, to Dabney's bridge, near Starrsville.

Distance in miles.		Elevation in feet.
0.0	Alcovy River, mouth of, opposite, on west bank of Ocmulgee River, nail in root of white oak	494.27
.0	Surface of water	484
1	Right bank of river, nail in root of ash tree	493.73
1	Surface of water	487
2	East bank of river, near water, nail in root of ash tree	498.40
2	Surface of water	492
3.9	Waters's bridge, spike in northeast corner	506.55
3.9	Surface of water	493
4.9	West side of river, near water, nail in root of ash tree	505.37
4.9	Surface of water	497
5.9	Left bank of river, nail in root of birch tree	505.51
5.9	Surface of water	500
6.3	Mackey Shoals, opposite foot of, on left bank, nail in root of ash tree	512.77
6.3	Mackey Shoals, foot of, surface of water	502
6.4	Mackey Shoals, head of, surface of water	504
8.2	Mackey Second Shoals, opposite foot of, left bank, nail in root of birch tree	518.50
8.2	Mackey Second Shoals, foot of, surface of water	505
	Mackey Second Shoals, head of, surface of water	508
9	Newton Factory Shoals, foot of, surface of water	509
9.2	Dam at White's mill, on Newton Factory Shoals, opposite, nail in root of black gum	562.86
9.2	Dam, foot of, surface of water	553
9.2	Dam, top of, surface of water	558
9.8	Newton Factory Bridge, on lower end of, on nut, top of bolt	592.81
9.8	Surface of water	582
10	Newton Factory Shoals, head of, surface of water	592
10.8	Left bank of river, nail in root of red-oak tree	619.86
10.8	Surface of water	593
11.5	Foot of shoals, surface of water	594
11.55	Head of shoals, surface of water	596
12.3	Left bank of river, nail in root of water oak	604.59
12.3	Surface of water	597
13	West bank, opposite shoals, nail in root of large beech tree	604.88
13	Surface of water	598
13.3	East bank river, nail in sweet-gum tree	612.85
14	Left bank river, nail in root of water oak	620.76
14	Surface of water	602
15	Henderson's bridge and mill, right bank of river, near end of bridge, nail in root of post oak	618.99
15	Surface of water	604

Elevations on Alcovy River, from mouth, near Worthville, to Dabney's bridge, near Starrsville—Continued.

Distance in miles.		Elevation in feet.
15	Henderson's mill, foot of dam, surface of water	607
15	Henderson's mill, head of dam, surface of water	613
18.3	Dabney's bridge, west side of river, near end of, nail in root of water oak (raised cut with hatchet)	627.22
18.3	Surface of water	615

TOWALIGA RIVER BELOW HIGHFALLS, GA.

Towaliga River was surveyed from its mouth, near Berner, Ga., to Highfalls, Ga., a distance of 21.7 miles. The levels are based on a line carried down South and Ocmulgee rivers from Constitution earlier in the season. The plane-table sheets were all plotted on the scale of 1:22,500. Twelve bench marks were established and 23 water-surface elevations were determined.

Towaliga River flows in a southeasterly direction and empties into Ocmulgee River. In the distance surveyed there is a fall of 194 feet, but with the exception of Highfalls there are few shoals or rapids. For 21 miles above its mouth the stream does not average more than 50 feet in width, and is very shallow. It is swift and has a clean bed.

At Highfalls there is a drop of 95 feet in a distance of 3,000 feet, in the middle of which there is a sudden drop of 42 feet, known as the Highfalls. This is an excellent dam site, for, although during the normal stage of water the volume is small, there are splendid facilities to store the water above, as the bottom is widened out into a natural basin. A flour mill has been in operation here for over one hundred years, but it uses only a trifling part of the power. It is now proposed to erect a 25-foot dam at this point to supply electric power for a railway to Indian Springs, Ga., a summer resort 8 miles from Highfalls, and also for lighting the town of Forsythe, 14 miles to the southwest. Property for 6 miles above the falls has been purchased for a storage basin. Between Highfalls and the mouth of the river there are good bottom lands, but the country is thinly settled and most of it is still in timber. The principal crops are cotton and corn.

The elevations in the following list are based upon an aluminum tablet at the Washington street entrance of the State capitol building at Atlanta, marked "1050 M C," the elevation of which is accepted as 1,049.546 feet above mean sea level, as determined by the 1903 adjustment. The initial point of this list is a bench mark of flying levels on Ocmulgee River.

The leveling was done in 1903, under the direction of F. A. Franck, field assistant, by Joseph Palmer, levelman.

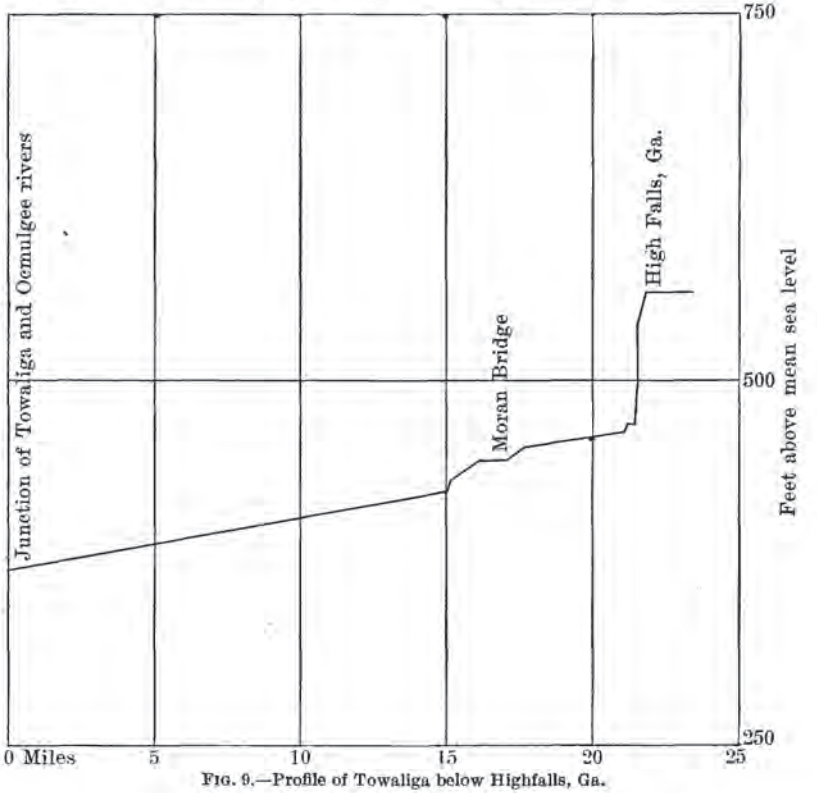


FIG. 9.—Profile of Towaliga below Highfalls, Ga.

Elevations on Towaliga River from mouth, near Berner, to Highfalls.

Distance in miles.		Elevation in feet.
0.0	Towaliga River, mouth of, on south side between railroad track and river, nail in root of water oak	379.34
.0	Surface of water	367
1.7	Lamars Bridge, near east end of, nail in root of beech tree	381.99
1.7	Surface of water	371
2.2	Small creek on west bank, mouth of, nail in root of ash tree	377.38
2.2	Surface of water	373
3.7	Surface of water	376
4	West bank, 50 feet from river, nail in root of large pine tree	412.45
4	Surface of water	379
4.6	Surface of water	382
6	Hunting Shoal Bridge, stone pier, on north end of bridge, iron bolt	412.80
6	Surface of water	386
7	North bank, 10 feet from river, twin water oak, nail in root of	399.49
7	Surface of water	393

Elevations on Towaliga River from mouth, near Berner, to Highfalls—Continued.

Distance in miles.		Elevation in feet.
8.8	Jacksons Bridge, west bank of river, large poplar tree, nail in root of	409.84
8.8	Surface of water	395
9.5	Surface of water	377
10.5	West bank of river, creek, 100 yards above mouth of, 10 feet from river, nail in root of pine tree	416.15
10.5	Surface of water	400
11.8	Wilsons Bridge, 10 feet below east approach, nail in root of water oak	421.06
11.8	Surface of water	406
12.3	West bank, on water oak	431.01
12.3	Surface of water	410
13.3	North and South forks of North Fork, 100 yards above junction of, nail in root of birch tree	416.93
13.3	Surface of water	414
14	Foot of shoals, surface of water	418
14.1	Head of shoals, surface of water	421
15	Foot of shoals, surface of water	422
15.1	Head of shoals, surface of water	428
15	Opposite shoals, north bank, nail in root of birch tree	432.23
15.5	Foot of shoals, surface of water	429
15.6	Head of shoals, surface of water	434
16	Morans Bridge, on north bank, 20 feet east of, nail in root of white oak	443.61
16	Foot of shoals, surface of water	437
16.1	Head of shoals, surface of water	439
17.4	Opposite shoals, nail in root of willow	449.74
17.4	Surface of water	443
17.5	Foot of shoals, surface of water	446
17.5	Head of shoals, surface of water	450
18	Tobes Creek, mouth of, nail in root of pine	457.48
18	Surface of water	452
18.5	Foot of shoals, surface of water	452
.0	Head of shoals, surface of water	454
18.7	Small shoals, surface of water	455
.0	Head of small shoals, surface of water	457
19.2	Branch, south bank, 20 feet above mouth of, nail in root of birch tree	462.60
21.2	Long shoals, foot of, south bank, nail in white oak tree	474.31
21.2	Surface of water	466
21.2	Highfalls Shoals, foot of, surface of water	492
21.3	Highfalls, head of Highfalls Shoals, surface of water	524
21.3	Highfalls, wagon bridge over Towiliga River, west side north approach to, top of iron bolt	563.32
21.7	Old dam, opposite, head of long shoals, surface of water	561
.0	Highfalls, high-water mark	561

CHATTAHOOCHEE RIVER FROM CHESTATEE TO SAUTEE, GA.

A survey of the upper Chattahoochee River between Chestatee and Sautee, Ga., a distance of 55 miles, was made during July and August, 1903. Between these two points a fall of 387 feet was found, the greater part of which is above the mouth of Soque River. During the survey 25 bench marks were established and 90 water-surface elevations determined. The plane-table sheets were plotted on a scale of 1:22,500. The original elevations for the levels were based upon an assumed elevation near Gainesville, Ga., but, as published herein, they have been reduced to mean sea level.

Above the mouth of Chestatee River for 10 miles are a number of small shoals aggregating a fall of 28 feet. Ten miles above the mouth of the Chestatee, Little River empties from the north, and at this point are the first good shoals, where there is a fall of 7 feet in a distance of 300 yards. A quarter of a mile above this point the North Georgia Electric Company is constructing a dam 36 feet high, which is to supply electric power. The backwater from this dam will extend 8 miles upstream, to just above Clarks Bridge. One half mile above this point is a shoal having a 9-foot fall in half a mile.

Just above this shoal are Reynolds Shoals, with a fall of 6 feet in 250 yards. There is a good power site at this point, as the banks and bottom are hard rock. From here to Mud Creek, 3 miles, there is a uniformly distributed fall of 15 feet, while just above the mouth of Mud Creek there is a good dam site. A dam here would be about 300 feet long, but the height could be 40 to 50 feet or more, if desired.

The next shoal of importance is Mountain Island Shoal. It gives a fall of 8 feet in half a mile. Here the river flows around the island between banks 100 feet high. A dam at the lower end would be 300 feet long. Perkins Shoals come next, 2 miles upstream, with a fall of 6 feet, and just above them is a shoal with a 7-foot fall. These could be used together.

From here to the mouth of Soque River is a uniform fall of 11 feet, and just above the mouth of the Soque there is a fall of 8 feet in 650 feet. For the next 3 miles there is a continuous succession of shoals, with a fall of 74 feet. The river flows in a narrow gorge of hard, unseamed rock, and at several points dams could easily be constructed. Above this point the river narrows very greatly, and is full of small shoals as far as Nacoochee Valley. From the valley to the end of the survey there are no falls or shoals.

Nacoochee Valley is very fertile and grain and grasses are raised. A large quantity of timber is still standing along the river, especially in the upper half of the valley.

The elevations in the following list are based upon an aluminum tablet at Nacoochee, marked "1349 Atlanta," in a ledge of rock 200

feet west of ford of Chattahoochee River, the elevation of which is now accepted as 1;348.269 feet above mean sea level.

The adjustment of this line was accomplished in conjunction with leveling on Chestatee and Soque rivers, tied at Willow and Clarksville, respectively, and by an extra check at Pole to primary-level circuits, and accords with the 1903 adjustment of the precise-level net.

The leveling was done in 1903, under the direction of F. A. Franck, field assistant, by Joseph Palmer, levelman.

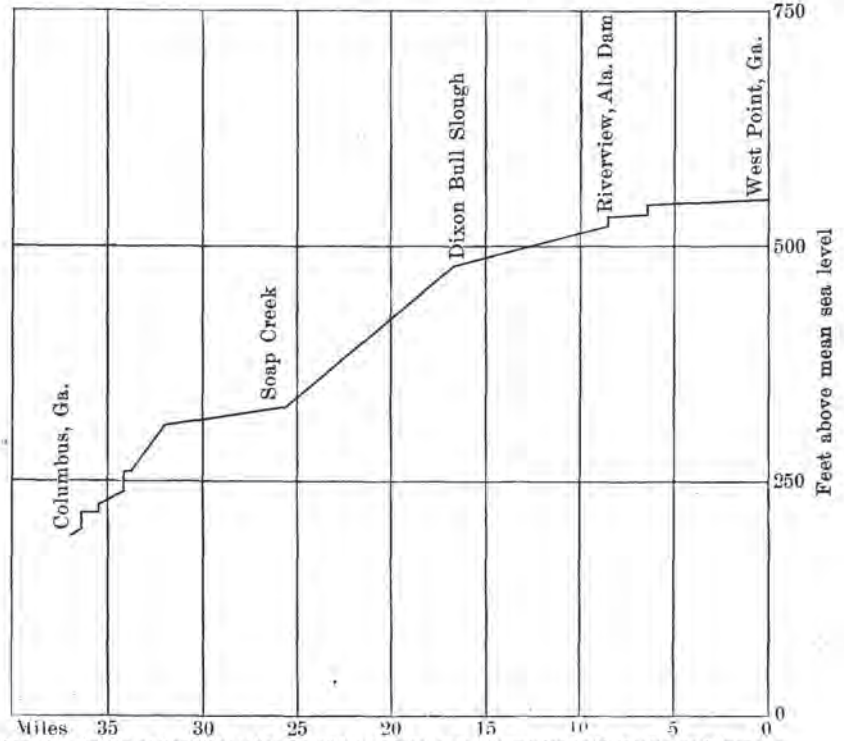


FIG. 10.—Profile of Chattahoochee River from Nacoochee to junction with Chestatee River, Ga.

Elevations on Chattahoochee River from Keith's bridge, at mouth of Chestatee River, to Nacoochee.

Distance in miles.		Elevation in feet.
0.0	Near Keith's bridge, mouth of Chestatee River, on nail in root of walnut tree	964.37
.0	Surface of water	950
.0	Foot of shoals, surface of water	950
.0	Head of shoals, surface of water	956
1.7	On nail in root of walnut tree, north bank of river	989.71
3.7	Foot of shoals, surface of water	960
3.7	Head of shoals, surface of water	963

Elevations on Chattahoochee River from Keith's bridge, at mouth of Chestatee River, to Nacoochee—Continued.

Distance in miles.		Elevation in feet.
5.7	Small shoals, edge of public road opposite, nail in root of large walnut tree	985.61
5.7	Small shoals, surface of water	965
6.2	Surface of water	966
6.8	Iron bridge, nail in root of large walnut tree	980.26
6.8	Surface of water	967
6.8	Foot of shoals, surface of water	967
7.3	Head of shoals, surface of water	972
8.3	Thompson Bridge, nail in root of large walnut tree	998.36
8.3	Surface of water	977
9.4	Little River, mouth of, foot of shoals, surface of water	978
9.4	Head of shoals, surface of water	984
10	North Georgia Electric Company's new dam, 100 yards below, north side of bluff, nail in root of white oak	1,004.04
10	Surface of water	985
11	Chattahoochee Park, on east side and at sharp bend of river, nail in birch tree	1,004.27
	Foot of shoals, surface of water	996
	Head of shoals, surface of water	1,010
12.2	New Bridge, near Gainesville, near small store building, large oak tree, spike in root of	1,028.32
12.2	Surface of water	1,011
13.2	South bank of river, 6 feet from water, willow tree, nail in root of	1,014.94
13.2	Surface of water	1,012
13.9	Foot of shoals, surface of water	1,012
	Head of shoals, surface of water	1,014
16.2	Clarks Bridge, east side of river, large maple tree, nail in root of	1,039.81
16.2	Surface of water	1,017
17.2	Small bluff, north side of river, poplar tree, nail in root of	1,045.27
17.2	Surface of water	1,020
	Head of shoals, surface of water	1,024
19.2	Red oak tree, nail in root of	1,043.29
19.2	Foot of shoals, surface of water	1,025
19.5	Foot of shoals, surface of water	1,028
	Head of shoals, surface of water	1,332
21.2	Savage Ferry, nail in notch of oak post	1,051.30
21.2	Surface of water	1,034
22.2	Left bank of river, nail in root of birch tree	1,050.46
22.2	Surface of water	1,037
23.9	North bank of river, nail in root of water-oak tree	1,046.76
23.9	Surface of water	1,038

Elevations on Chattahoochee River from Keith's bridge, at mouth of Chestatee River, to Nacoochee—Continued.

Distance in miles.		Elevation in feet.
23.9	Head of shoals, surface of water	1,040
24.9	Seven Island shoals, opposite foot of, large poplar tree, nail in root of	1,066.94
	Foot of shoals, surface of water	1,040
	Head of shoals, surface of water	1,044
25.6	Flat Creek, 1 mile above mouth of, nail in root of poplar tree	1,045.84
25.6	Surface of water	1,045
26.5	Lulu bridge, 60 feet below, on north bank of river, red oak tree, nail in root of	1,065.68
26.5	Surface of water	1,049
28.8	Walnut tree in large open bottom, left bank of river, nail in root of	1,076.23
	Surface of water	1,053
29.8	Belton bridge, 100 yards below, right bank of river, walnut tree, nail in root of	1,076
29.8	Surface of water	1,056
31.8	Right bank of river, pine tree, nail in root of	1,092.99
31.8	Foot of shoals, surface of water	1,061
31.9	Head of shoals, surface of water	1,069
32.6	Nail in root of birch tree	1,085.79
32.6	Surface of water	1,070
	Foot of shoals, surface of water	1,071
	Head of shoals, surface of water	1,073
33.1	Head of shoals, on side of bluff, large pine, opposite, nail in root of	1,092.83
33.1	Surface of water	1,082
33.2	Harrisons Shoals, foot of, surface of water	1,084
34.1	Harrisons Shoals, opposite, nail in root of oak tree	1,101.70
34.1	Harrisons Shoals, surface of water	1,087
	Harrisons Shoals, head of, mouth of Mossy Creek, surface of water	1,087
34.2	Mountain Island Shoals, foot of, surface of water	1,088
	Head of shoals, surface of water	1,096
34.5	Head of shoals, opposite, nail in root of white oak	1,109.78
35.2	Foot of shoals, surface of water	1,101
35.2	Head of shoals, surface of water	1,106
35.2	Perkins Shoals, opposite foot of, nail in root of water oak	1,113.68
35.2	Perkins Shoals, foot of, surface of water	1,107
	Perkins Shoals, head of, surface of water	1,113
37.3	Foot of shoals, surface of water	1,115
	Head of shoals, surface of water	1,123
37.4	Head of shoals, north bank of river, opposite, nail in root of black-gum tree	1,127.76
38.2	Foot of shoals, surface of water	1,127
38.2	Head of shoals, surface of water	1,130

Elevations on Chattahoochee River from Keith's bridge, at mouth of Chestatee River, to Nacoochee—Continued.

Distance in miles.		Elevation in feet.
38.3	Duncan Bridge, 30 feet below, nail in red-oak tree	1,148.90
38.4	Foot of shoals, surface of water	1,131
38.6	Head of shoals, surface of water	1,135
38.6	Head of shoals, opposite, nail in root of water oak	1,155.41
39.3	Soque River, south bank, at mouth, nail in root of birch tree	1,147.82
39.3	Surface of water	1,137
39.3	Soque River, mouth of, in forks of river, nail in root of pine stump	1,148.86
39.3	Surface of water	1,137
39.6	Head of shoals, surface of water	1,144
39.8	Foot of shoals, surface of water	1,149
40	Head of shoals, surface of water	1,159
40	Head of shoals, opposite, on west bank of river, nail in root of red oak	1,165.20
40.5	Long shoals, head of, surface of water	1,178
40.8	Foot of shoals, surface of water	1,178
	Head of shoals, surface of water	1,216
41.8	Head of shoals, root of hickory tree	1,222.10
42.3	Irwins Bridge, 10 feet below, left bank of river, nail in root of poplar tree	1,223.37
42.3	Surface of water	1,216
42.6	Irwins bridge, just above, surface of water	1,222
43.2	Head of shoals, surface of water	1,228
43.5	Foot of shoals, surface of water	1,229
	Head of shoals, surface of water	1,242
43.5	Blue Creek, surface of water	1,243
43.6	Blue Creek, 100 yards above mouth of, in fork, nail in root of red oak tree	1,256.09
44.2	Amos Ford, on west bank, large birch tree, nail in root of	1,256.09
44.2	Surface of water	1,244
44.5	Surface of water	1,247
45	Head of shoals, surface of water	1,250
46	Allens Bridge, west end of, red oak tree, nail in root of	1,266.49
46	Surface of water	1,256
	Head of shoals, surface of water	1,259
46.8	Foot of shoals, surface of water	1,260
	Head of shoals, surface of water	1,263
46.8	Head of shoals, opposite, nail in root of birch tree	1,264.18
47.3	Foot of shoals, surface of water	1,271
	Head of shoals, surface of water	1,274
47.5	Shoals, opposite head of, nail in root of pine tree	1,280.73
48.5	Foot of shoals, surface of water	1,276

Elevations on Chattahoochee River from Keith's bridge, at mouth of Chestatee River, to Nacoochee—Continued.

Distance in miles.		Elevation in feet.
49	Head of shoals, surface of water	1,280
49	Shoals, red oak opposite head of, nail in root of	1,285.53
49	Head of shoals, surface of water	1,288
49.2	Sharp bend of river, water oak tree, nail in root of	1,304.53
49.2	Surface of water	1,292
50.5	Suspension footbridge, poplar tree at, nail in root of	1,305.97
50.5	Surface of water	1,297
51.8	Foot of shoals, surface of water	1,299
	Head of shoals, surface of water	1,306
53	Sautee Creek, near mouth of, in Nacoochee Valley, surface of water	1,309
55	Sautee Creek, ford near mouth, surface of water	1,339
55	Nacoochee post-office, 200 feet west of, ford of Chattahoochee River, 6 feet above surface of road, on ledge of rock, aluminum tablet marked "1349 Atlanta"	1,348.269

CHATTAHOOCHEE RIVER FROM CHATTAHOOCHEE TO FRANKLIN, GA.

A survey of the middle Chattahoochee River was made between Chattahoochee and Franklin, Ga., a distance of 65 miles. The elevations for this survey were based upon the United States Geological Survey bench mark at Chattahoochee, Ga., and the plane-table sheets were plotted on a scale of 1:22,500.

In the lower section of the river for 21 miles the Chattahoochee is without shoals or rapids until Redmens Shoals are reached, where there is a fall of 2 feet. The next shoals, Maderia Shoals, 11 miles farther downstream, have a fall of 6 feet in half a mile. Here, on the west side, is a large bluff of hard rock, and on the east side are flat bottom lands. The water is very shallow, and the stream has a rocky bottom. A dam here would be about 600 feet long, and to be made of sufficient height to develop any amount of head would flood valuable bottom lands above.

Below Maderia Shoals the river runs over small riffles of 1 to 2 feet until the Central of Georgia Railroad bridge is reached, and for 5 miles below this point there is practically no fall until McIntosh Shoals are reached, where there is a fall of 8 feet in a quarter of a mile. The river here runs through broken country, with high banks on both sides, showing good exposures of hard rock. A dam here would be 600 feet long, but several rocky islands would probably reduce the cost of construction. The dam could be 25 feet high or more if necessary.

Seven miles farther down the river are Fishtrap Shoals, with a 6-foot fall in a quarter of a mile. A dam here would be 700 feet long, as the west bank is low. Two miles downstream is the beginning of Bushhead Shoals, the best dam site on this section of the river. Here there is a fall of 7 feet, but added to the 5 feet just above and the 6 feet of Fishtrap Shoal, a total fall of 19 feet could be obtained in a distance of 5 miles. A dam built here would be 650 feet long and could be of any desired height. Good rock is exposed on each bank. Two flourishing towns, Newnan and Carrollton, which are about 15 miles from here, in opposite directions, would utilize this power. One mile below is a small 4-foot shoal, where the banks of the river are very flat.

At the mouth of Centralhatchee Creek, 2 miles below, is the last shoal, which has a 2-foot fall. It does not offer a good opportunity for development, owing to the low and extensive bottom lands on

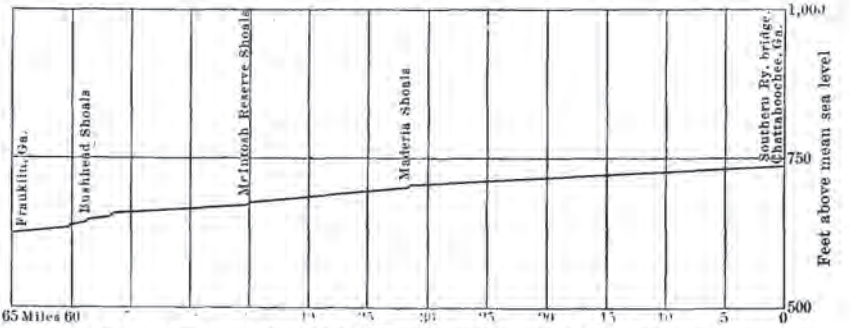


FIG. 11.—Profile of Chattahoochee River from Chattahoochee to Franklin, Ga.

the north side of the river. This section of the river has a width of about 300 feet, but in some places widens to over 1,000 feet.

Valuable and extensive bottom lands are under high cultivation, principally cotton and corn being raised, but the transportation facilities are very poor. The overflow from the river several times a year spreads a slimy sediment over the bottom which seems to act as a rich fertilizer.

For 4 miles below Chattahoochee there are valuable clay beds on the south side of the river, which have been excavated to a depth of 10 feet for brick manufacture.

The elevations in the following list are based on an aluminum tablet at the Washington street entrance to the State capitol building at Atlanta, marked "1050 M C," the elevation of which is now accepted as 1,049.546 feet above mean sea level. The line is adjusted to accord at each end, Oakdale and Franklin, with corrected primary elevations in accord with the 1903 adjustment.

The leveling was done in 1903, under the direction of F. A. Franck, field assistant, by Joseph Palmer, levelman.

Elevations on Chattahoochee River from Chattahoochee to Franklin.

Distance in miles.		Elevation in feet.
0.0	Oakdale, in front of station, main track, top of south rail	809.20
.0	Surface of water	740
.5	Left bank of river, on root of willow tree	741.82
.5	Surface of water	739
1.6	Mason and Turner Ferry, near east approach to, on root to hickory tree	754.38
1.6	Surface of water	738
3.4	Old ferry, 10 feet from left bank, on root of sycamore tree	751.35
3.4	Surface of water	736
4.1	Left bank, 20 feet above bridge, on root of water oak	752.94
4.1	Surface of water	735
5.4	Left bank, 40 feet from river, on root of walnut tree	755.10
5.4	Surface of water	732
6.4	Left bank, 30 feet from river, on root of walnut tree	746.41
6.4	Surface of water	730
7.4	Left bank, 40 feet from river, on root of walnut tree	752.90
7.4	Surface of water	729
8.4	Left bank, 20 feet from river, on root of sweet gum tree	742.16
8.4	Surface of water	727
10.3	Adaholts Ferry, mouth of Sweetwater Creek, opposite, on root of large sycamore tree	744.73
10.3	Surface of water	726
11.3	Left bank, 30 feet from river, on root of large walnut tree	747.58
11.3	Surface of water	725
12.8	Dupree Ferry, left bank, 15 feet from river, on root of elm tree	738.09
12.8	Surface of water	723
14.8	Left bank, 70 feet from river, on root of walnut tree	746.29
14.8	Surface of water	721
16.6	Camp Creek, mouth of, on root of ash tree	736.13
16.6	Surface of water	720
17	Left bank, 20 feet from river, on root of walnut tree	741.78
17	Surface of water	719
17.9	Campbellton Ferry, 10 feet from river, left bank, on root of sycamore tree	728.69
17.9	Surface of water	719
20.6	Brock's ferry, 10 feet from river, left bank, on root of white oak tree	730.49
20.6	Surface of water	716
21.2	Redmens Shoals, left bank, 10 feet from river on root of sycamore tree	728.58
21.2	Surface of water	716
21.3	Redmens Shoals, foot of, surface of water	714
21.7	Pea Creek, mouth of, surface of water	714

Elevations on Chattahoochee River from Chattahoochee to Franklin—Continued.

Distance in miles.		Elevation in feet.
22	Rivertown Ferry, left bank, 10 feet from river, on root of sycamore tree	720.64
22	Surface of water	714
23.4	Pumpkintown Ferry, left bank, 15 feet from river, on large birch tree	727.94
23.4	Surface of water	712
24.5	Bear Creek, mouth of, on root of poplar tree	730.35
24.5	Surface of water	712
25.6	Left bank, 40 feet from river, on root of walnut tree	725.50
25.6	Surface of water	710
28.1	Defer's ferry, left bank, 15 feet from river, on large birch tree	722.92
28.1	Surface of water	709
29.6	Jones Ferry, left bank, 15 feet from river, on root of pine tree	718.60
29.6	Surface of water	706
30	Ballard Shoals, 10 feet from river, left bank, on root of willow tree	711.13
30.9	Ballard Shoals, head of, surface of water	705
31.1	Ballard Shoals, foot of, surface of water	704
31.4	Madeira Shoals, head of, surface of water	704
31.8	Madeira Shoals, opposite, on right bank, on root of white oak, side of rock bluff	716.81
31.8	Madeira Shoals, surface of water	702
32.1	Wolf Creek, mouth of, foot of Madeira Shoals, surface of water	698
33.4	Hutchinson's ferry, right bank, 20 feet from river, on root of maple tree	709.12
33.4	Surface of water	694
35.1	Long Island, upper end of, head of shoals, surface of water	692
35.1	Right bank, head of shoals, in root of pine tree	709.11
36	Long Island, opposite lower end of, foot of shoals, nail in root of water oak tree	703.37
36	Surface of water	689
37.5	Snake Creek, right bank, 10 feet from river, 100 yards above mouth, on root of willow tree	696.72
37.5	Surface of water	688
38.6	Moores Ferry, right bank, on root of large birch tree	702.85
38.6	Surface of water	686
39.2	Shoals, head of, surface of water	685
39.3	Shoals, foot of, surface of water	684
40.1	Central, of Georgia, Railroad bridge over river, right bank, 40 feet above bridge, on root of willow tree	692.12
40.1	Surface of water	684
40.1	Shoals, foot of, surface of water	683
40.7	Opposite right bank, nail on root of poplar tree	699.76
40.7	Surface of water	682

Elevations on Chattahoochee River from Chattahoochee to Franklin—Continued.

Distance in miles.		Elevation in feet.
41.4	Reese's ferry, right bank, on root of ash tree	693.86
41.4	Surface of water	682
41.7	Head of Shoals, surface of water	682
41.8	Foot of Shoals, surface of water	681
42.6	Fridell Shoals, head of, surface of water	680
42.7	Fridell Shoals, foot of, surface of water	679
43	Foot of bluff, right bank of river, nail in root of sweet gum tree	684.36
43.6	Hanson Shoals, head of, surface of water	678
43.9	Houston Ferry, nail in root of catalpa tree	684.02
43.9	Surface of water	677
44.9	McIntosh Reserve Shoals, head of, surface of water	676
45.4	McIntosh Reserve Shoals, foot of, right side of bank, nail in root of sweet gum tree	679.49
45.4	McIntosh Reserve Shoals, foot of, surface of water	668
46.1	Culpepper, mouth of, on root of red oak tree	678.04
46.1	Surface of water	667
49	Whooping Creek, mouth of, nail in root of birch tree	670.70
49	Surface of water	664
50	Brown's ferry, right bank, nail in root of walnut tree	661.96
50	Surface of water	662
50.7	Yellow Dirt Creek, right bank, nail in root of sweet gum tree	679.80
50.7	Surface of water	662
50.9	Yellow Dirt Creek, mouth of, surface of water	660
53.1	Hollingsworth Ferry, right bank, nail in root of water oak tree	673.31
53.1	Surface of water	658
55	Pink Creek, mouth of, surface of water	658
55.3	Right bank, on nail in root of sweet gum tree	664.97
55.3	Surface of water	658
56.3	Fishtrap Shoals, head of, surface of water	657
56.9	Fishtrap Shoals, right bank, opposite center of shoals, elm tree, nail in root of	670.26
56.9	Fishtrap Shoals, surface of water	652
57.5	Fishtrap Shoals, foot of, surface of water	648
58.5	Bushhead Shoals, opposite upper island, nail in root of birch	653.32
58.5	Bushhead Shoals, head of, surface of water	645
59	Bushhead Shoals, foot of, on side of bluff, nail in root of white oak	648.15
59	Bushhead Shoals, foot of, surface of water	638
60	Head of shoals, surface of water	638
60.2	Foot of shoals, surface of water	634
60.8	Head of shoals, surface of water	634
61	Foot of shoals, surface of water	632
62	Head of shoals, surface of water	632

Elevations on Chattahoochee River from Chattahoochee to Franklin—Continued.

Distance in miles		Elevation in feet.
62.2	Foot of shoals, surface of water	628
63.8	Centralhatchee Creek, opposite mouth of, nail in root of birch	633.49
63.8	Surface of water	628
64	Foot of shoals, surface of water	627
64.5	Franklin, wagon bridge, surface of water	626
64.7	Franklin, on rivet on top left iron pier of east approach of wagon bridge	655.17
65	Franklin, in south side of court-house, bronze tablet marked "695 A"	694.742

CHATTAHOOCHEE RIVER FROM WEST POINT TO COLUMBUS, GA.

Chattahoochee River was surveyed from West Point to Columbus, Ga., a distance of 37 miles, in which there is a fall of 361 feet. During the work 5 bench marks were established and 35 water-surface elevations obtained. The survey was plotted on the scale of 1:22,500, and was accompanied by a flying-level line based on a United States Geological Survey tablet at West Point, Ga.

For 4 miles below West Point the river is sluggish. At Langdale, Ala., there is a wing dam with 9 feet head, operating a knitting mill. The dam is loosely built of light lumber, connecting a number of small islands, and a large amount of water goes to waste.

Probably the best site for a permanent structure at Langdale is about one-half mile below the present mill, where a head of 18 feet would back water to just below West Point. A dam as proposed above would not, except in time of flood, spread the backwater beyond the present banks of the river.

Between Langdale and Riverview, where there is another knitting mill, there is a continuous network of small islands. At Riverview there is a 9-foot wing dam similar to that at Langdale, but it furnishes even less water, as the eastern channel is broader.

From Riverview to Columbus the river is one continuous shoal, and the choice of sites for dam construction rests on minor details rather than amount of power.

Some of the best sites are just below Houstons Ferry, 3¼ miles from Riverview, where a 24-foot dam would have good ledge-rock foundations for the 480 feet of river bed, while the ordinary red clay of the region appears on the banks.

Three miles farther downstream, about 1 mile below Blantons Ferry, is another site, but a dam here would flood a good deal of

bottom land. For 4 miles below here is one of the swiftest and roughest parts of the river. There is a good site at the end of the stretch, just below the Big Bull Slough, and another one-third of a mile above Bartlett's old ferry. The former could probably be developed into a valuable plant, supplying power to West Point, Lanett, Hamilton, Opelika, and a score of smaller towns, all less than 25 miles from this point. A dam probably could be built here with a head of 70 feet. The river bottom is ledge rock, with some bowlders, and the shores are of the same rock covered with more or less soil. A dam 70 feet high would back the water nearly to Mountain Oak Creek. Many of the islands in the river would be flooded. Some of them are large and cultivated to some extent. There would also be some flooding of bottom lands on both sides of the river, but no lands of pronounced value would be destroyed.

About 5¾ miles farther downstream, at what is known locally as Goats Rock, a dam very similar to the above could be constructed. The shore lines are very precipitous and ledge rock outcrops on both banks. A head of 70 feet would utilize all the available power between this point and the proposed dam 5¾ miles above.

Seven and one-half miles below is the beginning of what is known as the old Clapp factory falls. This is one of the best rapids on the river. Unfortunately, the river is exceptionally wide and the construction of a dam would be expensive. The old mill derived its power by means of a wing dam which has not been used upward of fifteen years. A dam here, backing the water up to Goat Rock, and a canal carrying it to the foot of the falls, will give a total head of about 77 feet. The river bottom is ledge rock, and the shores are the same covered with several feet of soil.

One and one-fourth miles below the old Clapp factory is the dam of the Columbus Power Company. This dam has a head of 32 feet, developed by a stone concrete dam, below which the tailrace has been deepened and separated from the river by a stone wall. Part of the power is utilized by the large cotton mill of the company, situated on the east bank of the river. The balance is distributed about the city of Columbus.

One and one-fourth miles farther down the stream is what is called the city mill dam, with 9½ feet head. It is a wooden structure and needs constant attention, furnishing power to the city of Columbus and to a gristmill. Three-fourths of a mile below is a stone dam kept in good repair and owned by the Eagle and Phoenix Company, one of the largest cotton manufacturing companies in the South. Just below this dam is the head of navigation for steamboats.

The elevations in the following list are based upon a bronze tablet in west abutment of Altanta and West Point Railroad bridge over Chattahoochee River at West Point. The elevation of this, as

determined by a net of primary levels, extended from Rome, Ga., a point on the precise-level net, is 573.193 feet above mean sea level, in accord with the 1903 corrected elevation of that place.

The leveling was done under the direction of I. T. Fitch, field assistant, by W. H. Sallee, levelman.

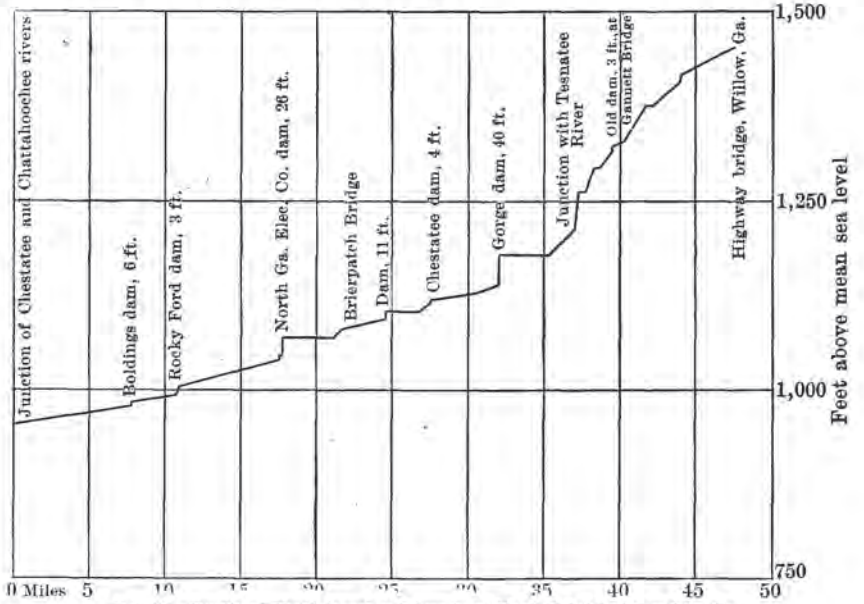


FIG. 12.—Profile of Chattahoochee River from West Point to Columbus, Ga.

Elevations on Chattahoochee River from West Point to Columbus, Ga. (single spur line)

Distance in miles.		Elevation in feet.
0.0	West Point, in west abutment of Atlanta and West Point Railroad bridge over Chattahoochee River, bronze tablet marked "573 A"	573.193
.0	Highway bridge, surface of water	551
.0	Tidewater elevation corresponding to zero of local hydrographic station	549
.0	West Point, opposite, in Alabama, United States engineers' bench mark, 1,000 feet north of highway bridge, 100 feet east of road intersection, west bank of river, 75 feet from water, iron monument sunk in ground	564.28
3.1	Long Cane Creek, surface of water	549
6	Langdale, Ala., 90 feet south of Moores Creek, in factory lawn between factory and track, top of hydrant	548.54
6	Langdale, mill pond at, surface of water	542.1
6	Langdale, below dam, surface of water	533
8.6	Riverview, mill pond, surface of water	532
8.6	Riverview, below mill pond, surface of water	522
8.6	Riverview, opposite, in Alabama, northwest corner of cotton mill, 35 feet southwest of, 50 feet south of dam, top of double-orifice hydrant	534.94

Elevations on Chattahoochee River from West Point to Columbus, Ga. (single spur line)—Continued.

Distance in miles.		Elevation in feet.
12	Houstons Ferry, surface of water	497
14.4	Blantons Ferry, west side of river, 200 feet from edge of water, 25 feet east of poplar tree, wagon road, top of knob, south side of blazed tree	508.74
16.6	Dixons Ferry, surface of water	483
20.3	Bartletts old ferry, 50 feet northwest of west bank of river, top of ledge, rock 18 feet from water	404.78
23.7	Mulberry Creek, Georgia, surface of water	363
34.7	Columbus Power Company, mill pond, surface of water	260
34.7	Columbus Power Company, below pond, surface of water	240
35.9	Columbus, mill pond of city milldam, surface of water	226
	Columbus, below mill pond of city milldam, surface of water	216
36.1	Columbus, above Eagle and Phoenix Company dam, surface of water	216
36.1	Columbus, below Eagle and Phoenix Company dam, surface of water	200
37	Columbus, beneath highway covered bridge, surface of water	190
37	Girard, Ala., Broad and Sixth streets, southeast corner of intersection, bucket and windlass well, 45 feet east of, top of stone guard post at Wm. C. Bill's saloon	255.14

SOQUE RIVER BELOW CLARKSVILLE, GA.

Soque River was surveyed from its mouth, near View, Ga., to Clarksville, Ga., a distance of 8 miles. The levels were based on a line carried up Chattahoochee River from Gainesville, Ga., and the field sheets were platted on the scale of 1:22,500.

The first power is 5½ miles above its mouth and 1 mile below from Bert. Here there is an undeveloped fall of 6 feet in about 50 yards. The south bank is hard rock; the north bank is not very high, but seems to be solid rock. The best site for a dam is probably at the lower end of the falls. A dam here would be about 380 feet long and not over 7 feet high, or the water would back up over the lower end of more valuable shoals above.

At Bert, Ga., are the Porter Shoals, which have a drop of 48 feet—far the best waterfall on the river. A small wing dam develops power to operate Porter's woolen and cotton factory, 4 miles from Demorest, Ga., the nearest railroad point.

About 500 feet upstream is Porter's upper shoal, at which there is a 15-foot fall partly developed by a small dam, and which supplies power for factory No. 2 of the same company. A much greater head would be obtained here by increasing the size of the dam.

One and one-half miles above Bert is a splendid water-power site, known as the Old Factory Shoals, where there is a fall of 23 feet in a distance of 600 feet. There was a dam here at one time, but all

signs of it have vanished. The river is about 350 feet wide and flows in several channels between small islands. Good sandstone outcrops on both banks.

Just above this point the river bottoms widen and the farming lands are better between here and Clarksville, the end of the survey, than any point on the river.

The elevations in the following list are based upon an aluminum tablet at the north side of east entrance to the court-house at Clarksville, marked "1372 Atlanta," the elevation of which is accepted as 1,371.991 feet above mean sea level, in accord with the 1903 adjustment of the precise-level net.

The leveling was done in 1903, under the direction of F. A. Franck, field assistant, by Joseph Palmer, levelman.

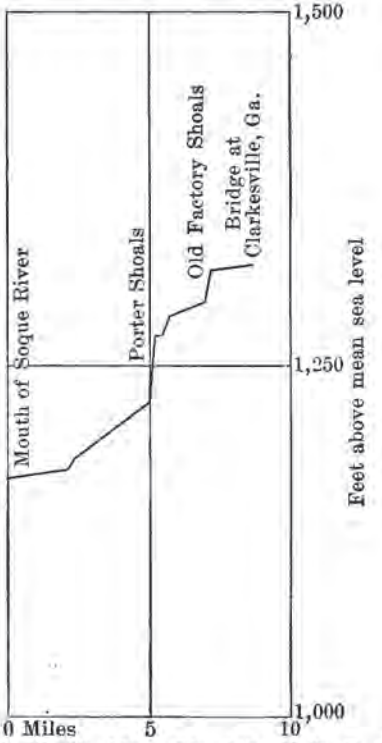


FIG. 13.—Profile of Soque River below Clarksville, Ga

Elevations on Soque River from near View to Clarksville, Ga.

Distance in miles.		Elevation in feet.
0.0	Soque River, south bank of mouth of, at junction of Soque and Chattahoochee rivers, birch tree, nail in root of	1,147.82
.0	Surface of water	1,137
1.6	McAllisters Bridge, near north end of, nail in root of white oak	1,156.30

Elevations on Soque River from near View to Clarkesville, Ga.—Continued.

Distance in miles.		Elevation in feet.
1.6	Surface of water	1,142
	Foot of shoals, surface of water	1,142
	Head of shoals, surface of water	1,149
4	Newbridge, hickory tree on north bank, nail in root	1,171.71
	Surface of water	1,152
4.1	Foot of shoals, surface of water	1,153
	Head of shoals, surface of water	1,156
4.7	Foot of shoals, surface of water	1,156
	Head of shoals, surface of water	1,162
5.6	Foot of shoals, surface of water	1,166
5.7	Head of shoals, surface of water	1,181
6.1	Porter's mills, foot of Porter Shoals, surface of water	1,189
6.1	Bert, head of Porter Shoals, surface of water	1,237
5.9	Bert, Porter Shoals, opposite head of shoals, water oak, nail in root of	1,189.07
6.1	Bert, near north end of wagon bridge, red oak tree, nail in root of	1,246.13
6.2	Bert, foot of upper shoals, surface of water	1,238
	Head of upper shoals, surface of water	1,253
6.3	Bert, Ga., 200 yards above factory, near river, on root of water oak	1,262.75
7.3	Foot of shoals, surface of water	1,261
7.3	Left bank of river, nail on root of sycamore tree	1,287.37
7.3	Surface of water, head of shoals	1,284
8.8	Clarksville, Habersham County court-house, on north side of east entrance, aluminum tablet marked "1372 Atlanta"	1,371.991
8.8	Surface of water	1,289

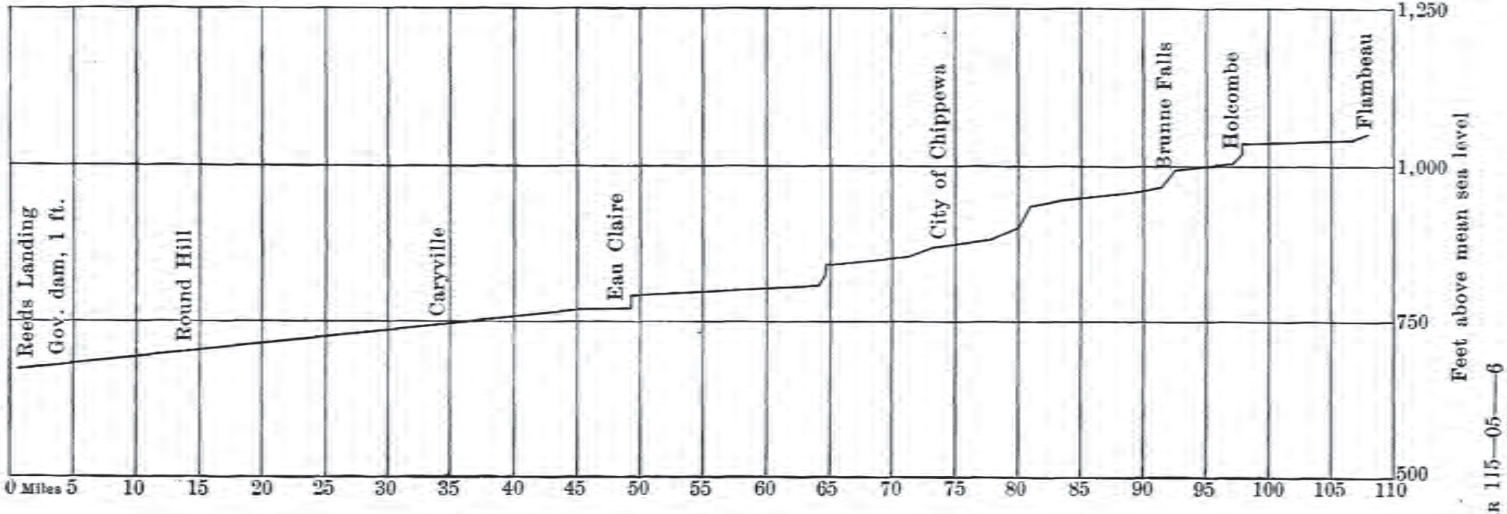
CHESTATEE RIVER BELOW WILLOW, GA.

Chestatee River was surveyed from Willow, Ga., to its mouth, near Chestatee, a distance of 47.7 miles.

A line of secondary levels was run, based on a primary bench mark of the United States Geological Survey, 2 miles north of Willow. The field sheets were platted on the scale of 1:22,500. During the course of the survey 40 bench marks were established and 98 water-surface elevations obtained.

For the first 8 miles the river traverses a very wild and broken country, and is only about 50 feet wide. There is not enough water to produce any considerable amount of power, although there is a fall of 124 feet.

At Gannett Bridge there is an old 3-foot dam which was used to furnish power for a gold-stamping mill, the machinery of which is now



PROFILE OF CHESTATEE RIVER BELOW WILLOW, GA.

ruined from disuse. This is about the north boundary of the Dahlonega gold field now under vigorous development.

One mile downstream is an unnamed shoal, with a fall of 30 feet in 0.6 of a mile. The river runs between very steep banks of hard, unseamed rocks, and a 200-foot dam could be constructed here, abundant material being easily accessible.

Just below Grinnells Ford is a splendid site, where the river suddenly drops 47 feet in about 150 yards and passes through a narrow gorge. The river bed is of broken rock, and a dam at this point would be about 200 feet long.

About 2 miles farther down is a drop of 11 feet in 100 yards. The river runs through a narrow gorge, but just above the valley widens enough to make a good storage basin. A dam would be about 225 feet long and could be built to almost any desired height. A pyrites mine here employs 50 men. Four miles below the Crown Gold Mining Company is erecting a 40-foot dam, known as the Gorge dam, to run hydraulic pumps for two placer mines.. This dam will back up the water for 2½ miles and will cover a number of small shoals.

The river below here runs swiftly, but without important shoals for about 3½ miles. It then enters the back water from Chestatee dam, which is 4 feet high, and supplies power for a gristmill, cotton gin, and hydraulic pump.

Three miles farther down is a gold-stamping mill, the power for which is supplied by an 11-foot dam, which backs the water up as far as Iron Bridge just below the Chestatee dam. Six miles farther down is a 26-foot dam, built by the North Georgia Electric Company, at Newbridge, Ga., which supplies power for the traction system and lighting of the city of Gainesville, Ga., 15 miles away. A smaller dam, 4 feet high, just below the main structure, furnishes power for a gristmill and cotton gin.

Below Newbridge, Ga., the river enters a more level country and runs with little fall to Bolden's bridge, 9 miles below, passing a 3-foot dam, which is used to operate a small flouring mill, and a 6-foot dam, which supplies power for a large gristmill.

In the remaining 8 miles there are no shoals or opportunities for power development. The sand in the bed of the river contains a large amount of gold, and placer mining on a considerable scale is one of the occupations of the people throughout this whole region.

Nearly all of the important shoals which are undeveloped are controlled by the mining interests in the neighborhood. The upper part of the survey was through fairly heavy timber, but the lower end of the work was through land all under high cultivation. The river passes 3 miles from Dahlonega, the county seat of Lumpkin County.

The elevations in the following list are based upon a bronze tablet 2.5 miles north of Willow, in rock on west side of river at fork of

road, marked "1529 Atlanta," the elevation of which is accepted as 1,528.649 feet above mean sea level, in accord with the 1903 adjustment of the precise-level net.

The leveling was done in 1903, under the direction of F. A. Franck, field assistant, by Joseph Palmer, levelman.

Elevations on Chestatee River below Willow, Ga.

Distance in miles.		Elevation in feet.
2.5	Willow, 2.5 miles north of, on west side of river, at fork of road, in rock, bronze tablet marked "1529 Atlanta"	1,528.649
.0	Willow, near west end of bridge, walnut tree, nail in root of	1,461.37
.0	Surface of water	1,454
.25	Surface of water	1,449
1	Foot of shoals, opposite, west side of river, nail in root of maple tree	1,447.54
1	Head of shoals, surface of water	1,446
	Foot of shoals, surface of water	1,444
1.6	Head of shoals, surface of water	1,443
	Foot of shoals, surface of water	1,438
2.5	Head of shoals, surface of water	1,428
2.7	Foot of shoals, surface of water	1,422
3	Right bank and 10 feet from river, nail in root of red oak tree	1,437.94
3	Surface of water	1,416
3.7	Head of large shoals, surface of water	1,415.5
3.8	Foot of large shoals, surface of water	1,406
4	Shoals, opposite, right bank of river, nail in root of red oak	1,425.41
4	Surface of water	1,405
4.2	Foot of shoals, surface of water	1,399
4.7	Sharp bend of river, right bank, nail in root of red oak	1,404.53
4.7	Surface of water	1,394
4.9	Crooked Shoal, head of, surface of water	1,390
5.2	Crooked Shoal, foot of, surface of water	1,386
5.2	Head of shoals, surface of water	1,384
5.4	Foot of shoals, surface of water	1,378
5.4	Left bank of river, opposite shoals, large white oak, nail in foot of	1,388.79
6	Head of shoals, surface of water	1,377
6.4	Foot of shoals, surface of water	1,353
6.4	Foot of shoals, left bank, 60 feet below, nail in root of hickory	1,364.25
6.9	Head of shoals, surface of water	1,346
	Foot of shoals, surface of water	1,328
7.3	Small creek, mouth of, opposite center of shoals, spruce pine, nail in root of	1,335.59
8	Old dam, top of, surface of water	1,321
	Old dam, bottom of, surface of water	1,317
8.2	Gannett Bridge, 10 feet below, on left bank river, nail in red oak	1,318.35

Elevations on Chestatee River below Willow, Ga.—Continued.

Distance in miles.		Elevation in feet.
8.2	Surface of water	1,309
8.5	Old gold-stamping mill, foot of bridge at, surface of water	1,305
8.8	Head of shoals, surface of water	1,304
	Foot of shoals, surface of water	1,296
	Foot of shoals, opposite, left bank river, nail in root of sweet gum tree	1,303.10
9.4	Head of shoals, surface of water	1,293
9.9	Grinnells Ford, foot of shoals, surface of water	1,263
10	Grinnells Ford, in root of large birch tree, near ford, nail in root of	1,265.45
10.3	Head of shoals, surface of water	1,262
10.7	Tesnatee River, mouth of, foot of shoals, surface of water	1,215
10.7	Tesnatee River, mouth of, in fork between rivers, on side of rock bluff, in white oak tree, nail	1,231.37
11.1	Grinnell's lower ford, surface of water	1,209
11.2	Grinnell's lower ford, on right bank 100 yards below ford, point of large rock, chisel mark	1,218.11
11.2	Grinnell's lower ford, foot of shoals, surface of water	1,207
11.4	Head of shoals, surface of water	1,206
11.6	Foot of shoals, surface of water	1,201
11.6	Right bank of river, nail in root of hickory tree	1,214.34
11.7	Head of shoals, surface of water	1,200
11.9	Foot of shoals, surface of water	1,189
12.6	Head of shoals, surface of water	1,187
	Foot of shoals, surface of water	1,174
12.8	Right bank river, pine tree, nail in root of	1,183.54
13.5	Head of shoals, surface of water	1,169
	Foot of shoals, surface of water	1,163
14	White oak tree, nail in root of	1,166.95
14	Surface of water	1,160
14.6	Head of shoals, surface of water	1,155
	Foot of shoals, surface of water	1,150
14.9	Gorge dam, above, head of shoals, surface of water	1,149
15.8	Gorge dam, 40 feet below, right bank of river, nail in hickory tree	1,159.21
15.9	Gorge dam, below dam, foot of shoals, surface of water	1,138
16.4	Surface of water	1,133
17	Bearden's bridge, top of stone pier on west approach, iron bolt	1,150.10
17	Surface of water	1,130
17.6	Head of shoals, surface of water	1,125
17.8	Surface of water	1,122
20.2	Chestatee dam, top of, surface of water	1,119
20.2	Chestatee dam, foot of, surface of water	1,115
20.4	Iron Bridge, 60 feet below, beech tree, nail in root of	1,121.86

Elevations on Chestatee River below Willow, Ga.—Continued.

Distance in miles.		Elevation in feet.
	Iron Bridge, surface of water	1,109
20.6	Foot of shoals, surface of water	1,106
	Surface of water	1,105
22.8	Gold-stamping mill, top of dam, surface of water	1,104
	Foot of dam, surface of water	1,092
	Gold-stamping mill, persimmon tree near, nail in root of	1,114.62
23.9	Branch, near mouth of, nail in root of red oak	1,106.49
23.9	Surface of water	1,089
24.2	Foot of small shoals, surface of water	1,084
25.1	Brierpatch Bridge, south side of east approach, iron bolt	1,104.71
25.1	Surface of water	1,082
26.1	Head of shoal, surface of water	1,079
26.2	Foot of shoals, surface of water	1,075
26.8	Head of shoals, surface of water	1,070
27.9	Left bank of river, pine tree, nail in root of	1,079.43
30	Georgia Electric Company's dam, top of, surface of water	1,070
	Foot of dam, surface of water	1,043
30.2	Newbridge (post-office), west side, top of central bridge pier, bolt	1,060.43
	Newbridge, head of small dam, surface of water	1,043
30.2	Small dam, foot of, surface of water	1,039
31.3	East bank, 50 feet from river, nail in root of large pine	1,062.63
31.3	Surface of water	1,028
32.5	Head of shoals, surface of water	1,027
	Foot of shoals, surface of water	1,024
32.5	Pine tree opposite shoals, nail in root of	1,049.28
33.4	Yellow Creek, 50 yards below mouth of, nail in root of red oak	1,048.27
33.4	Surface of water	1,022
33.5	Surface of water	1,017
	Head of small shoals, surface of water	1,016
	Foot of small shoals, surface of water	1,014
34.7	Robinson's ford, 10 feet from river, nail in root of red oak tree	1,025.30
	Robinson's ford, surface of water	1,012
35.7	Rock Bluff, left bank of river, nail in root of oak tree	1,020.21
35.7	Surface of water	1,009
35.8	Foot of shoals, surface of water	1,005
36.7	Flour mill, top of dam, surface of water	1,003
	Dam, foot of, surface of water	1,000
36.9	Surface of water	993
38.5	Small creek, mouth of, surface of water	986
38.8	East bank of river, 40 feet from, nail in root of red oak	1,003.69
39.6	Bolden's bridge, 40 feet from east bank, stump near bridge, nail in root of	999.56

Elevations on Chestatee River below Willow, Ga.—Continued.

Distance in miles.		Elevation in feet.
39.8	Bolden's bridge, west side of east approach, top of, iron bolt	1,001.28
39.8	Surface of water	984
39.9	Mill, top of dam, surface of water	983
	Mill, foot of dam, surface of water	977
40.8	Langleys Creek, east side, 40 feet below mouth, nail in root of red oak	989.34
40.8	Langleys Creek, mouth of, surface of water	972
40.9	Surface of water	970
42.6	East bank of river, nail in root of sycamore tree	974.48
42.6	Surface of water	964
43.4	Surface of water	963
44.6	River, 200 feet from, in open field, nail in walnut tree	975.87
44.6	Surface of water	960
45.6	Mouth of branch, near, 40 feet from east bank of river, nail in red oak tree	981.76
47.7	Chestatee, Ga., near, at mouth of Chestatee River, near Keith's bridge, nail in root of walnut tree	964.37

HIWASSEE RIVER FROM HIWASSEE, GA., TO APALACHIA, N. C.

Hiwassee River was surveyed from Hiwassee, Ga., to Apalachia, N. C., a distance of 63 miles. In that distance there is a fall of 707 feet. A line of secondary levels based on the United States Geological Survey bench mark at Hiwassee, Ga., was run. The field sheets were plotted on the scale of 1:22,500. During the course of the survey 39 bench marks were established and 119 water-surface elevations obtained.

There are no shoals of any consequence until just below Bell Creek, where there is one of 10 feet with good rock bottom and rock bluffs on the northeast side of the river. A dam could be constructed here with a length of about 200 feet.

One mile below Hayesville Bridge is a shoal with a fall of 18 feet in 1¼ miles, but no suitable place for a dam was noted.

One and one-half miles below, at Passmore Ford, is a shoal with a 21-foot fall in 1¼ miles and with a fairly good site for the construction of a dam. The bottom is rocky and there are rock bluffs on the south side of the river. The dam would be about 300 feet long.

Four and one-half miles below is the 12-foot dam of the Cherokee Lumber Company. This is a splendid site. A 40-foot structure would not back the water over 1½ miles and would not do any damage to cultivated lands.

Three miles below, at Island Ford, is a shoal with a 17-foot fall in

1 mile. This is an excellent dam site, as the bottom is rocky and there are hard-rock bluffs on either side. The dam would be 300 feet long. Building material can be easily obtained. Five miles below, and about 1 mile above Murphy, is a shoal with a 25-foot fall in 1¾ miles. A dam about 600 feet long could be built here.

One-third mile below Murphy, at the mouth of Valley River, is the head of a shoal 1¾ miles long with a fall of 25 feet. This is an excellent power site. The bottom is rocky; both sides are of hard rock. The dam would be about 500 feet long.

Seven and one-half miles below Murphy, at Shallow Ford, is a shoal with 14-foot fall in 1¼ miles. This offers an excellent site for a dam, as bottom and banks are rocky. The dam would be about

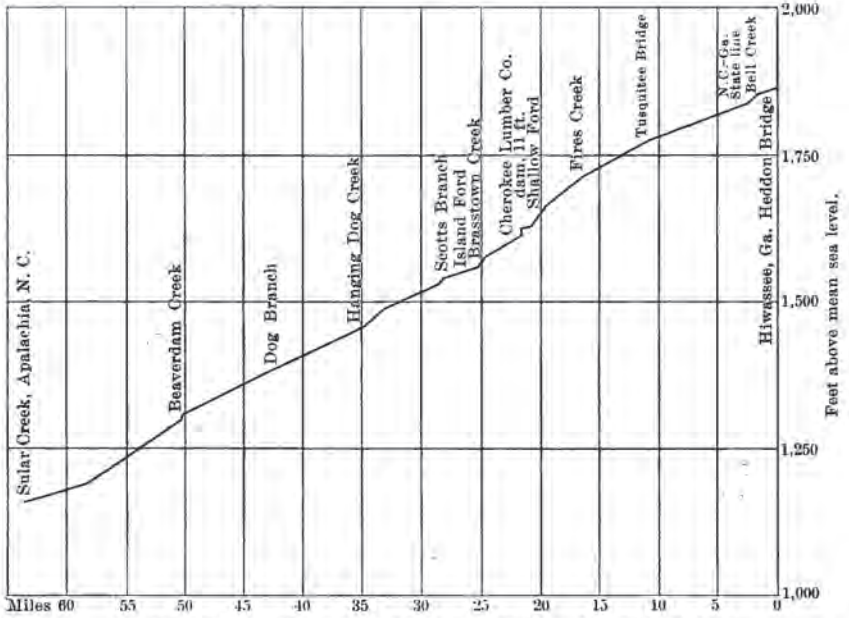


FIG. 14.—Profile of Hiwassee River from Hiwassee, Ga., to Apalachia, N. C.

550 feet long. Three miles below Shallow Ford is a shoal with a 20-foot fall in 1½ miles. The dam here would be only about 400 feet long.

Two miles below is a 23-foot shoal 1¾ miles long, where the river runs between steep hills. The dam here would be 600 feet long. Excellent building material is at hand.

From Chambers Creek to lower Shallow Ford, 6½ miles, the river has a fall of 15 feet per mile, and is almost a continuous shoal. There are several excellent dam sites. From Shoal Creek to Cane Creek, 2 miles, there is a shoal with a fall of 38 feet. This is a fine power site, with hard, rocky bottom and sides. A dam at this point would be about 700 feet long.

From Cane Creek down to the Tennessee State line (5 miles), the end of the survey, the river has a fall of 30 feet, with only a 7-foot shoal three-fourths of a mile between Kilpatrick Ferry and Taylor Ferry.

The elevations in the following list are based upon an aluminum tablet marked "1984 Atlanta" at the northeast corner of front vestibule of Towns County court-house, Hiwassee, Ga., the elevation of which is accepted as 1,983.634 feet above mean sea level. The leveling is adjusted with flying levels on Nottely River to accord with the 1903 adjusted elevation of primary bench mark at Blairsville and Hiwassee, Ga. From the mouth of Nottely River to Apalachia the leveling is a single spur line.

The leveling was done in 1903, under the direction of Carroll Caldwell, field assistant, by T. B. O'Hagan, levelman.

Elevations on Hiwassee River from Hiwassee, Ga., to Apalachia, N. C.

Distance in miles.		Elevation in feet.
0.0	Hiwassee, Towns County, court-house, at northeast corner of front vestibule, aluminum tablet marked "Atlanta, 1,984"	1,983.634
.3	Hiddon Bridge, 300 feet north of, edge of county road, white-oak tree, nail in west side of	1,882.30
.3	Hiddon Bridge, surface of water	1,865
.3	High water	1,882
.3	Bridge floor	1,881
.8	Town Branch, mouth of, surface of water	1,862
1.6	25 feet north of bridge, 20 feet west of river, point on bluff rock	1,871.36
	Bridge, surface of water	1,857
	B. F	1,874.8
	High water	1,876
1.7	Hog Creek, mouth of, surface of water	1,855
1.9	Small rapids, surface of water	1,854
2.2	Bell Creek, 900 feet north of, on east edge of river, triple maple tree, nail in side of	1,854.14
2.2	Bell Creek, mouth of, surface of water	1,853
2.3	Small falls, head of, surface of water	1,851
2.3	Small falls, foot of, surface of water	1,847
2.8	Surface of water	1,838
3.4	Sally Ford, mouth of, surface of water	1,836
3.6	Hog Creek, mouth of, surface of water	1,833
3.7	Surface of water	1,830
3.8	Gibson Creek, mouth of, surface of water	1,829
4.8	Long Bullet Creek, mouth of, surface of water	1,825
4.8	Pendelton Ford, 25 feet northwest of, nail in side of dead stump	1,838.20
4.8	Surface of water	1,823

Elevations on Hiwassee River from Hiwassee, Ga., to Apalachia, N. C.—Continued.

Distance in miles.		Elevation in feet.
4.8	High water	1,835
5.2	Sneaking Creek, mouth of, surface of water	1,820
5.5	Surface of water	1,819
5.6	——— Ford, 75 feet northwest of, 10 feet west of road, nail in red-oak tree	1,830.62
6.1	15 feet north of river, point on rock	1,824.63
6.2	Surface of water	1,811
6.4	Stream, mouth of, surface of water	1,809
6.4	Rough Ford, 15 feet north of river, rock bluff, point on rock	1,816.84
6.9	Surface of water	1,807
7.2	Shooting Creek, mouth of, surface of water	1,804
7.9	Barnard Bridge, northeast abutment, point on top of	1,818.31
	Surface of water	1,797
	Bridge floor	1,819.7
	High water	1,814
8.3	——— Ford, surface of water	1,794
8.3	——— Ford, 50 feet south of ford, 15 feet north of river, nail in side of dogwood tree	1,807.89
8.8	Surface of water	1,790
9	Head of island	1,789
9.2	Hyatts Mill Creek, mouth of, surface of water	1,787
9.4	Herbert Ford, on south edge of river at, nail in side of birch tree	1,791.19
	High water	1,799
	Surface of water	1,787
	Blair Creek, mouth of, surface of water	1,787
10	12 feet west of river, point on rock	1,796.74
10	Surface of water	1,782
10.8	Town Creek, mouth of, surface of water	1,778
11.5	Tusquite Bridge, 250 feet west of, on edge of river, nail in root of birch tree	1,778.90
	Bridge, surface of water	1,774
	High water	1,794
11.8	Martin or Quail Creek, mouth of, surface of water	1,174
12.2	Surface of water	1,773
12.6	Tusquitee Creek, mouth of, 150 feet northwest of, 10 feet west of river, nail in root of birch tree	1,777.93
12.6	Surface of water	1,771
12.8	Rapids, surface of water	1,767
13.3	Below rapids, surface of water	1,760
13.6	Stream, mouth of, surface of water	1,759
14	Martin Ford, 125 feet south of, on west edge of river, a fish trap, nail in root of birch tree	1,757.74
	Surface of water	1,756

Elevations on Hiwassee River from Hiwassee, Ga., to Apalachia, N. C.—Continued.

Distance in miles.		Elevation in feet.
14.8	Surface of water	1,742
14.9	Leatherwood Ford, 25 feet northwest of, nail in walnut tree	1,749.19
	Surface of water	1,741
16	Allbon Creek, mouth of, surface of water	1,741
16.4	Surface of water	1,722
17	Fires Creek, mouth of, surface of water	1,712
17.3	Mountain stream, mouth of, surface of water	1,708
17.5	Passmore Ford, east side of river, in center of ford road, nail in root of gum tree	1,709.84
17.5	Surface of water	1,707
17.7	Cloud Fire Creek, mouth of, surface of water	1,700
18.3	Surface of water	1,690
18.8	Betty Creek, mouth of, surface of water	1,685
19.1	Head of island, surface of water	1,679
19.4	Sweetwater Creek, mouth of, surface of water	1,673
19.6	Stream, mouth of, surface of water	1,668
20	Shallow Ford, 15 feet east of river, nail in side of birch tree	1,667.14
20	Surface of water	1,663
20.5	Surface of water	1,659
20.9	End of island, surface of water	1,649
21	Creek, mouth of, surface of water	1,642
21.4	Surface of water	1,632
21.5	Surface of water	1,629
21.8	Backwater of Cherokee dam, 1,500 feet from, at small rapids, surface of water	1,624
22	Top of Cherokee dam, surface of water	1,625
22	Foot of dam, surface of water	1,614
22	Cherokee dam, 25 feet southwest of, point of rock	1,616.59
22	Surface of water	1,609
22.2	Canewater Ford, surface of water	1,606
24	Rocky Branch, mouth of, surface of water	1,591.4
24	North edge of river, nail in side of birch tree	1,594.79
24.1	Small rapids, foot of, surface of water	1,590
24.7	Stream, mouth of, surface of water	1,586
25.2	Brasstown Creek, mouth of, surface of water	1,576
26.2	Island Ford, 700 feet east of, south side of river, point on rock	1,566.56
27.6	Peachtree Creek, mouth of, surface of water	1,550
28	Horseshoe Ford, surface of water	1,549
28	South side of ford, nail in side of beech tree	1,553.06
29.5	20 feet north of river, north side of road, point on rock	1,548.70
29.9	Scott Branch, mouth of, surface of water	1,539
30.4	Stream, mouth of, surface of water	1,529

Elevations on Hiwassee River from Hiwassee, Ga., to Apalachia, N. C.—Continued.

Distance in miles.		Elevation in feet.
31.3	Martin Creek, mouth of, surface of water	1,520
31.6	Twin beech tree, nail in root of	1,518.12
31.8	Stream, mouth of, surface of water	1,513
32.1	Murphy, N. C., iron bridge, south abutment, point on rock	1,518.30
32.1	Surface of water	1,512
32.1	Bridge floor	1,531.9
32.1	High water	1,529
32.5	Valley River, mouth of, west shore, 20 feet north of, in water, point on rock	1,506.85
32.5	Surface of water	1,506
33.6	Surface of water	1,499
34	Surface of water	1,491
34.9	Laurel Creek, mouth of, surface of water	1,474
35.3	Johnson Ford, 8 feet south of river, nail in root of birch tree	1,471.95
35.3	Surface of water	1,469
35.3	High water	1,481
35.9	Hanging Dog Creek, mouth of, surface of water	1,462
36.5	Surface of water	1,459
37	Nottely River, mouth of, surface of water	1,455
37	On land projecting between the two rivers, birch tree, nail in root of	1,459.40
37	Nottely River, mouth of, south side of, willow tree, nail in root of	1,456.93
38	Small rapids, surface of water	1,448
39	Beach Creek, mouth of, surface of water	1,438
40.5	Surface of water	1,425
40.5	Shallow Ford, 40 feet southwest of ford, honey-bee tree, nail in root of	1,431.59
41.2	Surface of water	1,418
42	Grape Creek, mouth of, surface of water	1,416
42.5	Small shoals, head of, surface of water	1,415
42.5	Small shoals, surface of water, foot of	1,410
42.9	Surface of water	1,406
44.1	Persimmon Creek, mouth of, surface of water	1,391
44.8	Foot of large shoals, point on rock	1,390.24
44.8	Surface of water	1,381
45	Head of small shoals, surface of water	1,379
46.2	Dennest Creek, mouth of, surface of water	1,365
46.9	Point on rock	1,363.58
48	Shoals, surface of water	1,346
48.8	Robertson Ferry, 100 feet below, point on rock	1,344.23
48.8	Surface of water	1,343
49.9	Shoals, surface of water	1,340
50.4	Creek, mouth of, surface of water	1,332

Elevations on Hiwassee River from Hiwassee, Ga., to Apalachia, N. C.—Continued.

Distance in miles.		Elevation in feet.
50.6	Surface of water	1,329
51.2	Chambers Creek, mouth of, surface of water	1,324
51.2	20 feet north of bank, point on rock	1,327.94
51.8	Opposite island, surface of water	1,318
52.5	Beaverdam Creek, mouth of, surface of water	1,304
53	Opposite island, surface of water	1,296
53.9	Lared Creek, mouth of, surface of water	1,290
54.3	Shoals, surface of water	1,285
54.3	Foot of shoals, surface of water	1,277
54.8	Surface of water	1,269
55.2	Rapids, surface of water	1,259
56.9	Anderson Creek, mouth of, surface of water	1,248
57.9	Surface of water (15 feet above low water)	1,240
58.5	Shallow Ford, 40 feet south of, nail in root of gum	1,239.67
58.5	Surface of water	1,234
58.5	High water	1,241
58.6	Foot of small shoals, surface of water	1,227
58.9	Shoals Creek, mouth of, surface of water	1,227
59.7	Foot of small rapids, surface of water	1,218
60.8	Stream, south of, surface of water	1,198
61.1	Cane Creek, mouth of, surface of water	1,195
63	Surface of water	1,178
64.2	Camp Creek, mouth of, surface of water	1,175
65	Kilpatrick Ferry, 12 feet south of, willow tree	1,175.14
65	Surface of water	1,172
65.2	Taylor Ferry, 60 feet northwest of, edge of bank, point on large rock	1,169.58
65.2	Surface of water	1,166
66.8	Apalachia, N. C., Sular Creek, mouth of, 100 feet from post-office, 5 feet feet north of bank of river, triple willow tree	1,161.58
66.8	Surface of water	1,158
66.8	High water	1,168

NOTTELY RIVER BELOW BLAIRSVILLE, GA.

Nottely River was surveyed from its mouth, 3½ miles below Murphy, N. C., to Blairsville Bridge, near Blairsville, Ga., a distance of 38 miles. In that distance there is a fall of 314 feet. A line of secondary levels was run, based on a primary bench mark of the United States Geological Survey at Hiwassee, Ga., and the field sheets were plotted on a scale of 1:22,500. During the course of the

survey 30 bench marks were established and 88 water-surface elevations obtained.

One mile above the mouth of the river is a 24-foot shoal 1 mile long, where there is an excellent solid rock dam site. At this place a dam would be 200 feet long. Three and one-fourth miles farther up, at Hall Ford, there is a shoal with a fall of 33 feet in $1\frac{3}{4}$ miles, with good bottom and good sides. A dam would be about 350 feet long.

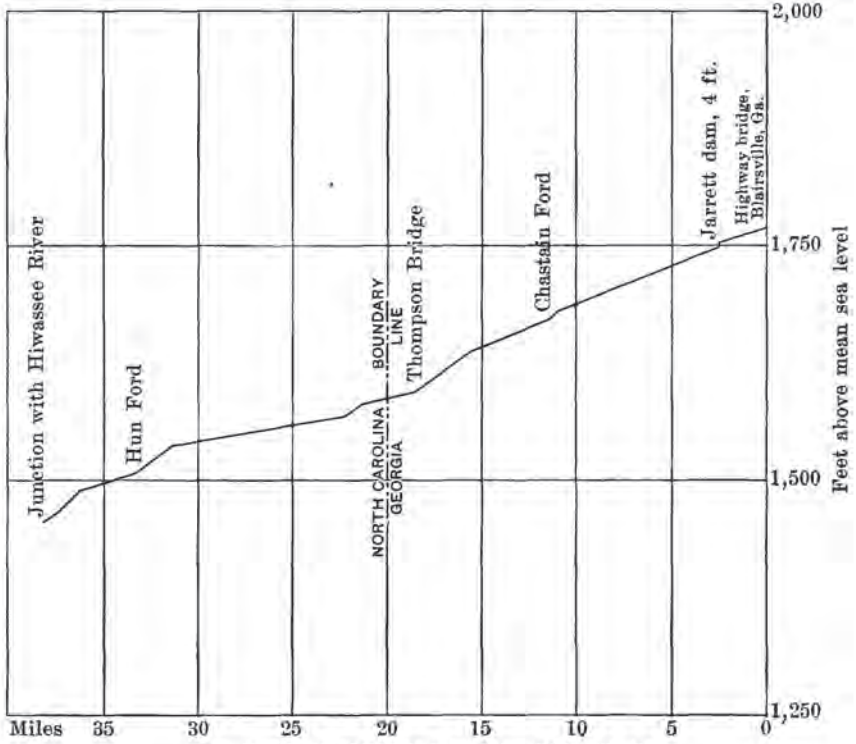


FIG. 15.—Profile of Nottely River below Blairsville, Ga.

For 9 miles above this point the bottoms widen and are cultivated on either side for most of the distance. The fall in this section is a little over 3 feet per mile.

One mile below Laudermilk Ford there is a shoal with a fall of 10 feet in three-fourths of a mile where a dam, with a length of 200 feet, could be built.

At Thompson Bridge, at the foot of a 46-foot shoal, 3 miles long, is an excellent dam site. From Weazel Creek to Morgan Ford, $5\frac{1}{2}$ miles, the river has a fall of 40 feet, and there are two or three suitable sites for small dams. At Watkins Bridge there is a 4-foot dam using all the available power to operate a gristmill.

From here to Blairsville Bridge, the end of the survey, the river is very much smaller, with a few small shoals, which, however, do not seem worth developing.

The elevations in the following list are based upon a bronze tablet marked "1892 Atlanta" in the foundation wall at northwest corner of Union County court-house, Blairsville, Ga., the elevation of which is accepted as 1,891.536 feet above mean sea level. The leveling is adjusted with the Hiwassee River flying levels to accord with the 1903 adjusted elevation of primary bench marks at Blairsville and Hiwassee.

The leveling was done, under the direction of Carroll Caldwell, field assistant, by T. B. O'Hagan, levelman.

Elevations on Nottely River from its mouth to Blairsville, Ga.

Distance in miles.		Elevation in feet.
0.0	Junction of Nottely and Hiwassee rivers, on point of peninsular, nail in side of birch tree	1,459.40
.0	Surface of water	1,454.52
.3	At lower ford, surface of water	1,459
.3	Seventy-five feet north of lower ford, nail in root of hickory tree	1,466.77
1	High-water mark	1,471
1	Upper ford, 50 feet south of, nail in root of oak tree	1,474.59
1	Surface of water	1,467
1.3	Surface of water	1,477
1.5	Surface of water	1,472
1.5	Surface of water	1,478
1.8	Deep Ford, 25 feet north of, nail in root of black oak	1,487.56
1.8	Surface of water	1,483
2	Surface of water	1,489
2.3	High water	1,499
2.4	Head of shoals, surface of water	1,491
2.6	Surface of water, rain during night raised 1.3 feet (lower water surface, 1,492.67 feet)	1,493
2.9	Hall Bridge, 20 feet west of, nail in side of apple tree	1,500.20
2.9	Surface of water	1,493
2.9	High water	1,503
4.2	Davis Ford, 20 feet northwest of, nail in side of maple tree	1,504.43
4.2	Surface of water	1,499
4.9	Surface of water, on rock	1,502
5.2	Mouth of Coombs Creek, surface of water	1,505
5.4	Surface of water	1,505
5.5	Hall Ford, north edge of river, nail in side of water birch tree	1,513.02
5.5	Surface of water	1,505
5.5	High water	1,521

Elevations on Nottely River from its mouth to Blairsville, Ga.—Continued.

Distance in miles.		Elevation in feet.
5.9	Mouth of branch, surface of water	1,512
6	Surface of water	1,520
6.6	Surface of water	1,526
6.9	Opposite island, surface of water	1,534
7	Mouth of Rocky Branch, surface of water	1,535
7.1	Near old mill, surface of water	1,538
7.5	Surface of water	1,542
8.6	Nottely Bridge, 1,800 feet north of, in old field near barn, nail in side of persimmon tree	1,559.54
8.6	Mouth of branch, surface of water	1,544
8.9	Nottely Bridge, 100 feet west of, 5 feet south of road, nail in side of black oak tree	1,560.13
8.9	Surface of water	1,544
9.6	Surface of water	1,547
10.5	Mouth of Johnson Branch, surface of water	1,548
10.9	Surface of water	1,551
11.5	Jack Creek, 900 feet south of, in bend of river, 600 feet west and 600 feet north of, in cornfield, nail in root of dead peach tree	1,571.83
11.5	Surface of water	1,554
11.7	Surface of water	1,555
12	Anderson Bridge, 50 feet west of, nail in side of sycamore tree	1,565.78
12	Surface of water	1,556
12	High water	1,575
12.2	Surface of water	1,560
12.9	Mouth of branch, surface of water	1,561
13.3	Ford (has no name), 20 feet northeast of, nail in side of birch stump	1,574.02
13.3	Surface of water	1,562
13.3	High water	1,577
14.2	Surface of water	1,565
15.1	Surface of water	1,568
15.4	Laudermilk Ford, 1.4 miles below, opposite old fish dam, 50 feet west of river, near small branch, nail in root of black oak tree	1,586.77
15.6	Surface of water	1,573
16	Surface of water	1,580
16.8	Laudermilk Ford, 100 feet southwest of, 20 feet north of road, nail in root of apple tree	1,598.19
16.8	Surface of water	1,583
16.8	High water	1,599
17.2	Mouth of Butler Creek, surface of water	1,585
17.7	Below fish dam, surface of water	1,587
17.8	Mouth of Moccasin Creek, surface of water	1,588
17.8	Moccasin Creek, 200 feet south of, 35 feet east of river, east side of road, nail in root of red oak tree	1,602.87

Elevations on Nottely River from its mouth to Blairsville, Ga.—Continued.

Distance in miles.		Elevation in feet.
18.5	Mouth of branch, surface of water	1,591
18.6	Mouth of Dooley Creek, surface of water	1,591
18.9	Thompson Bridge, 250 feet south of, 100 feet southeast of road, nail in root of red-oak tree	1,611.01
18.9	Surface of water	1,592
18.9	High water	1,601.53
19.1	Surface of water	1,599
19.6	In shoals, surface of water	1,611
20.2	Above fish dam, surface of water	1,617
20.4	Head of fish dam, surface of water	1,619
20.8	Foot of island, in shoals, surface of water	1,624
21	Surface of water	1,630
21.4	Chapman Ford, 150 feet north of, 2 feet east of road, nail in root of walnut tree	1,645.81
21.4	Surface of water	1,634
21.4	High water	1,644
21.8	Just below fish dam, surface of water	1,638
21.9	Mouth of Camp Creek, surface of water	1,639
22.6	Above shoals, surface of water	1,652
23	Mouth of Weasel Creek, surface of water	1,655
23.6	Mouth of branch, surface of water	1,656
23.8	In shoals, surface of water	1,657
23.8	Chamber Ford, 0.4 mile northeast of, northwest side of river, point on edge of rock	1,675.88
24.2	Chamber Ford, 200 feet west of, nail in root of walnut tree	1,671.49
24.2	Surface of water	1,661
24.2	High water	1,678
25	Above small shoals, surface of water	1,669
25.2	Chastain Ford, 50 feet west of, nail in side of walnut tree	1,683.45
25.2	Surface of water	1,669
25.5	Foot of large shoals, surface of water	1,675
25.8	Mouth of Ivylog Creek, head of shoals, surface of water	1,680
26.3	Near house, surface of water	1,685
26.6	Majners Ford, 75 feet west of, on edge of bank, nail in side of corn-bean tree	1,690.8
26.6	Surface of water	1,687
26.8	Meadow Ford, 15 feet north of, nail in root of beech tree	1,699.17
26.8	Surface of water	1,689
26.8	High water	1,703
27.3	Huggins Ford, 25 feet north of, corn bean tree, nail in side of	1,707.82
27.3	Surface of water	1,692
27.5	Shoals, surface of water	1,694
27.8	Surface of water	1,698

Elevations on Nottely River from its mouth to Blairsville, Ga.—Continued.

Distance in miles.		Elevation in feet.
27.9	Above shoals, surface of water	1,698
28.4	Morgan Ford, 40 feet north of, red-oak tree	1,714
28.4	Surface of water	1,702
29	Mouth of Young Cane Creek, surface of water	1,699
29	Mouth of Castile Creek, surface of water	1,709
29.1	Castile Creek, 1,600 feet above, on rock, edge of river, point on rock	1,714.20
29.4	Above rapids, surface of water	1,715
30	Above fish dam, surface of water	1,718
30.3	McBee Ford, 60 feet north of, nail in side of red oak	1,734.37
30.3	Surface of water	1,721
30.8	Above branch, surface of water	1,723
31.1	Mouth of Reece Creek, surface of water	1,724
31.4	Youngs Ford, 80 feet southwest of, red-oak tree	1,741.02
31.4	Surface of water	1,727
31.5	Millburn Creek, just below, surface of water	1,730
31.9	At canal, surface of water at foot of	1,732
31.9	Head of canal, surface of water	1,735
31.9	Canal cut, 50 feet northeast of river, 15 feet southwest of ford, nail in root of red-oak tree (cut has a drop of 3.6 feet)	1,741.26
32.2	Above small rapids, surface of water	1,739
33	Mouth of creek, surface of water	1,743
33.6	Watkins Bridge, 375 feet above, north edge of river, point on rock	1,747.54
33.6	Surface of water	1,747
33.6	Jarrett milldam, foot of, surface of water	1,748
33.6	Jarrett milldam, head of, surface of water (Jarrett milldam has a drop of 3.79 feet)	1,752
34.5	Reeds Ford, 150 feet east of, nail in root of walnut tree	1,766.24
34.5	Surface of water	1,755
35	Above small rapids, surface of water	1,760
35.9	Blairsville Bridge, 100 feet southeast of, mouth of Butternut Creek, 15 feet north of, nail in side of red-oak tree	1,775.94
35.9	Surface of water	1,769
35.9	High water	1,783
37.2	Blairsville court-house, Union County, Ga., in wall on west side of building, bronze tablet	1,891.536

TOCCOA RIVER BELOW DIAL, GA.

Toccoa River was surveyed from Butts Bridge, 3 miles east of Dial, Ga., to the Tennessee State line, near McCays, Tenn. In the 36 miles surveyed there is a fall of 414 feet. A line of secondary levels was run, based on the primary bench mark of the United States Geological

Survey, three-fourths of a mile northeast of Butts Bridge. The field sheets were plotted on the scale of 1:22,500, and during the course of this survey 27 bench marks were established and 94 water-surface elevations were obtained.

Toccoa River flows in a northwesterly direction, and after crossing the Tennessee State line is known as Ocoee River. Between Pigeon Creek and Dial Bridge there is a shoal, with a fall of 21 feet in 1¼ miles. There are good foundations for a dam 250 feet long.

From upper Big Creek to Shallow Ford, 3 miles, there is a fall of 55 feet in an almost continuous shoal. There are several available power sites, and building material is easily accessible. From Shallow Ford

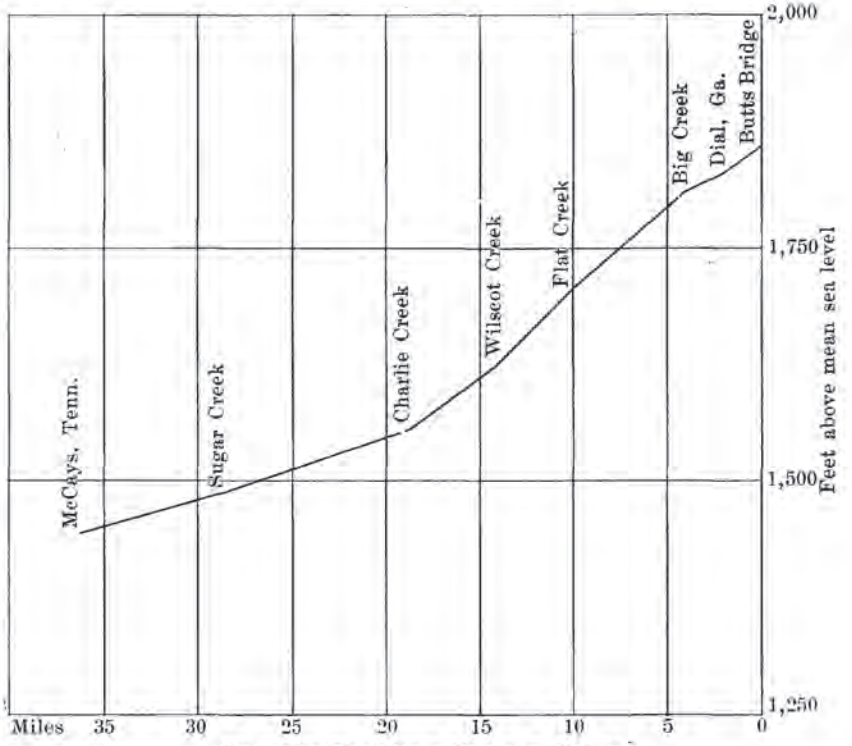


FIG. 16.—Profile of Toccoa River below Dial, Ga.

to Wilscot Creek, 7½ miles, the river has an average fall of 18 feet per mile. There are several excellent sites where there is hard rock on either side.

From Wilscot Creek to Charlie Creek there is an average fall of 14 feet per mile, with several fine shoals having steep hills and good hard bottom.

Eleven miles down the river, at Galloway, Ga., there is a shoal with a fall of 10 feet in half a mile. This would be a good site for a small dam. From one-half mile below Galloway to McCays, Tenn., 6 miles, the river has a fall of 60 feet, with several good power sites.

The elevations in the following list are based upon an aluminum tablet at the Washington street entrance of the State capitol building at Atlanta, marked "1050 M C," the elevation of which is now accepted as 1,049.546 feet above mean sea level. They accord with the 1903 adjusted elevations of primary bench marks near Morganton and Shallow Ford. The section from Shallow Ford to McCays Ferry is a single spur line.

The leveling was done under the direction of Carroll Caldwell, field assistant, by T. B. O'Hagan, levelman.

Elevations on Toccoa River from Butts Bridge, Georgia, to Tennessee State line.

Distance in miles.		Elevation in feet.
0.0	Morganton (3 miles east of Dial), forks of Morganton and Ellijay road, in large marble rock, copper bolt marked "1981"	1,947.821
1.5	Butts Bridge, surface of water	1,858
1.5	Butts Bridge, east side of, nail in top of abutment	1,874.25
1.5	High-water mark	1,870
2	Pigeon Creek, 550 feet east of, north side of road, 60 feet north of river, point on rock	1,858.35
2	Mouth of Pigeon Creek, surface of water	1,849
2.3	Between rapids, surface of water	1,845
2.5	Foot of shoals, surface of water	1,840
2.9	Mouth of Weeks Creek, foot of rapids, surface of water	1,830
3.1	Dial post-office, Van Zant's bridge, 100 feet north of, east side of road, nail in root of red-oak tree	1,844.68
3.1	Surface of water	1,828
3.1	High-water mark	1,851
4	Mouth of Noontootly Creek, surface of water	1,823
4	Mouth of branch, surface of water	1,821
4.2	Rogers Ford, 50 feet west of, nail in root of tree	1,825.14
4.2	Surface of water	1,820
4.7	Surface of water	1,815
5.1	In rapids, surface of water	1,813
5.2	Big Creek Ford, 225 feet southeast of, 50 feet south of river, nail in root of white-oak tree	1,817.74
5.2	Surface of water	1,810
5.2	In rapids, surface of water	1,809
5.7	Above rapids, surface of water	1,802
5.9	Below fish dam, surface of water	1,799
6.1	Head of shoals, surface of water	1,795
6.4	Foot of shoals, surface of water	1,791
6.4	Surface of water	1,790
7	Surface of water	1,782
7.1	Shallow Ford, 1 mile north of, north side of road, in large rock, copper bolt marked "1859"	1,826.439

Elevations on Toccoa River from Butts Bridge, Georgia, to Tennessee State line—Continued.

Distance in miles.		Elevation in feet.
	Single flying level spur line to McCays Ferry.	
7.1	Below rapids, surface of water	1,779
7.6	In rapids, surface of water	1,769
8.1	Shallow Ford, 100 feet north of, nail in root of red-oak tree	1,774.93
8.1	Surface of water	1,763
8.1	High-water mark	1,774
8.3	In rapids, surface of water	1,758
8.6	Surface of water	1,755
8.8	Mouth of Stanley Creek, surface of water	1,752
9.1	Rapids, surface of water	1,747
9.3	Mouth of stream, surface of water	1,743
9.5	Below rapids, surface of water	1,738
9.9	Stanley Creek, 1 mile northwest of, opposite island, north side of river, point on rock	1,738.77
10	In rapids, surface of water	1,729
10.2	Opposite falls in river, 50 feet north of first falls, point on large rock	1,744.02
10.2	Head of falls, surface of water	1,728
10.2	Foot of falls, surface of water	1,719
10.7	Mouth of branch, surface of water	1,717
11	Below rapids, surface of water	1,709
11.2	Mouth of Flat Creek, surface of water	1,705
11.5	In rapids, surface of water	1,691
11.6	Surface of water	1,690
11.8	Head of long shoals, surface of water	1,689
11.8	Rock cliff, south side of river, opposite large shoals, point in side of	1,692.11
11.9	Head of island, in shoals, surface of water	1,679
12	Foot of island, in shoals, surface of water	1,677
12.9	In shoals, surface of water	1,665
13.3	Foot of large shoals, surface of water	1,659
13.4	Below rapids, head of more shoals, surface of water	1,656
13.4	In rapids, surface of water	1,646
14	Foot of shoals, surface of water	1,640
14.6	Mouth of Persimmon Creek, surface of water	1,633
14.6	Persimmon Creek, 300 feet east of, west side of river, nail in root of large dead stump	1,638.06
14.7	Below fish dam, surface of water	1,629
15.2	Mouth of stream, surface of water	1,624
15.4	Mouth of Wilscot Creek, surface of water	1,624
15.8	In shoals, surface of water	1,616
16	Foot of shoals, surface of water	1,609
16.8	In rapids, surface of water	1,602

Elevations on Toccoa River from Butts Bridge, Georgia, to Tennessee State line—Continued.

Distance in miles.		Elevation in feet.
	Single flying level spur line to McCays Ferry—Continued.	
8	Wilscot Creek, 1.5 miles northwest of, rock cliff, 18 feet north of river, point on very large rock	1,608.96
16.9	In shoals, surface of water	1,600
17.1	Foot of shoals, surface of water	1,596
17.3	Tarpley Ford, surface of water	1,593
17.3	Tarpley Ford, 20 feet west of, nail in root of beech tree	1,598.30
17.6	In rapids, surface of water	1,589
18.2	Mouth of creek, surface of water	1,576
18.3	Surface of water	1,571
18.8	Mouth of creek, surface of water	1,568
19	Mouth of Bullfrog Creek, surface of water	1,565
19.6	Surface of water	1,559
20	Mouth of Charlie Creek, surface of water	1,555
20	Lovingood Ford, 300 feet northeast of, nail in side of walnut tree	1,564.61
20	Surface of water	1,554
20	High-water mark	1,569
21.5	Mouth of Star Creek, surface of water	1,550
21.6	Below fish dam, surface of water	1,548
22	Mouth of Rogers Branch, surface of water	1,547
22.4	Toccoa Bridge, surface of water	1,546
22.4	Toccoa Bridge, 10 feet east of, nail in root of beech tree	1,557.64
22.9	Mouth of spring stream, surface of water	1,540
23.5	Below small rapids, surface of water	1,539
23.6	Mouth of Weavers Creek, surface of water	1,538
23.9	At Benchlog Ford, surface of water	1,538
23.9	Benchlog Ford, 20 feet northeast of, nail in side of beech tree	1,543.47
25.2	Large bend in river, surface of water	1,528
25.5	Atlanta, Knoxville and Northern Railroad bridge, east side of bridge abutment, point on rock	1,536.79
25.5	Surface of water	1,526
25.5	High-water mark	1,541
26.6	Mouth of branch, surface of water	1,519
26.8	Harts Ford, 100 feet west of, stump on edge of bank at canoe landing, nail in side of	1,521.90
26.8	Surface of water	1,516
28	Surface of water	1,510
28.8	Bakers Ford, 100 feet southeast of, on edge of bank, nail in side of birch tree	1,515
28.8	Surface of water	1,507
29.6	Surface of water	1,504
30	Bend of river, surface of water	1,502

Elevations on Toccoa River from Butts Bridge, Georgia, to Tennessee State line—Continued.

Distance in miles.		Elevation in feet.
	Single flying level spur line to McCays Ferry—Continued.	
30.2	Surface of water	1,498
30.9	Mouth of Sugar Creek, surface of water	1,494
30.9	Sugar Creek railroad bridge abutment, point in center of east side of bridge	1,508.32
31.2	Below Galloway Ford, surface of water	1,592
31.5	In shoals, surface of water	1,589
32.1	200 feet northwest of ford, 4 feet southeast of Atlanta, Knoxville and Northern Railroad track, nail in side of peach tree	1,562.69
32.1	Surface of water	1,484
32.5	Canoe Landing, surface of water	1,479
32.8	Hothouse Creek, mouth of, surface of water	1,476
33.7	Foot of small shoals, near island, surface of water	1,467
34	Mouth of Barker Creek, surface of water	1,464
34.5	Kyle post-office, 600 feet east of, Atlanta, Knoxville and Northern Railroad bridge over Barker Creek, on southeast end of, end bolt	1,482.43
34.6	Kyle post-office, 40 feet south of, in front of Queen Brothers' store, pile supporting platform, nail in top of	1,483.62
34.6	Kyle ford, surface of water	1,463
35	Below rapids, surface of water	1,458
35.4	Mouth of Wolf Creek, surface of water	1,455
35.8	Atlanta, Knoxville and Northern Railroad bridge over Ocoee River, east side of bridge, point on abutment	1,471.98
35.8	Surface of water	1,452
36.1	In bend of river, surface of water	1,450
36.3	Dillbeck Ford, north edge of river, nail in side of dead birch tree	1,451.87
36.3	Surface of water	1,447
37.5	McCays post-office, Polk County, Tenn., rock supporting southwest corner of, point on	1,468.07
37.5	McCays Ferry, north side of river, pile supporting swinging bridge, cartridge shell in top of	1,460.15
37.5	High-water mark	1,469
37.5	Surface of water	1,444

CHIPPEWA RIVER FROM REEDS LANDING, MINNESOTA, TO FLAMBEAU, WIS.

Between April 15 and June 12, 1903, J. R. Ellis, field assistant, ran a careful double-rodded primary-level line along the Chippewa River from Reeds Landing, Minnesota, to Chippewa Falls, Wis. This work was under the general direction of J. H. Renshawe, geographer in charge of the central section of topography. Later in the year it was decided to continue this work above Chippewa Falls, and on

September 1 the central and eastern sections having united as the eastern section of topography, H. M. Wilson, geographer in charge, assigned F. T. Fitch, field assistant, to this work. Between that date and October 4 Mr. Fitch ran a line of flying levels accompanied by a plane-table stadia traverse and topographic sketching from Chippewa Falls to Flambeau, Wis.

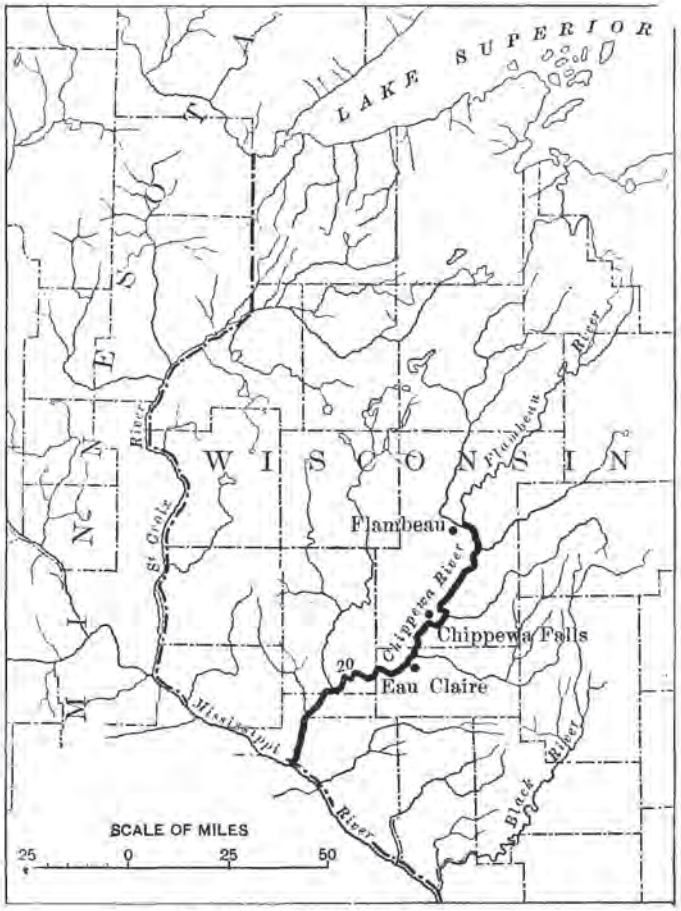


FIG. 17.—Map showing location of surveys in Wisconsin.

This level work is based on a bench mark of the Mississippi River Commission at Reeds Landing, and the distances were obtained by pacing. No plane-table survey of the river was undertaken. In this section, 64 miles in length, there is a fall of 135 feet. Eleven bench-mark tablets and 70 temporary bench marks were established, and 72 water-surface elevations were determined.

While the survey was being made the stage of the river fluctuated greatly, owing to rains and to alternate flooding and stoppage

of the stream by various lumber companies. This diversion of the water is the cause of much compiaint by the various mill owners, many of whom want a system of reservoirs constructed near the headwaters to regulate the water supply.

Owing to the slight fall, the width of the stream, and the wide bottom lands, there are no opportunities for power development upon the Chippewa above Reeds Landing until the city of Eau Claire is reached.

On Eau Claire River, a few hundred feet above its junction with the Chippewa at Eau Claire, is a 13-foot dam 300 feet long, which furnishes power for a linen mill. A few miles above the city of Eau Claire on Chippewa River the Dells Paper Company has a 20-foot dam which might be raised 3 or 4 feet by the use of flashboards. There are no power sites on Chippewa River until the city of Chippewa Falls is reached, but there are good prospects of developing power on several of the tributaries between these cities.

From Chippewa Falls to Flambeau the stadia survey of the river and adjacent banks was plotted on a scale of 1:22,500. In this distance, 43 miles, there is a total fall of 244 feet. Seven bench marks were established and 40 water-surface elevations were determined.

At Chippewa Falls a wooden 13-foot dam, owned by the Chippewa Falls Lumber and Boom Company, increases the head to 30 feet and supplies power for a large sawmill, and an electric plant which furnishes the city of Chippewa Falls with water and light. This dam could be made higher, as the local conditions are favorable, but this would interfere with a proposed plant at Paint Creek Rapids, 2½ miles upstream, to which point the water now backs up. Here there was formerly a flooding dam, but a freshet cut a channel around it to the north, and the dam has since been torn out. A 14-foot dam could be constructed at the foot of the rapids where the banks and bed of the river are sand intermingled with large bowlders. Abundant stone for construction is near at hand.

At Eagle Rapids, 4½ miles upstream, is a good site for a dam. A dam here was torn out. A 20-foot dam would back water three-fourths of a mile above the city of Chippewa, where O'Neils Creek enters from the west. One mile above O'Neils Creek is a gorge 700 feet wide. A 25-foot dam would have solid sandstone for foundation and abutments and would back water almost to the foot of Jim Falls, 5 miles above. At the small village of Jim Falls, near the site of an old flooding dam, is the best opportunity for power development on the river. This point is now under development, the company having purchased all the land needed as well as the water rights. The river flows over a series of granite ledges from 1 to 4 feet high, while the banks seem to be solid rock covered by a

few feet of sandy soil. The proposed dam will be 28 feet high and will be located at the head of the rapids. It will furnish power for a pulp mill. The dam will back water nearly to Brunne Falls, 9½ miles, and covers the Colton and Chevalley rapids. The head obtained by this dam will be 55 feet.

At Brunne Falls the best location for a dam would be at the main fall, about 650 feet above the foot of the rapids, where a 35-foot dam would back the water up to the rapids at Holcombe, 5½ miles. The river at the falls is very narrow, and at the point mentioned the banks are ledges of rock. A rocky island in the river would help in the construction a good deal.

At Holcombe the Chippewa Falls Lumber and Boom Company has an old dam with a head of about 17 feet. This is the third dam they have built there, the others having been washed out by freshets. As the lumber interests in this locality are declining, the present dam is being allowed to decay, and could be replaced with a more substantial structure for power purposes. The river here has a rock bottom and rather low, clay sides, and an 18-foot dam could be constructed on the site of the present structure, which, together with a 15-foot dam at the foot of the rapids, would not destroy any more valuable bottom lands above. This would back the water up for more than a mile above Deer Tail Creek and furnish considerable storage. From here to Flambeau, the end of the survey, there are no rapids of any consequence.

There are two railway bridges and a highway bridge across the river at Chippewa Falls and another road bridge just below Eagle Rapids. There are but few boats on the river, as during the log-driving season boats would be crushed.

The lumbering operations, which are on the decline, are controlled by the Chippewa Falls Lumber and Boom Company, with headquarters at Chippewa Falls, a thriving city of about 10,000 population, where there are a number of factories and mills. About ten miles above is the city of Chippewa, at one time the most promising town in the neighborhood, but now little more than a hamlet. At Jim Falls there is a village, but Holcombe is the only town of any importance above Chippewa Falls. Several railroad lines are being built in this section, and the agricultural and manufacturing interests are supplanting the lumber industry, while the land is generally taken up by settlers wherever the lumber has been cut, so that no second-growth timber is coming up. The whole community seems very prosperous, while numerous companies are on the point of investing capital in the manufacturing interests in the neighborhood.

The elevations of water surfaces of the river are dependent on the following table of daily gage readings by the Chippewa Falls

Lumber and Boom Company from a gage on the highway bridge at Chippewa Falls. The elevation of the zero of gage is 804.8 feet above sea level. The gage height of the highest water known had an elevation of 831.4 feet above sea level.

Gage height of Chippewa River at Chippewa Falls.

Date.	Height.		Date.	Height.	
	Ft.	*In.*		*Ft.*	*In.*
May 1	8	10	June 6	3	10
2	8	6	7	2	2
3	8	0	8	2	6
4	8	0	9	3	0
5	7	9	10	2	9
6	7	3	11	2	6
7	6	8	12	2	6
8	5	6	13	2	2
9	5	6	14	.....	
10	.....		15	1	6
11	5	6	16	1	6
12	8	9	17	1	6
13	9	6	18	1	3
14	9	6	19	0	6
15	9	1	20	2	6
16	8	1	21	.....	
17	.....		22	1	0
18	6	3	23	1	3
19	5	8	24	1	0
20	5	2	25	0	9
21	5	3	26	0	9
22	5	8	27	0	9
23	5	3	28	.....	
24	.....		29	1	6
25	5	9	30	1	10
26	6	4	July 1	3	8
27	8	8	2	4	10
28	11	0	3	5	7
29	12	5	4	9	6
30	11	8	5	10	6
31	10	3	6	10	3
June 1	8	8	7	9	0
2	7	10	8	7	9
3	6	6	9	6	9
4	5	9	10	5	1
5	4	9	11	6	0

Gage height of Chippewa River at Chippewa Falls—Continued.

Date.	Height.		Date.	Height.	
	Ft.	*In.*		*Ft.*	*In.*
July 12	6	0	Aug. 22	1	9
13	5	4	23	.....	
14	4	6	24	1	9
15	4	3	25	1	9
16	3	3	26	1	9
17	3	3	27	1	9
18	5	0	28	2	0
19	1	0	29	2	3
20	2	10	30	2	6
21	2	6	31	2	3
22	2	3	Sept. 1	2	3
23	2	3	2	2	9
24	2	3	3	2	3
25	3	0	4	2	0
26	.....		5	.....	
27	2	6	6	2	3
28	1	9	7	2	6
29	1	6	8	2	8
30	1	4	9	4	0
31	1	0	10	4	4
Aug. 1	1	3	11	5	1
2	1	6	12	7	0
3	2	0	13	7	8
4	2	9	14	9	6
5	3	6	15	12	4
6	5	3	16	13	3
7	5	3	17	12	6
8	6	9	18	11	0
9	3	6	19	9	6
10	3	10	20	8	6
11	3	8	21	7	3
12	3	0	22	6	4
13	3	3	23	5	6
14	3	2	24	4	6
15	3	6	25	3	3
16	.....		26	3	3
17	3	0	27	3	3
18	2	6	28	3	4
19	2	0	29	3	3
20	1	6	30	3	3
21	1	6	Oct. 1	3	3

Gage height of Chippewa River at Chippewa Falls—Continued.

Date.	Height.	Date.	Height.
	Ft. In.		*Ft. In.*
Oct. 2	3 3	Oct. 5	7 10
3	3 6	6	8 1
4	5 9	7	8 0

The elevations in the following list are based upon a bronze tablet, marked "797 E. C," at southwest corner of the court-house at Eau Claire, Wis., the elevation of which is accepted as 797.473 feet above mean sea level. The initial point upon which these levels depend is bench mark "Bottom," of the Missouri River Commission, opposite Reeds Landing, Minnesota, the elevation of which is accepted as 672.355 feet above mean sea level. These elevations accord with the 1903 adjustment of the precise-level net.

Permanent bench marks dependent on this datum are marked with the letters " E. C." in addition to the figures of elevation.

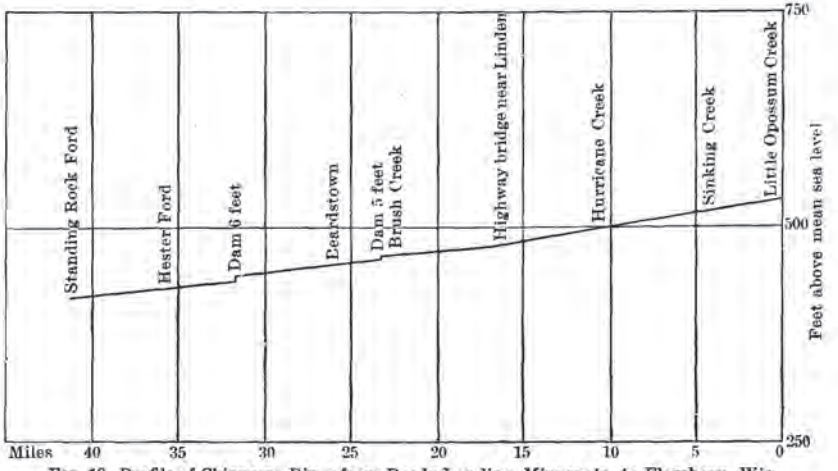


FIG. 18. Profile of Chippewa River from Reeds Landing, Minnesota, to Flambeau, Wis.

Elevations on Chippewa River from Reeds Landing, Minnesota, along Chicago, Milwaukee and St. Paul Railroad, to Chippewa Falls, Wis.

Distance in miles.		Elevation in feet.
0.0	Reeds Landing, Minnesota (Miss. River Commission bench mark "Bottom"), tile and iron pipe in low flat ground, opposite, 220 meters from left bank of river, in property of Mrs. C. S. Richards, 45 meters west of Chicago, Milwaukee and St. Paul Railroad trestle to bridge, 205 meters southwest of end of trestle and small pond	672.355

Elevations on Chippewa River from Reeds Landing, Minnesota, along Chicago, Milwaukee and St. Paul Railroad, to Chippewa Falls, Wis.—Continued.

Distance in miles.		Elevation in feet.
0.5	High water in back water of slough	672
1.4	Trevin's, at grade crossing Burlington and Chicago, Milwaukee and St. Paul railroads, top of rail	684.3
1.4	15 feet northwest of intersection of grade crossing, spike in telegraph pole	684.89
1.9	15 feet northwest of end of trestle, nail in top of fence post	680.01
2.6	Lone narrow island, lower end of, left bank of river, birch tree, nail in root of	677.46
2.6	High water	674
3.2	Private road crossing, top of rail	681.4
3.5	Government dam, 300 feet below, opposite north end of small island, left bank of river, water maple, nail on notch	680.36
3.5	High water	675
3.6	300 feet north of rapids, high water	676
3.8	Wancuda Island, 0.25 mile below north end of, left bank of river, notch cut on elm tree, nail in	681.52
4.3	North end of Government dam, 100 feet below, left channel, surface of water	677
4.5	165 feet east of river, water maple tree, notch cut in	681.13
4.5	Surface of water	678
0	Near north corner of C. W. Knight's yard, in top of limestone 8 by 10 by 26 inches, set 25 inches in ground, bronze tablet marked "682 E. C."	682.337
5.5	Opposite trestle 32 H, surface of water	680
5.8	Old Battle Slough station, in west side of switch stand, spike	685.28
6.2	Surface of water (river about 1 foot above ordinary stage)	681
6.6	Bridge No. 38 M, 50 feet south of, west side of dump, cross on stone	685.28
6.7	Bridge No. 42 M, private road crossing south of, top of rail	688.41
7.4	Bridge No. 50 M, at south end of, east side of track, nail in cross cut in cap	688.26
7.4	Surface of water	683
7.9	Private crossing, top of rail	692.1
7.9	Surface of water	685
8	Second telegraph pole north of slough, spike in	689.33
8.5	Elm tree on left bank of river, nail in notch cut in	689.36
8.5	Surface of water (1.9 feet higher than stage observed nearer mouth)	687
9	Trestle No. 60 M, top of rail	
9	Surface of water	688
9.6	Maxwell station, surface of water	691
9.6	Maxwell, 180 feet southwest of platform, in sandstone post 8 by 12 by 80 inches, set 27 inches in ground, bronze tablet marked "691 E. C."	691.196
10.3	Trestle No. 66 M, Little Belf Slough, surface of water	691

Elevations on Chippewa River from Reeds Landing, Minnesota, along Chicago, Milwaukee and St. Paul Railroad, to Chippewa Falls, Wis.—Continued.

Distance in miles.		Elevation in feet.
10.6	West side of railroad, near gate at private road crossing, nail in top of stump	694.91
10.6	Surface of water (is about 4 feet lower than low water)	693
11.4	South end of trestle No. 70 M, 15 feet east of railroad, cross on sandstone	701.32
11.9	Big Beef Slough, 150 feet below railroad bridge No. 74 M (is about 3 feet above low water) surface of water	695
12.3	595 feet north of bridge, on west side of track, nail in top of post	711.65
12.4	Private road crossing, top of east rail	714.61
12.8	Pawn's farm, private road crossing, top of west rail	724.3
13.4	T. 24 N., R. 13 W., just outside of Chicago, Milwaukee and St. Paul Railroad right of way, left bank of river, and 0.25 mile due west of center sec. 6, in sandstone post 12 by 6 by 30 inches, bronze tablet marked "733 E. C."	732.878
13.4	Surface of water	698
14	Round Hill, 0.25 mile below, left bank of river, black oak tree, nail in notch cut in	737.7
14	Surface of water	699
14.4	Road in front of barn	733
14.4	Surface of water	699
14.6	Round Hill, north and south road crossing on Chicago, Milwaukee and St. Paul Railroad	731.4
15.2	Road crossing on east side of railroad, spike in signboard	740.56
15.9	Private road crossing, top of rail	724.55
16.1	Durand, 100 feet north of south switch block, 12 feet east of center of track, north end of sandstone, cross	717.54
16.5	300 feet north of brewery, east and west road crossing, top of rail	720.6
16.8	Durand, road crossing north of station, top of rail	724.7
16.8	Durand County jail building, water table at southwest corner of, bronze tablet marked "724 E. C."	724.361
16.8	Upper bridge, surface of water	703
17.5	Durand, north part of, at north end of siding, 35 feet northwest of switch block, cottonwood tree, notch cut in root, nail in	727.23
	Spur line up river.	
18.2	Elm tree, left bank of river, nail in notch	707.24
18.2	Surface of water	705
18.5	Creek from east, white oak tree at, nail in notch on root	707.20
18.5	Creek, at mouth, surface of water (river is about 2 feet above low water)	706
	Main line continued.	
18.8	Northwest corner of trestle No. 96 M, nail in top of fence post	717.24
18.8	Surface of water	711
19.1	Beaver Creek, surface of water	712

Elevations on Chippewa River from Reeds Landing, Minnesota, along Chicago, Milwaukee and St. Paul Railroad, to Chippewa Falls, Wis.—Continued.

Distance in miles.		Elevation in feet.
19.1	Trestle No. 98 M, top of sandstone, at southeast end of trestle	714.55
19.7	Trestle No. 100 M, southeast corner of, spike in cap	715.60
19.7	Surface of water	713
20.4	Bear Lake, 0.75 mile north of, private road crossing, top of west rail	733.2
20.6	Private road crossing, top of east rail	735.1
21.1	Whistle post for road crossing, spike in	735.62
21.2	East and west road crossing, top of west rail	735.8
21.4	Northwest and southeast road crossing, top of west rail	737.2
22.1	Weber's house, road crossing, top of rail	745.8
22.1	Crossing post, near bottom, railroad spike	746.52
22.4	Trestle No. 106 M, section line between secs. ——— top of rail	749.64
22.8	Red Cedar, 0.33 mile south of, T. 25 N., R. 12 W., sec. 6, one-quarter corner north side of, in ground at T road east, sandstone 6 by 12 by 30 inches, bronze tablet marked "755 E. C."	755.670
23.1	Red Cedar, west part of, foundation to water tank	758.36
23.1	Red Cedar, road crossing, top of rail	758.9
23.3	Surface of water	721
23.9	Private road crossing, top of rail	735.2
24	Private road crossing, spike in base of first telegraph pole north of	731.37
24.2	Red Cedar Junction, at switch block, top of east rail	729.3
24.4	Red Cedar Junction, surface of water at bridge	721
24.6	Trestle No. 108 M, at southwest corner, nail in top of fence post	730.45
24.6	Surface of water	722
25.7	Tyrone (abandoned station), 750 feet south of, spike in telegraph pole	727.97
25.7	Surface of water	724
25.8	Tyrone, at road crossing, top of rail	732
26.4	Private road crossing, top of rail	731.2
26.7	Trestle No. 116, fence post at southwest corner of, nail in top of	732.96
26.7	Surface of water	724
26.9	Private road crossing, top of west rail	733.24
27.1	Railroad spike in crossing post	731.5
27.4	Road crossing (second one north of public crossing), top of rail	732.9
27.9	Trestle No. 118 M, at southeast corner of, in top of fence post	733.04
27.9	Surface of water	728
28.8	Meridian, T. 26 N., R. 12 W., sec. 14, north part of, at southeast corner of Iver Brock's residence, in stone foundation, bronze tablet marked "740 E. C."	739.923
28.8	Road crossing, top of rail	739.2
29.4	Private road crossing, top of rail	739.8
29.6	Trestle No. 124 M, at east end of, nail in top of fence post	738.46

Elevations on Chippewa River from Reeds Landing, Minnesota, along Chicago, Milwaukee and St. Paul Railroad, to Chippewa Falls, Wis.—Continued.

Distance in miles.		Elevation in feet.
29.6	Surface of water	733
29.7	North and south road crossing, top of rail	739.6
30.1	North and south road crossing, cross on stone	740.30
30.1	Road crossing, top of north rail	741.7
31	Road crossing, spike in telegraph pole	745.02
31	Wagon bridge, surface of water	739
32.2	South side of railroad, 60 feet west of large spring, cross cut in sandstone	751.82
32.2	Surface of water	741
33	Spike in base of telegraph pole	747.85
33.7	Opposite small island, on highest point of large sandstone bowlder, cross cut	753.19
33.7	Surface of water	743
34.1	On bank of river at right of way fence, sandstone bowlder, cross cut in top of	754.70
34.5	Rock Creek, surface of water	744
34.7	Private road crossing, top of rail	752.9
34.9	Trestle No. 144, at northwest corner of, nail in cross cut in cap	751.22
35.8	Caryville, T. 26 N., R. 11 W., sec. 11, east part of, at northwest corner of post-office, Strand's general store, in stone foundation, bronze tablet marked "760 E. C."	760.144
35.9	Road crossing, top of rail	757.7
	[Line continued along highway.]	
36.3	Wagon bridge over West Creek, in top of pile at east approach, nail	753.98
36.3	Surface of water	746
37	East of small island, water maple 40 feet east of river, on left bank, nail in root of	749.63
37	Surface of water	747
38.3	Powell Lake and Chippewa River roads, 75 feet east of junction, small double elm tree, nail in root of	756.15
39.1	Surface of water	752
39.5	Surface of water	752
40.7	On left bank of river, at east end of long log boom, nail in maple stump	763.11
40.7	Surface of water	755
41.3	Coolies Lake, near outlet, B. A. Churchville residence, at southwest corner of, in foundation, bronze tablet marked "779 E. C."	779.356
41.4	Surface of water	758
42.4	Porterville, 0.75 mile south of, wagon road culvert, nail in top of pile	763.92
42.4	Surface of water	761
43	Old Porter mills, nail in root of large water maple	764.84
43.3	T roads	767

Elevations on Chippewa River from Reeds Landing, Minnesota, along Chicago, Milwaukee and St. Paul Railroad, to Chippewa Falls, Wis.—Continued.

Distance in miles.		Elevation in feet.
43.3	Creek, mouth of, surface of water	764
43.8	On river bank, 30 feet west of road, nail in top of stump	767.85
44.1	Surface of water	764
44.8	Charles Bannon's residence, 120 feet southeast of, at gate, nail in white oak stump	771.08
44.9	Lower Creek, road crossing on Chicago, Milwaukee and St. Paul Railroad, top of rail	773.4
44.9	Surface of water (higher than has been for 2 years)	768
45.5	Shawtown, 1 mile south of, T. 27 N., R. 10 W., sec. 36, northeast corner of, in stone foundation at northwest corner of Henry Trimble's residence, bronze tablet marked "781 E. C."	780.84
45.5	High water, in 1884	777
45.8	Road crossing	776.5
45.8	Surface of water	769
46.5	Shawtown, 200 feet south of railroad bridge, spike in base of telegraph pole	783.98
46.5	Under bridge, surface of water	769
46.6	Menomonie street crossing, top of rail	777.6
47.6	Eau Claire, crossing of Niagara and Seventh street	781.2
48.1	East entrance to high school, first window to right, in sill, cut in center	797.93
48.3	Eau Claire, at southwest corner of court-house, bronze tablet marked "797 E. C."	797.473
48.4	Crossing of Grand and Oxford avenue, top of rail	791
48.7	200 feet south of railroad bridge, spike in base of crossing post	787.33
48.8	Center of railroad bridge over river	788.3
48.8	Eau Claire River, mouth of, surface of water under bridge (June 2)	770
	[Spur line, June 9, up Eau Claire River from junction. Stage of water 6.5 lower.]	
.1	Junction of Chippewa and Eau Claire rivers, June 9, foot of first dam at mouth of, on Eau Claire river	763.5
.1	Head of same dam	774
.75	Foot of second dam	774
.75	Head of second dam	786.8
	[Main line continued June 2. River is 6.5 feet higher than a week later.]	
49	Eau Claire court-house, 0.7 mile north of, at Chicago, Milwaukee and St. Paul Railroad station, top of rail	786.05
49.1	Forrest street crossing of spur to paper mill, top of rail	778.6
49.4	Elm street crossing, top of rail	780.3
49.4	The Dallas Paper Mill Company dam, foot of, surface of water	772
49.4	The Dallas Paper Mill Company dam, head of, surface of water	793
49.8	Chicago and Northwestern Railroad bridge over river, south corner of east pier, cross cut on	804.36

Elevations on Chippewa River from Reeds Landing, Minnesota, along Chicago, Milwaukee and St. Paul Railroad, to Chippewa Falls, Wis.—Continued.

Distance in miles.		Elevation in feet.
50.6	Chicago and Northwestern, at mile post St. Paul 87, top of rail	843.1
50.7	Duluth Branch, at overhead road crossing, top of rail	851.8
50.8	Duluth branch, Chicago and Northwestern Railroad, on east side of railroad, opposite yard-limit post, spike in base of telegraph pole.	858.56
51	Road crossing, top of rail	871.3
51.4	Mile post 1, top of east rail	882.8
51.6	Power house at crossing of Chicago, Milwaukee and St. Paul and Chicago and Northwestern railroads, 1,100 feet south of, spike in telegraph pole	882.09
51.9	Grade crossing, top of rail	881.2
52	Chicago, Milwaukee and St. Paul and Chicago and Northwestern railroads, grade crossing, top of rail	880.2
52.6	Road crossing, top of west rail	843.5
52.6	20 feet west of north cattle guard to road crossing, in base of fence corner post, spike	840.09
53.2	Road crossing, top of rail	813.8
53.3	Second pole west of road crossing, spike in	807.97
53.5	Dalles Mill station, road crossing, top of west rail	804.2
54.4	Road crossing on line between Eau Claire and Chippewa counties	813
54.4	County line crossing, in north cattle guard, nail in top of fence post	815.18
54.8	East and west road crossing, top of east rail	821.1
54.8	Surface of water	793
56.1	La Fayette, road crossing at old site of, top of west rail	817.4
56.1	Surface of water	794
56.1	La Fayette, second telegraph pole above road crossing at old site of, spike in	818.75
57.3	North and south private road crossing, spike in black oak tree	815.96
.0	Surface of water	794
57.4	Road crossing east and west	821.9
58.3	Badger Mills, road crossing just below north switch block	817
58.3	Halle Lake, Badger Mills, surface of water	815
58.4	Badger Mills, just south of waiting shed, spike in crossing post	818.19
58.4	Badger Mills, opposite waiting shed, top of east rail	820.2
58.76	Badger Mills, summer hotel, in ground in lawn of, 50 feet due west of front window, sandstone post 10 by 8 by 30 inches, bronze tablet marked "827 E. C."	827.716
59.4	150 feet west of P. C. mark, 150 feet south of gate, spike in base of telegraph pole	831.45
59.4	Surface of water	797.3
60.5	Surface of water	801
60.6	Trestle No. 216, in sleeper at west end of, painted cross on bolt	833.51
61.1	Gravel Island, crossing post just below, spike in base of	855.19
61.1	Gravel Island, slough, mouth of, surface of water	803

Elevations on Chippewa River from Reeds Landing, Minnesota, along Chicago, Milwaukee and St. Paul Railroad, to Chippewa Falls, Wis.—Continued.

Distance in miles.		Elevation in feet.
62.1	Surface of water	805
62.2	Spike in base of crossing post	840.31
62.2	Road crossing, top of rail	842.4
62.8	Central Junction, Chicago, Milwaukee and St. Paul Railroad and Wisconsin Central Railroad, switch block at	832.4
62.9	East side of railroad, spike in base of telegraph pole	832.9
62.9	Road crossing, top of rail	833.9
63	Center of Chicago, Milwaukee and St. Paul Railroad bridge, top of rail	834.03
63	Surface of water under bridge	805
63.3	Junction of Chicago, Milwaukee and St. Paul Railroad and Wisconsin Central Railroad (main line), top of rail	840.3
63.8	Chippewa Falls, 20 feet south of water tank, spike in base of telegraph pole	830.63
63.9	Chippewa Falls, Taylor street crossing, top of rail	833.7
63.9	Chippewa Falls, under bridge, foot of dam, surface of water	807
64.31	Chippewa Falls, northeast corner of city building containing fire department and city jail, in foundation, bronze tablet marked "840 E. C."	840.468
64.4	Chippewa Falls, above dam, surface of water	840
	[Flying levels by F. T. Fitch, field assistant, Chippewa Falls, up Chippewa River to Flambeau.]	
.0	Highest water mark on record, recorded by Chippewa Falls Lumber and Boom Company, Sept. 10, 1884	832
.0	Second highest water mark of Chippewa River, recorded Dec. 3, 1896	831
.0	Lowest water mark of Chippewa River, reading taken at Chippewa Falls	804
.0	Highway bridge at falls, surface of water	806
.0	Chippewa Falls, surface of water	826
.0	Crest of dam of Chippewa Falls Lumber Company, surface of water	839
3.7	Paint Creek Rapids, foot of, north bank of river, 50 feet from water, top of bowlder, chiseled square	844.54
5.5	Yellow River, mouth of, surface of water	852
8	Eagle Rapids, foot of, surface of water	854
9.2	Eagle Rapids, head of, surface of water	867
10.7	Surface of water	871
13	Foot of rapids, surface of water	881
15.7	Jim Falls, east side of river at edge of water, nearly opposite Pitch Hotel, at foot of rapids, in granite ledge, chiseled square	902
15.7	Surface of water	901
16.6	Head of rapids, surface of water	936
17.9	Coltons Rapids, foot of, surface of water	942.2
19.2	Coltons Rapids, head of, surface of water	945

Elevations on Chippewa River, from Reeds Landing, Minnesota, along Chicago, Milwaukee and St. Paul Railroad, to Chippewa Falls, Wis.—Continued.

Distance in miles.		Elevation in feet.
19.2	Chas. Richards, near house occupied by, 150 feet south of road intersection, at edge of water, rock, chiseled square	947.40
20.2	Shaw Creek, 400 feet above mouth of, surface of water	
22.9	Bob Creek, mouth of, surface of water	954
25.7	Chevalley Rapids, foot of, surface of water	961
26.9	Above rapids, surface of water	966
26.9	Brunne Falls, at boat landing, west bank of river, below main falls and just above Chevalley Rapids, 125 feet south of old house, 50 feet from water, bowlder 2 feet square, chiseled square	984.19
27	Brunne Rapids, foot of, surface of water	967
28	Brunne Rapids, head of, surface of water	993
29.5	Fisher River, mouth of, surface of water	995
32.7	Holcombe, foot of rapids, surface of water	1,004
33.2	Holcombe, foot of dam, surface of water	1,020
33.2	Above dam, surface of water	1,036
33.2	South entrance to bridge over flooding dam, 500 feet west of, south side of highway, 50 feet south of river, on bowlder in fence, chiseled square	1,046.55
39.7	Deer Tail Creek, mouth of, surface of water	1,036
43.3	Flambeau, post-office, at intersection of Flambeau and Chippewa rivers, on point of land, nail in root of tree	1,055.09
43.3	Junction of rivers, surface of water	1,050

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O

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