DEPARTMENT OF THE INTERIOR

# WATER-SUPPLY

AND

# IRRIGATION PAPERS

OF THE

## UNITED STATES GEOLOGICAL SURVEY

## No. 44

PROFILES OF RIVERS IN THE UNITED STATES.—GANNETT

WASHINGTON
GOVERNMENT PRINTING OFFICE
1901

# IRRIGATION REPORTS.

The following list contains titles and brief descriptions of the principal reports relating to water supply and irrigation prepared by the United States Geological Survey since 1890:

**1890.**

First Annual Report of the United States Irrigation Survey, 1890; octavo, 123 pp.

Printed as Part II, Irrigation, of the Tenth Annual Report of the United States Geological Survey, 1888–89. Contains a statement of the origin of the Irrigation Survey, a preliminary report on the organization and prosecution of the survey of the arid lands for purposes of irrigation, and a report of work done during 1890.

**1891.**

Second Annual Report of the United States Irrigation Survey, 1891; octavo, 395 pp.

Published as Part II, Irrigation, of the Eleventh Annual Report of the United States Geological Survey, 1889–90. Contains a description of the hydrography of the arid region and of the engineering operations carried on by the Irrigation Survey during 1890, the statement of the Director of the Survey to the House Committee on Irrigation, and other papers, including a bibliography of irrigation literature. Illustrated by 29 plates and 4 figures.

Third Annual Report of the United States Irrigation Survey, 1891; octavo, 576 pp.

Printed as Part II of the Twelfth Annual Report of the United States Geological Survey, 1890–91. Contains "Report upon the location and survey of reservoir sites during the fiscal year ended June 30, 1891," by A. H. Thompson; "Hydrography of the arid regions," by F. H. Newell; "Irrigation in India," by Herbert M. Wilson. Illustrated by 93 plates and 190 figures.

Bulletins of the Eleventh Census of the United States upon irrigation, prepared by F. H. Newell; quarto.

No. 35, Irrigation in Arizona; No. 60, Irrigation in New Mexico; No. 85, Irrigation in Utah; No. 107, Irrigation in Wyoming; No. 153, Irrigation in Montana; No. 157, Irrigation in Idaho; No. 163, Irrigation in Nevada; No. 178, Irrigation in Oregon; No. 193, Artesian wells for irrigation; No. 198, Irrigation in Washington.

**1892.**

Irrigation of western United States, by F. H. Newell; extra census bulletin No. 23, September 9, 1892; quarto, 22 pp.

Contains tabulations showing the total number, average size, etc., of irrigated holdings, the total area and average size of irrigated farms in the subhumid regions, the percentage of number of farms irrigated, character of crops, value of irrigated lands, the average cost of irrigation, the investment and profits, together with a résumé of the water supply and a description of irrigation by artesian wells. Illustrated by colored maps, showing the location and relative extent of the irrigated areas.

**1893.**

Thirteenth Annual Report of the United States Geological Survey, 1891–92, Part III, Irrigation, 1893; octavo, 486 pp.

Consists of three papers: "Water supply for irrigation," by F. H. Newell; "American irrigation engineering" and "Engineering results of the Irrigation Survey," by Herbert M. Wilson; "Construction of topographic maps and selection and survey of reservoir sites," by A. H. Thompson. Illustrated by 77 plates and 119 figures.

A geological reconnoissance in central Washington, by Israel Cook Russell, 1893; octavo, 108 pp., 15 plates. Bulletin No. 108 of the United States Geological Survey; price, 15 cents.

Contains a description of the examination of the geologic structure in and adjacent to the drainage basin of Yakima River and the great plains of the Columbia to the east of this area, with special reference to the occurrence of artesian waters.

**1894.**

Report on agriculture by irrigation in the western part of the United States at the Eleventh Census, 1890, by F. H. Newell, 1894; quarto, 283 pp.

Consists of a general description of the condition of irrigation in the United States, the area irrigated, cost of works, their value and profits; also describes the water supply, the value of water, of artesian wells, reservoirs, and other details; then takes up each State and Territory in order, giving a general description of the condition of agriculture by irrigation, and discusses the physical conditions and local peculiarities in each county.

Fourteenth Annual Report of the United States Geological Survey, 1892–93, in two parts; Part II, Accompanying papers, 1894; octavo, 597 pp.

Contains papers on "Potable waters of the eastern United States," by W J McGee; "Natural mineral waters of the United States," by A. C. Peale; "Results of stream measurements," by F. H. Newell. Illustrated by maps and diagrams.



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UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

# PROFILES OF RIVERS

IN THE

# UNITED STATES

BY

HENRY GANNETT

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## ILLUSTRATIONS.


JULIUS BIEN & CO. N.Y.

# PROFILES OF RIVERS IN THE UNITED STATES.

By HENRY GANNETT.

## GENERAL DISCUSSION.

The profiles here represented are derived from various sources and differ from one another greatly in accuracy. Many of them are drawn from the annual reports of the Chief of Engineers, U. S. A., under which are included the reports of the Mississippi and Missouri River commissions. The heights thus obtained are those of the level of water in the rivers at certain stages, and may be regarded as of great accuracy. Others have been obtained from railroad profiles, being the level of the rivers at points where the railroads touch or cross them. Still others have been taken from the atlas sheets of the United States Geological Survey and from other maps. In most such cases the points at which the contours cross the rivers upon the maps have been taken. These again differ in point of accuracy with the means adopted for the location of the contours. Where the spirit level was used in locating contours it may be assumed that the determinations are fairly good, but where the barometer was used the probable error may be of considerable magnitude. Such elevations are, however, mainly in the mountainous parts of the country, where the fall of the streams is great, and where, therefore, errors of considerable magnitude may be tolerated, as affecting but little the form of the profile.

The rivers whose profiles are presented in the following pages are indicated upon the map which forms Pl. I. The profiles are given in figures, showing the distance between points, the height at each point, and the average fall per mile between points. They are also represented graphically upon Pls. II to XI, inclusive. All these profiles are represented upon the same horizontal and vertical scales, the former being 100 miles to an inch and the latter 2,000 feet to an inch. This relation between the scales, which scarcely suffices to show any slope in the Lower Mississippi, gives the appearance to many other streams of exceeding steepness, as in the case of those flowing out of the Sierra Nevada. Still it was judged best, after much consideration, to use uniform scales throughout, in order that comparisons between different rivers might be made directly.

## ST. CROIX RIVER.

The drainage basin of this river is in eastern Maine, a portion of it projecting over into New Brunswick. Its area is 1,674 square miles. Its surface is undulating and hilly, but not mountainous, and is, in the main, densely forested.

At a distance of 20 miles from its mouth the river forks, the main branch, known as the Kennebasis, coming down from the north. It is of this branch that the profile is given. The other branch, known as the Chiputneticook, comes from the west.

To illustrate the lacustrine character of this stream it may be stated that there are within its drainage basin, and tributary to it, no fewer than 27 lakes, ranging in size from three-quarters of a square mile up to 27 square miles, and with a total area of 134 square miles.

Upon the river and its northern tributary there are many falls and rapids, only a few of which have been utilized.

The profile shows great and recent disturbances, changing it materially from the normal profile which it must have presented at the opening of the Glacial epoch.

The figures are from Wells's Water Power of Maine.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Upper bridge, Milltown, mouth | 0 | 0 | ..... |
| Baring bridge | 5¼ | 86 | ..... |
| Foot of Sprague falls | 10¼ | 93 | 9 |
| Head of Sprague falls | 10¾ | 118 | 50 |
| Head of Enoch rips | 11¼ | 128 | ..... |
| Pitch of Lower Grand falls | 19¼ | 145 | 3 |
| Head of Upper Grand falls | 19¾ | 165 | 40 |
| Foot of Grand Chiputneticook falls | 22 | 169 | 2 |
| Head of Grand Chiputneticook falls | 22¾ | 190 | 28 |
| Foot of Canoose rips | 30 | 200 | 1 |
| Head of Canoose rips | 30½ | 211 | 22 |
| Foot of Haycock rips | 33¼ | 212 | ..... |
| Head of Haycock rips | 33¾ | 218 | 12 |
| Foot of Meeting-house rips | 34¾ | 218 | ..... |
| Head of Meeting-house rips | 35¾ | 226 | 8 |
| Foot of Rocky rips | 36½ | 227 | ..... |
| Head of Rocky rips | 39¾ | 252 | 8 |
| Foot of Mile rips | 50 | 353 | ..... |
| Head of Mile rips | 51 | 358 | 5 |
| Foot of Kill-me-quick rips | 54 | 372 | 5 |
| Head of Kill-me-quick rips | 54½ | 382 | 20 |
| Head of Chiputneticook Lake | 74½ | 382 | ..... |
| Stream into Mud Lake | 76¼ | 426 | 22 |
| Head of Mud Lake | 80½ | 426 | ..... |

## PENOBSCOT RIVER.

This, the largest river in the State, has a drainage area of 8,934 square miles, its greatest length being 160 miles, and its greatest breadth 115 miles. Its surface is hilly or undulating, in the main forest-clad and full of lakes; indeed, within its basin 185 lakes and ponds have been counted, having a total area of 395 square miles.

The course of the river is crooked; indeed, in its upper part it has apparently no definite direction, flowing through lakes and swamps. It meets tide at Vinal Mills, 39 miles above its mouth. Its profile is equally irregular, consisting of level reaches, rapids, and falls.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | ..... |
| Bangor | 27 | 0 | ..... |
| Head of falls, Vinal Mills | 39 | 92 | 7.7 |
| Mouth of Mattawamkeag River | 84 | 190 | 2.2 |
| Chesuncook Lake | 120 | 900 | 19.7 |
| Penobscot Lake | 200 | 1,509 | 7.6 |

## KENNEBEC RIVER.

This river has its source in Moosehead Lake, from which it flows in a generally southward direction to its mouth below Bath. It meets tide at Augusta, 26 miles above Merrymeeting Bay, and about 40 miles above its mouth. Its drainage area, excluding Androscoggin River, is 6,400 square miles, most of which, and especially the northern part, is densely forested. It is in a lacustrine region containing hundreds of lakes and ponds, most of which are small in area. The profile is from the census report on Water Power, 1880.

| Locality. | Distance from Merrymeeting Bay. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Merrymeeting Bay | 0 | 0 | ..... |
| Augusta, head of tide | 26 | 0 | ..... |
| Head of Kendall Mills rip | 48 | 91 | 4.1 |
| Norridgewock | 66 | 138 | 2.6 |
| Dam at Madison bridge | 79 | 236 | 7.5 |
| Head of Caratunk falls | 90 | 316 | 7.3 |
| Moosehead Lake | 138 | 1,023 | 14.7 |

### ANDROSCOGGIN RIVER.

This river heads in the White Mountains, in New Hampshire, and flows in a generally eastward and southeastward direction, joining the Kennebec in Merrymeeting Bay. Its drainage basin presents the same characteristics as those of the Penobscot and Kennebec, varied by the fact that its sources are in a mountain region and at a considerable elevation. It has the same forest-clad, lacustrine character. The river contains numerous falls, many of which, especially at Lewiston, have been greatly utilized. The total area drained measures 3,698 square miles, of which three-fourths lie in Maine and the remainder in New Hampshire. The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Merrymeeting Bay | 0 | 0 | ..... |
| Head of Rumford falls | 75 | 600 | 8.0 |
| Bethel | 100 | 620 | 0.8 |
| State line | 114 | 690 | 5.0 |
| Head of Berlin falls | 128 | 1,048 | 25.6 |
| Head of river proper | 160 | 1,256 | 6.5 |
| Parmachene Lake | 186 | 1,600 | 13.2 |
| Magalloway Lake | 199 | 2,225 | 48.1 |

### SACO RIVER, MAINE AND NEW HAMPSHIRE.

This stream heads in eastern New Hampshire and flows east and southeast to its mouth, near Saco and Biddeford. Its drainage basin, having an area of 1,750 square miles, half of which is in Maine and half in New Hampshire, is quite similar in its characteristics to the basins of the other rivers of these States. Its head is in the southern part of the White Mountains, and it flows thence through the low country in Maine.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | ..... |
| Mouth of Ossipee River | 40 | 266 | 6.7 |
| Foot of Great falls | 45 | 271 | 1.0 |
| Head of Great falls | 45 | 343 | ..... |
| Conway Center | 73 | 412 | 2.5 |
| Mouth Ellis River | 83 | 511 | 9.9 |
| West boundary of Bartlett | 92 | 745 | 26.0 |
| Head | 104 | 1,880 | 94.6 |

## MERRIMAC RIVER.

This little stream, which probably turns more spindles than any other stream of the United States, heads in the central part of New Hampshire, and flows in a direction a little east of south into northeastern Massachusetts, which it traverses in a northeast course to its mouth, at Newburyport. Its drainage basin is 4,864 square miles. The upper portion is a forest-clad, lacustrine region, but it soon enters a country which is densely settled and has been largely cleared of forests. Everywhere, however, it abounds in lakes and ponds. Its profile shows the irregularities which are so characteristic of the streams of New England, consisting of a succession of still reaches alternating with falls and rapids.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | ..... |
| Mitchell falls | 22 | 0 | ..... |
| Foot of locks at Lawrence | 27 | 10 | 2.0 |
| Top of Lawrence dam | 28 | 39 | 29.0 |
| Foot of Hunt falls | 37 | 42 | 0.3 |
| Head of Hunt falls | 38 | 53 | 11.0 |
| Top of Pawtucket dam, Lowell | 40 | 87 | 17.0 |
| State line | 49 | 90 | 0.3 |
| Mouth of Nashua River | 53 | 93 | 0.8 |
| Foot of Cromwell falls | 57 | 93 | 0.0 |
| Foot of Goff falls | 64 | 112 | 2.7 |
| Head of Goff falls | 65 | 117 | 5.0 |
| Manchester, below falls | 68 | 126 | 3.0 |
| Top of Manchester dam | 69 | 178 | 52.0 |
| Hooksett, below falls | 78 | 181 | 0.3 |
| Hooksett, top of dam | 79 | 197 | 16.0 |
| Foot of Garvin falls | 83 | 199 | 0.5 |
| Head of Garvin falls | 83 | 227 | 28.0 |
| Foot of Sewell falls | 93 | 229 | 0.2 |
| Head of Sewall falls | 95 | 248 | 9.5 |
| Mouth of Contoocook River | 96 | 249 | 1.0 |
| Franklin, head of river | 110 | 269 | 1.4 |

## CONTOOCOOK RIVER.

This is a branch of Merrimac River in New Hampshire. It heads in the southwestern part of the State, near the Massachusetts line, and flows northeastward to its connection with the parent stream. It has a rapid fall, supplying many water powers.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 249 | |
| Just above Contoocook | 11 | 365 | 10.5 |
| Just below Henniker | 21 | 389 | 2.4 |
| Foot of Long fall | 22 | 433 | 44.0 |
| Head of Long fall | 24 | 546 | 56.5 |
| Foot of falls at Hillsboro bridge | 27 | 564 | 6.0 |
| Head of falls at Hillsboro bridge | 27 | 591 | |
| Foot of falls at Bennington | 36 | 606 | 1.7 |
| Head of falls at Bennington | 37 | 676 | 70.0 |
| Foot of falls at North Peterboro | 44 | 714 | 5.4 |
| Head of falls at North Peterboro | 44 | 724 | 1.5 |
| Foot of falls at Peterboro | 46 | 727 | |
| Head of falls at Peterboro | 46 | 734 | 35.25 |
| Hillsboro county line | 50 | 875 | |
| Three Ponds, in Rindge | 55 | 1,114 | 47.8 |

## CONNECTICUT RIVER.

Connecticut River heads near the boundary line between the State of Vermont and Canada in a series of small lakes at an altitude exceeding 2,000 feet, flows thence in a southerly course, forming the boundary between Vermont and New Hampshire, and thence across Massachusetts and Connecticut to its mouth in Long Island Sound. Its total length is nearly 400 miles, and its fall in that distance somewhat more than 3,000 feet, being an average of about 5 feet per mile. It is tidal to Hartford, 50 miles above its mouth. The area of its basin includes 11,269 square miles. The upper part of this is forest clad, but lower down, and especially throughout Massachusetts and Connecticut, the forests have been largely cleared away for settlement. Throughout it is in a lacustrine region. From its head as far as central Massachusetts it has a narrow valley, but in southern Massachusetts and northern Connecticut the valley expands broadly, owing to the fact that it is here composed of Triassic sandstones, which are much softer than the Archean rocks in which its course lay above. Below Holyoke its course is crossed by a dike of trap which has retarded its work of eroding its bed, forming a partial dam, behind which the river becomes very gentle, sluggish, and winding, developing a broad course in its bottom land.

One of its curves is known as the Oxbow, which has been cut off, and has become a crescent-shaped lake, similar to those so common in the valley of the Lower Mississippi.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Hartford | 50 | 0 | |
| Foot of Enfield rapids | 60 | 6 | 0.6 |
| Top of Enfield dam | 66 | 38 | 5.3 |
| Top of Holyoke dam | 84 | 98 | 3.3 |
| Fitchburg R. R. crossing | 115 | 109 | 0.35 |
| Top of Turners Falls dam | 120 | 173 | 12.8 |
| Mouth of Ashuelot River | 136 | 206 | 2.1 |
| Westmoreland | 159 | 219 | 0.6 |
| Foot of Bellows falls | 170 | 234 | 1.4 |
| Head of Bellows falls | 170 | 283 | |
| Beaver Meadows, Charlestown | 181 | 289 | 0.5 |
| Windsor | 196 | 304 | 1.0 |
| White River Junction | 209 | 339 | 2.7 |
| Ledyard bridge, Hanover | 213 | 375 | 9.0 |
| Oxford | 230 | 380 | 0.3 |
| Wells River | 255 | 407 | 1.1 |
| Foot of McIndoes falls | 262 | 432 | 3.6 |
| Lower Waterford | 273 | 643 | 19.2 |
| Head of Fifteen-mile falls | 285 | 830 | 15.6 |
| North Stratford | 312 | 885 | 2.0 |
| West Stewartstown | 344 | 1,035 | 4.7 |
| Connecticut Lake | 361 | 1,618 | 34.3 |
| Second Lake | 369 | 1,882 | 15.5 |
| Third Lake | 375 | 2,038 | 26.0 |

## HOUSATONIC RIVER.

This important stream heads in western Massachusetts, flows southerly down into Connecticut, and then turns to the southeast, emptying into Long Island Sound near Bridgeport. It has a drainage basin of 1,933 square miles. In its upper course it flows through a hilly country, partially cleared, the hills gradually becoming smaller and the proportion of woodland less as the stream is traced southward.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Mouth of Shepaug River | 30 | 105 | 3.5 |
| Two miles above Cornwall bridge | 64 | 457 | 10.2 |
| Falls village | 73 | 622 | 19.4 |
| Ashley Falls, Mass | 82 | 705 | 9.2 |
| Pittsfield | 123 | 983 | 4.3 |

## HUDSON RIVER.

This river heads in Lake Tear of the Clouds, in the heart of the Adirondacks, at a great altitude, and comes down the south slope of that mountain group with a steep descent, flowing through many ponds and over many cataracts and waterfalls in its course. The profile rapidly flattens as the river leaves the mountains, but in the neighborhood of Glens Falls, near its junction with the Mohawk, it makes a series of abrupt drops, due to passing over hard rock beds, which furnish valuable water power. It reaches tide at Troy, 150 miles from its mouth.

Its drainage area, including Mohawk River, is 13,366 square miles.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Troy | 150 | 5 | 0.03 |
| Crest of Saratoga dam | 180 | 102 | 3.2 |
| Fort Edward R. R. bridge | 190 | 118 | 1.6 |
| Crest of Glens Falls feeder dam | 197 | 284 | 23.7 |
| Mouth of Secondaga River | 216 | 536 | 13.3 |
| Mouth of Stony Creek | 222 | 571 | 5.8 |
| Mouth of Schroon River | 228 | 594 | 3.8 |
| The Glen | 236 | 720 | 15.7 |
| Mouth of Mill Creek | 240 | 817 | 24.2 |
| Mouth of North Creek | 248 | 981 | 20.5 |
| North of River village | 253 | 1,041 | 12.0 |
| Mouth of Boreas River | 257 | 1,134 | 23.3 |
| Mouth of Indian River | 265 | 1,403 | 33.6 |
| Mouth of Cedar River | 266 | 1,454 | 51.0 |
| Lake Tear of the Clouds | 300 | 4,322 | 84.4 |

## MOHAWK RIVER.

This, the main western branch of Hudson River, flows eastward through a broad depression between the Adirondacks and the Helderberg Plateau. The irregularities of its profile are due mainly to its flowing over the edges of hard rock beds. Its principal fall is that at Cohoes, near its mouth.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 12 | |
| Lower aqueduct (fall nearly all at Cohoes) | 4 | 162 | 37.5 |
| Schenectady | 19 | 214 | 3.5 |
| Mouth of Schoharie Creek | 42 | 270 | 2.4 |
| Three miles east of Utica | 95 | 393 | 2.3 |
| Four miles east of Rome | 112 | 418 | 1.5 |
| Rome, above feeder dam | 115 | 431 | 4.3 |

## PASSAIC RIVER.

[From the census report on Water Power, 1880.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Passaic | 29 | 0 | |
| Dundee dam, crest | 30 | 22 | 22.0 |
| Paterson, below falls | 41 | 39 | 1.5 |
| Paterson dam, crest | 42 | 115 | 76.0 |
| Little falls, dam | 47 | 162 | 9.4 |
| Lower Chatham bridge | 69 | 168 | 0.3 |
| Near Madisonville | 86 | 240 | 4.2 |

## DELAWARE RIVER.

This river heads in the western slopes of the Catskill Mountains and in the plateaus north of them, flows in a course alternating between southwest and southeast, but generally southeast, to its mouth, in Delaware Bay, reaching tide at Trenton. Throughout most of its course it forms the boundary line between Pennsylvania, on the west, and New York or New Jersey, on the east. The length of the stream,

following its windings from its source to Trenton, is about 280 miles, and its average fall about 6.7 feet per mile. Its drainage area, including all its branches, is 12,012 square miles.

The first part of its course is down the declivities of the Catskill Mountains. Shortly thereafter it enters the faulted and folded region of the Appalachian Valley, flowing alternately with the ridges and across them. At Delaware Water Gap it passes the Kittatinny Range. At Trenton, where it crosses the Fall Line and meets tide, there is a fall of nearly 8 feet, which furnishes a valuable water power.

The profile is mainly from the census report on Water Power, 1880.

| Locality. | Distance from Trenton. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Trenton, below falls | 0 | 0 | ..... |
| Yardley | 3 | 8 | 2.7 |
| Bull Island | 26 | 74 | 2.9 |
| Easton | 54 | 159 | 3.0 |
| Belvidere | 68 | 235 | 5.4 |
| Delaware Water Gap | 81 | 301 | 5.1 |
| Four miles above Port Jervis | 127 | 450 | 3.2 |
| Lackawaxen | 146 | 600 | 7.9 |
| Deposit | 212 | 984 | 5.8 |
| Head | 280 | 1,886 | 13.3 |

## LEHIGH RIVER.

[From the census report on Water Power, 1880.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 159 | ..... |
| Bethlehem | 12 | 205 | 3.8 |
| Slatington | 33 | 350 | 6.9 |
| Lehighton | 42 | 450 | 11.1 |
| Mauch Chunk, below dam | 46 | 504 | 13.5 |
| | 54 | 690 | 23.2 |
| Near White Haven | 70 | 1,105 | 25.9 |
| Stoddartsville | 83 | 1,457 | 27.1 |

## SCHUYLKILL RIVER.

This river heads in Schuylkill County, in eastern Pennsylvania, and flows southeast to its junction with the Delaware at Philadelphia. In its course through Schuylkill and Berks counties it traverses numerous water gaps through the ridges of the Appalachian Valley. Its length is 112 miles, and its drainage basin about 1,800 square miles. The average fall of the river is about 5 feet per mile.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Fairmount | 8 | 0 | |
| Pawlings dam | 30 | 67 | 3.0 |
| Reading | 70 | 205 | 3.45 |
| Port Clinton | 92 | 390 | 8.4 |
| Landingville | 100 | 472 | 10.25 |
| Schuylkill Haven | 105 | 509 | 7.4 |
| Port Carbon | 112 | 619 | 15.7 |

## SUSQUEHANNA RIVER.

Susquehanna River rises in two large branches known as the North and West branches, the former rising in southern New York and the latter in central Pennsylvania, both branches heading in the Allegheny plateau. The drainage basin of the entire river is 27,655 square miles, three-fourths of it being within the State of Pennsylvania. The length of the river, following up the North Branch, is 422 miles. The North Branch pursues an extremely crooked course, flowing in a generally southwesterly course in the State of New York, changing in northeastern Pennsylvania to a southeast course, until it flows out of the plateau and into the great Appalachian Valley. Then it flows southwestward to its junction with the West Branch at Sunbury. Most of this part of its course lies in limestone valleys, but in several cases it breaks through ridges from valley to valley, forming water gaps.

The West Branch heads in Cambria County and flows, at first, northward and northeastward and then southeastward until it leaves the plateau and enters the valley. Then it flows eastward in a limestone valley, at the south foot of the Allegheny Front, until it reaches a point north of Sunbury, whence it flows southward to its junction at that place with the North Branch, cutting several water gaps through opposing ridges on its way.

From Sunbury to Harrisburg the main Susquehanna flows nearly south across the trend of the ridges and valleys. In this part of its course the river cuts five fine water gaps. Through each of these the stream runs with accelerated velocity, while in the intervening limestone valleys it has a leisurely flow. From Harrisburg the river flows southeast to the head of Chesapeake Bay, most of the way through a rolling, highly cultivated country.

Between Sunbury and Harrisburg the profile is slightly convex, showing the effect in retarding the progress of the river's erosion of the hard ridges which it crosses.

The profile is from the census report on Water Power, 1880.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | ..... |
| State line | 12 | 69 | 5.8 |
| Mouth of Fishing Creek | 20 | 100 | 3.9 |
| Foot of Columbia dam | 43 | 224 | 5.4 |
| Crest of Columbia dam | 43 | 231 | ..... |
| Foot Conewago falls | 57 | 254 | 1.6 |
| Above Conewago falls | 59 | 273 | 9.5 |
| Harrisburg | 69 | 298 | 2.5 |
| Rockville | 75 | 305 | 1.16 |
| Clark ferry dam, foot | 84 | 336 | 3.4 |
| Clark ferry dam, crest | 84 | 343 | ..... |
| Liverpool | 99 | 378 | 2.3 |
| Selinsgrove | 116 | 421 | 2.5 |
| Sunbury dam, foot | 122 | 422 | 0.2 |
| Sunbury dam, crest | 122 | 429 | ..... |
| Nanticoke dam, foot | 174 | 509 | 1.5 |
| Nanticoke dam, crest | 174 | 515 | ..... |
| Wilkesbarre | 183 | 521 | 0.66 |
| Mouth of Lackawanna River | 190 | 536 | 2.14 |
| Mouth of Tunkhannock Creek | 211 | 581 | 2.14 |
| Mouth of Meehoopany Creek | 223 | 604 | 1.9 |
| Mouth of Wyalusing Creek | 244 | 646 | 2.0 |
| Mouth of Wysox Creek | 258 | 687 | 2.9 |
| Towanda | 262 | 700 | 3.2 |
| Athens | 278 | 744 | 2.7 |
| Otsego Lake | 422 | 1,193 | 3.1 |

WEST BRANCH OF SUSQUEHANNA RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 429 | ..... |
| Lewisburg dam, foot | 7 | 431 | ..... |
| Lewisburg dam, crest | 7 | 434 | ..... |
| Muncy dam, foot | 23 | 462 | 1.75 |
| Muncy dam, crest | 23 | 469 | ..... |
| Williamsport dam, foot | 39 | 498 | 1.8 |
| Williamsport dam, crest | 39 | 508 | ..... |
| Lockhaven dam, foot | 65 | 539 | 1.2 |
| Lockhaven dam, crest | 65 | 550 | ..... |
| Queens Run dam, foot | 69 | 551 | 0.25 |
| Queens Run dam, crest | 69 | 557 | ..... |
| Keating | 105 | 695 | 3.8 |
| Curwinsville | 160 | 1,117 | 7.7 |

JUNIATA RIVER.

This is a large western branch of Susquehanna River, which heads in the Appalachian Valley, under the Allegheny Front, and flows with a generally eastward, but an extremely crooked, course to its mouth, a few miles above Harrisburg. Its course is throughout an alternation of gentle stretches in limestone valleys and of rapid courses through water gaps. Its drainage basin comprises 3,223 square miles.

The profile is from the census report on Water Power.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 336 | ..... |
| Millerstown dam, foot | 16 | 380 | 2.7 |
| Millerstown dam, crest | 16 | 388 | ..... |
| Lewistown dam, foot | 44 | 442 | 1.9 |
| Lewistown dam, crest | 44 | 450 | ..... |
| Newton Hamilton dam, foot | 68 | 512 | 2.6 |
| Newton Hamilton dam, crest | 68 | 520 | ..... |
| Huntington dam, foot | 90 | 610 | 4.1 |
| Huntington dam, crest | 90 | 622 | ..... |

## POTOMAC RIVER.

This river heads in several long branches in the Appalachian Valley, in Virginia, and in the edge of the Allegheny Plateau. The North and South branches of the Potomac and the Shenandoah River flow in lines that are parallel to one another, with a course somewhat east of north, for long stretches through limestone valleys. The North Branch, which is the uppermost of the head streams, turns eastward at Cumberland and, thence known as the Potomac, flows in a generally southeasterly course as far as Washington, where it reaches tide level, being joined on the way by the South Branch of the Potomac at Piedmont and by the Shenandoah River at Harpers Ferry. In the upper part of its course it crosses a number of ridges in water gaps, and at Harpers Ferry crosses the Blue Ridge, cutting a gap nearly 1,000 feet in depth.

The obstruction produced by the rocks of the Blue Ridge at Harpers Ferry has retarded the stream to such an extent that above this point both the main river and its branch, the Shenandoah, have been locally graded for a long distance upstream, giving them gentle and very crooked courses. The drainage basin of the Potomac River is 14,479 square miles, including the Shenandoah, which has an area of 2,850 square miles.

The following profiles of the Potomac, its South Branch, and the Shenandoah with its North Fork, are from the atlas sheets of the United States Geological Survey:

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Point Lookout | 0 | 0 | ..... |
| Chain bridge, above Georgetown, D. C | 115 | 20 | 0.2 |
| Head of Little falls | 116 | 40 | 20.0 |
| Foot of Great falls | 121 | 60 | 4.0 |
| Head of Great falls | 125 | 150 | 22.5 |
| | 141 | 200 | 3.1 |
| Harpers Ferry | 172 | 250 | 1.6 |
| | 179 | 300 | 7.1 |
| Hancock | 220 | 400 | 2.4 |
| | 244 | 500 | 4.2 |
| Cumberland | 290 | 600 | 2.2 |
| | 310 | 700 | 5.0 |
| | 316 | 800 | 16.7 |
| | 320 | 900 | 25.0 |
| | 324 | 1,000 | 25.0 |
| | 330 | 1,200 | 33.3 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Cumberland | 334 | 1,400 | 50.0 |
| | 338 | 1,600 | 50.0 |
| | 342 | 1,800 | 50.0 |
| | 346 | 2,000 | 50.0 |
| Wilson | 358 | 2,500 | 41.7 |

SOUTH BRANCH OF POTOMAC.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, near Green Spring | 0 | 545 | ..... |
| | 15 | 600 | 3.7 |
| Romney | 27 | 700 | 8.3 |
| Moorefield | 52 | 800 | 4.0 |
| South Fork of South Branch | 65 | 1,000 | 15.4 |
| | 76 | 1,200 | 18.2 |
| | 87 | 1,500 | 27.3 |
| | 103 | 2,000 | 31.3 |

SHENANDOAH RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Harpers Ferry | 0 | 250 | ..... |
| | 10 | 300 | 5.0 |
| | 39 | 400 | 3.4 |
| Riverton | 58 | 465 | 3.4 |
| | 68 | 500 | 3.5 |
| Overall | 82 | 600 | 7.1 |
| | 94 | 700 | 8.3 |
| | 115 | 800 | 4.8 |
| | 133 | 900 | 5.5 |
| | 147 | 1,000 | 7.1 |
| | 170 | 1,200 | 8.7 |
| | 200 | 1,500 | 10.0 |

NORTH FORK OF SHENANDOAH RIVER.

| Locality. | Distance from mouth of Shenandoah River. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Riverton | 58 | 465 | |
| | 63 | 500 | 7.0 |
| | 73 | 600 | 10.0 |
| | 83 | 700 | 10.0 |
| | 98 | 800 | 6.7 |
| | 124 | 900 | 3.8 |
| | 135 | 1,000 | 9.1 |
| | 147 | 1,200 | 16.7 |

JAMES RIVER.

This tributary to Chesapeake Bay heads in the Allegheny Front, in West Virginia, and flows in a generally eastward course across the Appalachian Valley, cutting across its ridges and finally the Blue Ridge. In its course across the valley and through the Piedmont region it has many rapids. At Richmond it crosses the Fall Line with an abrupt descent of 84 feet and just below that city reaches tide and the head of navigation. From this point to its mouth, 111 miles, it is a tidal estuary. Its drainage basin, including that of its main branch, Appomattox River, comprises 9,684 square miles.

Appomattox River heads in the Piedmont region, flows eastward and joins James River just below Petersburg, at which point it crosses the fall line.

The profile of James River is from the levels of the Engineer Corps, U. S. A., and that of the Appomattox from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Richmond | 111 | 0 | |
| Grant dam | 114 | 84 | 28.0 |
| Bosher dam | 122 | 124 | 5.0 |
| Maiden's Adventure dam | 140 | 143 | 1.1 |
| Tye River dam | 220 | 375 | 2.9 |
| Joshua Falls dam | 246 | 463 | 3.4 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Lynchburg waterworks dam | 260 | 513 | 3.6 |
| Judith dam | 263 | 540 | 9.0 |
| Bald Eagle dam | 268 | 558 | 3.6 |
| Pedlar dam | 271 | 572 | 4.7 |
| Coleman Falls dam | 274 | 588 | 5.3 |
| Big Island dam | 278 | 606 | 4.5 |
| Cushaw dam | 282 | 649 | 10.8 |
| Blue Ridge dam | 287 | 706 | 11.4 |
| Quarry Falls dam | 290 | 720 | 4.7 |
| Varney Falls dam | 297 | 759 | 5.6 |
| Indian Rock dam | 301 | 786 | 6.8 |
| Wasp Rock dam | 305 | 812 | 6.5 |
| Junction Jackson and Cowpasture rivers | 325 | 1,014 | 10.1 |

APPOMATTOX RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | ..... |
| | 17 | 100 | 5.8 |
| Giles mill | 59 | 200 | 2.4 |
| Near Farmville | 98 | 300 | 2.6 |
| | 110 | 400 | 8.3 |
| Head near Appomattox | 130 | 800 | 20.0 |

ROANOKE RIVER.

The source of this river is in the Appalachian Valley, in southwest Virginia; thence it flows southeastward to the head of Albemarle Sound. It is navigable to Weldon, above which place it crosses the Fall Line. Its principal branch, Dan River, which heads in the mountains of western North Carolina, exhibits similar peculiarities.

The drainage basin of Roanoke River, including that of the Dan, is 9,237 square miles.

The profile of the Roanoke as far up as Brookneal and that of the Dan are from levels by the Engineer Corps, U. S. A. The upper portion of the Roanoke is from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Weldon | 129 | 39 | 0.3 |
| Gaston | 132 | 143 | 34.6 |
| Stone House Creek | 148 | 181 | 2.4 |
| Great Creek | 160 | 194 | 1.1 |
| Allen Creek | 172 | 212 | 1.5 |
| East Lynne Creek | 182 | 233 | 2.1 |
| Clarksville, Va | 196 | 289 | 4.0 |
| Roanoke landing | 217 | 319 | 1.4 |
| Wallace Creek | 223 | 328 | 1.5 |
| Old landing | 229 | 337 | 1.5 |
| Edmunds landing | 233 | 341 | 1.0 |
| Coles ferry landing | 239 | 350 | 1.5 |
| Brookneal | 249 | 368 | 1.8 |
| Head Long Island | 261 | 400 | 2.7 |
| Wards road ferry | 276 | 500 | 6.7 |
| Folers ferry, mouth of Pig River | 302 | 600 | 3.8 |
| Radford ford | 317 | 700 | 6.7 |
| Lynville ford | 330 | 800 | 7.7 |
| | 341 | 900 | 9.1 |
| Salem | 360 | 1,000 | 5.3 |
| | 365 | 1,100 | 20.0 |
| | 370 | 1,200 | 20.0 |
| | 379 | 1,300 | 11.1 |
| | 386 | 1,400 | 14.3 |
| | 388 | 1,500 | 50.0 |

DAN RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 289 | |
| Danville canal | 60 | 397 | 1.8 |
| Wilson upper ferry | 67 | 431 | 4.9 |
| Daniels ferry | 78 | 462 | 2.8 |
| Leaksville | 91 | 492 | 2.3 |
| Eagle falls | 99 | 510 | 2.3 |
| Madison bridge | 110 | 538 | 2.5 |
| Ladds ford | 119 | 568 | 3.3 |
| | 128 | 618 | 5.6 |
| Danbury | 138 | 688 | 7.0 |

## CAPE FEAR RIVER.

This river heads in the upper part of the Piedmont region and flows southeast to its mouth at Wilmington. It crosses the Fall Line above Fayetteville.

Its drainage basin comprises 8,310 square miles.

The profile is from the report on Water Power of the Tenth Census.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Wilmington | 0 | 0 | |
| Fayetteville | 112 | 7 | .06 |
| Smiley falls, foot | 139 | 42 | 1.3 |
| Smiley falls, head | 143 | 69 | 6.75 |
| Junction Haw and Deep rivers | 172 | 130 | 2.1 |

## GREAT PEDEE RIVER.

This river, following up the Yadkin, heads in the Blue Ridge, in the northern part of North Carolina, and flows southeastwardly to its mouth, near Georgetown, South Carolina, its course being throughout in the Piedmont region and the Atlantic Coastal Plain. It exhibits many irregularities, due to recent tilting of the region through which it flows. It crosses the Fall Line above Cheraw.

Its drainage basin is 17,098 square miles.

The profile is from the levels of the Engineer Corps, U. S. A., as far as Wilkesboro; above that point it has been derived from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Cheraw | 149 | 65 | 0.4 |
| Foot of Bluitt falls | 170 | 145 | 3.8 |
| Allentown ferry | 199 | 201 | 1.9 |
| Christian ferry | 208 | 209 | 0.9 |
| Mouth Uwharrie River | 212 | 239 | 7.5 |
| Head of Narrows | 214 | 259 | 10.0 |
| Stokes ferry | 227 | 505 | 18.9 |
| Bringle ferry | 237 | 557 | 5.2 |
| Crossing Southern R. R | 259 | 661 | 4.7 |
| Mouth of South Yadkin River | 263 | 667 | 1.5 |
| Dutchman Island | 272 | 680 | 1.4 |
| Oakes ferry | 281 | 694 | 1.6 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Bailey ferry | 291 | 711 | 1.7 |
| Hall ferry | 297 | 726 | 2.5 |
| Jones mill | 309 | 752 | 2.2 |
| Sycamore ford | 325 | 790 | 2.4 |
| Rockford | 341 | 866 | 4.8 |
| Hurt ledge | 351 | 908 | 4.2 |
| Sayles ford | 362 | 931 | 2.1 |
| Mouth of Roaring River | 371 | 958 | 3.0 |
| Wilkesboro | 382 | 992 | 3.1 |
| | 385 | 1,000 | 2.7 |
| | 391 | 1,100 | 16.7 |
| | 403 | 1,200 | 8.3 |
| Patterson | 410 | 1,250 | 7.1 |

SANTEE RIVER.

This river heads in the eastern slope of the Blue Ridge in several branches, converging in the Catawba, Saluda, and Broad rivers, which flow southwestward across the Piedmont region and the Atlantic Coastal Plain to its mouth, near Cape Romain. Its drainage basin is 14,696 square miles.

The profiles of this river and its branches are from the levels of the Engineer Corps, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | ..... |
| Junction of Wateree and Congaree rivers | 208 | 80 | 0.4 |
| Head of Wateree River | 268 | 160 | 1.3 |
| Foot of Gaydon falls | 275 | 226 | 9.4 |
| Crossing C. C. and A. R. R. | 308 | 461 | 7.1 |
| State Line | 323 | 485 | 1.6 |
| Crossing A. and C. R. R. | 328 | 508 | 4.6 |
| Crossing C. C. R. R | 333 | 522 | 2.8 |
| Crossing W. N. C. R. R. | 370 | 730 | 5.6 |
| Crossing Chester and Lenoir R. R | 398 | 884 | 5.5 |
| Moore shoal | 403 | 908 | 4.8 |
| Morganton | 413 | 1,010 | 10.2 |
| Old Fort | 463 | 1,274 | 5.3 |
| Crossing of Southern R. R. | 473 | 2,050 | 77.6 |
| Head, in Swannanoa gap | 479 | 2,658 | 101.3 |

CONGAREE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Junction with Wateree River | 0 | 80 | |
| Head, Columbia | 60 | 136 | 1.0 |

SALUDA RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 136 | |
| Crossing of G. & C. R. R | 60 | 383 | 4.1 |
| | 125 | 749 | 5.6 |
| Crossing of Southern R. R | 135 | 809 | 6.0 |

BROAD RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 136 | |
| Ninety-nine Islands | 12 | 176 | 3.3 |
| Summers shoal, foot | 26 | 229 | 3.7 |
| Lyle shoal, foot | 41 | 270 | 2.7 |
| Neal shoal, foot | 59 | 322 | 2.9 |
| Foot of the gravel | 68 | 340 | 2.0 |
| Foot of Ninety-nine Islands | 94 | 426 | 3.3 |
| Head of Cherokee shoal | 101 | 530 | 14.8 |
| Crossing Southern R. R | 105 | 542 | 3.0 |
| Green River | 141 | 759 | 6.0 |

SAVANNAH RIVER.

This river heads in the eastern slope of the Blue Ridge and flows southeast to its mouth at Savannah. It crosses the Fall Line just above Augusta, where is afforded a fine water power, which is utilized to a large extent, making Augusta the chief cotton-manufacturing point in the South.

The drainage basin of the river is 11,402 square miles.

The profile is from levels by the Engineer Corps, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Savannah | 0 | 0 | ..... |
| Crossing of C. & S. R. R. | 14 | 4 | 0.3 |
| Purysburg | 23 | 6 | 0.25 |
| Ebenezer landing | 34 | 14 | 0.7 |
| Sisters ferry | 47 | 20 | 0.5 |
| Parachuchla | 55 | 24 | 0.5 |
| Monkey point | 70 | 31 | 0.5 |
| Haga Slaga point | 91 | 44 | 0.6 |
| Cohens bluff | 101 | 51 | 0.7 |
| Burton ferry landing | 116 | 60 | 0.6 |
| Brown landing | 130 | 69 | 0.6 |
| Rattlesnake camp | 141 | 77 | 0.7 |
| Blue bluff | 150 | 80 | 0.3 |
| Demerief ferry | 161 | 87 | 0.6 |
| Eagle point | 170 | 92 | 0.6 |
| Hill landing | 180 | 98 | 0.6 |
| Mason landing | 191 | 103 | 0.5 |
| Augusta | 203 | 110 | 0.6 |
| Little River shoals | 225 | 203 | 4.2 |
| Point Lookout shoals | 235 | 256 | 5.3 |
| Petersburg, Ga | 259 | 289 | 1.4 |
| | 265 | 306 | 2.8 |
| Head Hell sluices | 272 | 380 | 10.6 |
| Moseley ferry | 278 | 405 | 4.2 |
| Harper ferry | 284 | 422 | 2.8 |
| Dooley ferry | 306 | 541 | 5.4 |
| Andersonville | 314 | 577 | 4.5 |

## OCONEE RIVER.

This is one of the main branches of the Altamaha River in Georgia. It heads on the eastern slope of the Blue Ridge and flows nearly southeast to its junction with the Altamaha. Its profile is remarkably smooth, with little variation from a normal one. It is from levels by the Corps of Engineers, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 83 | |
| Chaney ferry | 6 | 88 | 0.8 |
| McArthur landing | 15 | 99 | 1.2 |
| Adams landing | 25 | 109 | 1.0 |
| Savannah, Americus and Montgomery R. R. crossing | 30 | 114 | 1.0 |
| Adams landing | 37 | 121 | 1.0 |
| Odam landing | 39 | 123 | 1.0 |
| Dixon landing | 45 | 129 | 1.0 |
| Walton landing | 50 | 134 | 1.0 |
| Davis landing | 55 | 138 | 0.8 |
| Branch landing | 58 | 141 | 1.0 |
| Cooper landing | 62 | 145 | 1.0 |
| Walton landing | 67 | 151 | 1.2 |
| Pritchett landing | 70 | 154 | 1.0 |
| Clark landing | 72 | 156 | 1.0 |
| Dublin | 79 | 161 | 0.7 |
| Blackshears ferry | 85 | 167 | 1.0 |
| Kittrell landing | 93 | 175 | 1.0 |
| Thompson ferry | 98 | 179 | 0.8 |
| Ball ferry | 102 | 185 | 1.5 |
| Central R. R. bridge | 108 | 193 | 1.3 |
| Spring Lake | 114 | 202 | 1.5 |
| Whitaker Island | 127 | 221 | 1.5 |
| Tucker ferry | 137 | 231 | 1.0 |
| Milledgeville | 147 | 242 | 1.1 |
| Georgia R. R. bridge | 149 | 248 | 3.0 |
| Crossing Georgia R. R | 209 | 335 | 1.5 |
| Crossing N. E. R. R. near Athens | 249 | 604 | 6.7 |
| Crossing N. E. R. R. near Lula | 294 | 1,232 | 13.9 |

## APALACHICOLA AND CHATTAHOOCHEE RIVERS.

The Chattahoochee, the main branch of the Apalachicola River, heads in the Blue Ridge, in northeast Georgia, flows southwest to the boundary between this State and Alabama, following that boundary to the south line of the State, near which it joins Flint River to form the Apalachicola. The river leaves the metamorphic region and crosses the Fall Line at Columbus, the head of navigation. Just above this place is a succession of rapids and falls, giving the river a descent of 120 feet within 5 miles of Columbus.

The profile is taken mainly from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth of Apalachicola River | 0 | 0 | |
| Columbus | 400 | 238 | 0.6 |
| | 405 | 358 | 24.0 |
| West Point | 434 | 600 | 8.3 |
| Morns ferry | 512 | 700 | 1.3 |
| Lizzie | 537 | 750 | 2.0 |
| | 554 | 800 | 2.9 |
| Terry ferry | 586 | 900 | 3.1 |
| Stringer ford | 615 | 989 | 3.1 |
| Crowder ford | 627 | 1,100 | 9.3 |
| | 643 | 1,200 | 6.25 |
| Mouth of Spoiled Cane Creek | 653 | 1,500 | 30.0 |
| Head | 661 | 3,500 | 250.0 |

## COOSA AND TALLAPOOSA RIVERS.

Alabama River, one of the two main branches of Mobile River, divides just below Montgomery, Alabama, into two large branches, Coosa and Tallapoosa rivers. The former heads in northern Georgia, in the broken hills which form the southern end of the Appalachian Mountains in two branches, the Etowah and the Oostanaula rivers. The Tallapoosa River heads in northwest Georgia.

The entire drainage basin of the Alabama is 23,820 square miles.

The profile is from levels of the Engineer Corps, U. S. A.

## COOSA RIVER.

| Locality. | Distance from Wetumka bridge. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Wetumka bridge | 0 | 148 | |
| Thompson ferry | 19 | 244 | 5.1 |
| Zimmerman ferry | 31 | 276 | 2.7 |
| Narrows | 46 | 383 | 7.1 |
| Foot of Steamboat Island | 58 | 406 | 1.9 |
| Bullock Island | 64 | 413 | 1.2 |
| Tallasseehatchie Creek | 76 | 415 | 0.2 |
| Glover ferry | 85 | 423 | 0.9 |
| Griffith ferry | 96 | 453 | 2.7 |
| Truss ferry | 108 | 469 | 1.3 |
| Embry ferry | 115 | 471 | 0.3 |
| Greensport | 141 | 500 | 1.1 |
| | 160 | 521 | 1.1 |
| Garrett ferry | 207 | 571 | 1.1 |
| Cedar bluff | 223 | 623 | 3.3 |
| Rome | 271 | 652 | 0.6 |

## ETOWAH RIVER.

[This profile is made up mainly from the atlas sheets of the United States Geological Survey.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Rome | 0 | 652 | |
| Cartersville | 43 | 696 | 1.0 |
| Mouth of Little River | 63 | 798 | 5.1 |
| Chamlee ferry | 83 | 900 | 5.1 |
| Ledbetter bridge | 104 | 1,000 | 4.8 |
| Dougherty | 119 | 1,100 | 6.7 |
| | 122 | 1,200 | 33.3 |
| | 131 | 1,300 | 11.1 |
| Head | 144 | 3,500 | 169.2 |

### OOSTANAULA RIVER AND COOSAWATTEE RIVER.

[This profile is made up from atlas sheets of the United States Geological Survey.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Rome | 0 | 652 | |
| Foot of mountains | 67 | 700 | 0.7 |
| | 73 | 1,000 | 50.0 |
| | 83 | 1,200 | 20.0 |

### BLACK WARRIOR RIVER.

This is a large eastern branch of Tombigbee River, one of the two forks of Mobile River. It heads in northern Alabama and flows southwest to its junction with the Tombigbee.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Tuscaloosa | 0 | 0 | |
| Langston | 13 | 45 | 3.5 |
| Patton ferry | 32 | 107 | 3.3 |
| Mouth of Locust Fork | 47 | 120 | 0.9 |
| Tuggle landing | 70 | 144 | 1.0 |
| Junction Sipsey and Mulberry forks | 90 | 163 | 0.95 |

### TALLAPOOSA RIVER.

[This profile is made from atlas sheets of the United States Geological Survey.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 160 | |
| Bosworth | 90 | 500 | 3.8 |
| Malone ferry | 106 | 582 | 5.1 |
| Mouth of Little Tallapoosa River | 122 | 660 | 4.9 |
| | 148 | 800 | 5.4 |
| Muscadine | 181 | 900 | 3.0 |
| | 200 | 1,000 | 5.3 |
| Allgood mill | 215 | 1,154 | 10.3 |

## TEXAS RIVERS.

The rivers of Texas, the Trinity, Brazos, Colorado, and Nueces, and their branches, drain a territory whose physiographic features affect all its streams in a similar manner. The region slopes with much uniformity toward the southeast and the streams flow down this slope. It is formed of a succession of rock beds, dipping gently southeast, but more steeply than the slope of the land, so that on following down one of these streams we cross successively more recent strata. These beds are not of uniform hardness, and the streams, cutting more rapidly in the softer beds and being retarded by the harder ones, exhibit a succession of gentle and rapid courses. This is excellently shown in the Brazos and Colorado rivers.

These profiles were made up from atlas sheets of the United States Geological Survey.

### TRINITY RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | ..... |
| Crossing of H. E. & W. T. R. R | 72 | 50 | 0.7 |
| Sixteen miles below Dallas | 314 | 350 | 1.2 |
| Twelve miles above Dallas | 342 | 400 | 1.8 |
| Six miles below Fort Worth | 361 | 500 | 5.3 |
| Weatherford | 404 | 1,000 | 11.6 |

### BRAZOS RIVER AND CLEAR FORK.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | ..... |
| Bolivar landing | 51 | 2 | ..... |
| Mouth of Cow Creek | 60 | 9 | 0.8 |
| Crossing G. C. & S. F. R. R | 66 | 22 | 2.2 |
| Richmond | 89 | 47 | 1.1 |
| Eighteen miles above Waco | 291 | 400 | 1.7 |
| | 318 | 450 | 1.85 |
| | 341 | 500 | 2.2 |
| | 374 | 600 | 3.0 |
| | 407 | 700 | 3.0 |

BRAZOS RIVER AND CLEAR FORK—continued.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Near Palo Pinto | 462 | 800 | 1.8 |
| | 521 | 900 | 1.7 |
| | 545 | 1,000 | 4.2 |
| | 572 | 1,100 | 3.7 |
| Near Fort Griffin | 592 | 1,200 | 5.0 |
| | 621 | 1,400 | 6.2 |
| | 642 | 1,500 | 4.8 |
| Newsom | 675 | 1,650 | 4.5 |
| Roby | 710 | 1,900 | 7.1 |

COLORADO RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| | 145 | 300 | 2.1 |
| Above Bastrop | 175 | 350 | 1.7 |
| Below Austin | 205 | 400 | 1.7 |
| Dam above Austin | 217 | 450 | 4.2 |
| | 229 | 500 | 4.2 |
| | 261 | 600 | 3.1 |
| Marble Falls | 297 | 700 | 2.8 |
| Mouth of Llano River | 315 | 800 | 5.6 |
| | 329 | 900 | 7.1 |
| | 341 | 1,000 | 8.3 |
| | 371 | 1,100 | 3.3 |
| | 424 | 1,200 | 1.9 |
| | 468 | 1,300 | 2.3 |
| | 498 | 1,400 | 3.3 |
| | 524 | 1,500 | 3.8 |
| | 548 | 1,600 | 4.2 |
| | 569 | 1,700 | 4.7 |
| | 591 | 1,800 | 4.5 |

LLANO RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 800 | |
| Llano | 27 | 1,000 | 7.4 |
| | 48 | 1,200 | 9.5 |
| | 84 | 1,500 | 8.3 |

SAN SABA RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 1,120 | |
| Above San Saba | 14 | 1,200 | 5.7 |
| | 37 | 1,400 | 8.7 |
| | 61 | 1,600 | 8.3 |
| Fort McKavett | 111 | 2,100 | 10.0 |

CONCHO RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 1,500 | |
| Above Paint Rock | 22 | 1,600 | 4.5 |
| | 30 | 1,700 | 12.5 |
| San Angelo | 43 | 1,800 | 7.7 |
| | 55 | 1,900 | 8.3 |
| | 66 | 2,000 | 9.1 |
| | 83 | 2,200 | 11.7 |

NUECES RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Northern part of Zavalla County | 230 | 700 | 3.1 |
| | 256 | 1,000 | 11.5 |
| Northwestern part of Uvalde County | 275 | 1,250 | 13.2 |
| Barksdale | 292 | 1,500 | 14.7 |
| | 310 | 1,750 | 13.8 |

## RIO GRANDE.

The Rio Grande rises in the San Juan Mountains of Colorado and has a steep descent in a mountain canyon to San Luis Valley. In this broad valley its slope is greatly reduced, but increases again in the canyon in southern Colorado and northern New Mexico, which it has cut in a volcanic mesa. Flowing out of this it runs southward for several hundred miles in a valley, in which its slope is fairly uniform. It increases again in the canyon above the mouth of the Pecos, diminishing again below that point toward its mouth, where it becomes very slight.

The river is subject to wide variations in volume at different times of the year. From southern New Mexico to the mouth of the Pecos it is often dry in late summer, while in the springtime it is a powerful torrent.

The Pecos, its main branch, heads in the mountains above Las Vegas and flows southeastward over the plains and through a broad valley to its mouth. Its profile, although evidently controlled largely by the slopes of the surface, is nearly normal, but shows a decided irregularity in the increased slope near its mouth.

The profile of the Rio Grande has been made up mainly from the atlas sheets of the United States Geological Survey, that of the Pecos in part from railroad levels and in part from these atlas sheets.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| | 250 | 440 | 1.8 |
| | 420 | 960 | 3.1 |
| | 722 | 2,500 | 5.1 |
| | 765 | 2,600 | 2.3 |
| | 783 | 2,700 | 5.6 |
| | 798 | 2,800 | 6.7 |
| | 816 | 2,900 | 5.6 |
| | 829 | 3,000 | 7.7 |
| | 843 | 3,100 | 7.1 |
| | 878 | 3,200 | 2.8 |
| | 902 | 3,300 | 4.1 |
| | 916 | 3,400 | 7.1 |
| | 956 | 3,500 | 2.5 |
| | 992 | 3,600 | 2.7 |
| El Paso | 1,030 | 3,700 | 2.6 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Earlham | 1,069 | 3,800 | 2.6 |
| | 1,099 | 3,900 | 3.3 |
| | 1,153 | 4,120 | 4.1 |
| Alamocita | 1,197 | 4,250 | 2.9 |
| San Marcial | 1,233 | 4,400 | 4.2 |
| Albuquerque | 1,374 | 4,900 | 3.5 |
| Bernalillo | 1,396 | 5,000 | 4.5 |
| Cochiti | 1,420 | 5,200 | 8.3 |
| San Ildefonso | 1,450 | 5,500 | 10.0 |
| Rinconada | 1,480 | 5,829 | 10.9 |
| | 1,508 | 6,357 | 18.9 |
| Colonas ferry | 1,552 | 7,443 | 24.7 |
| Del Norte | 1,626 | 7,742 | 4.0 |
| Wagon Wheel gap | 1,656 | 8,450 | 23.6 |
| San Juan | 1,681 | 9,000 | 22.0 |
| Mouth of Lost Trail Creek | 1,756 | 9,500 | 6.7 |
| Mouth of Pole Creek | 1,765 | 10,790 | 143.3 |
| Head | 1,770 | 12,000 | 242.0 |

PECOS RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 1,000 | ..... |
| Pecos | 215 | 2,550 | 7.2 |
| Eddy | 300 | 3,107 | 6.6 |
| Hagerman | 375 | 3,400 | 3.9 |
| Crossing P. V. R. R. | 405 | 3,500 | 3.3 |
| Latitude 35° | 530 | 4,600 | 8.8 |
| Las Colonias | 548 | 4,850 | 13.9 |
| La Junta | 556 | 4,950 | 12.5 |
| | 567 | 5,100 | 13.6 |
| Anton Chico | 577 | 5,250 | 15.0 |
| La Cuesta | 597 | 5,800 | 27.5 |
| San Miguel | 607 | 6,000 | 20.0 |
| | 622 | 6,500 | 33.3 |
| | 637 | 7,000 | 33.3 |
| | 657 | 8,000 | 50.0 |
| Head | 663 | 12,000 | 666.7 |

## MISSISSIPPI RIVER.

The Mississippi River heads in Lake Itasca, or rather in the indefinite divide a few miles farther south. For several hundred miles its course is through a region over which the great northern glacier scattered its deposits, producing great irregularity in the disposition of the drainage. In this part of its course the river is very irregular, both in direction and in slope, flowing through numerous lakes of considerable size, and between them having rapids and falls. The most notable of the falls in the upper part of its course is that of St. Anthony, at Minneapolis, where the river flows off a bed of St. Peter sandstone. Below this fall its course becomes much more regular. It flows through Lake Pepin, where it has no appreciable descent, and there are no rapids of importance until those of Rock Island, Illinois, are reached, and these, with the rapids at Keokuk, are the only serious obstructions to navigation below Minneapolis. In each of these cases the rapids were produced by a recent shift in the river channel, caused by the Laurentian glacier.

The slope of the river as far as Cairo does not vary greatly, ranging from two feet to eight-tenths of a foot per mile. Most of the way the river flows in a bottom land of considerable breadth, generally widening downward, and the river becomes more and more crooked and winding.

Below Cairo, where it is joined by the Ohio, its character is that of a graded stream. Although its slope is not materially diminished, its bottom lands become broader, and within them it meanders widely from bluff to bluff. In southern Louisiana it changes again; its course becomes straighter, it deposits more detritus than it receives, and in consequence it has built up its bank by overflow, forming a broad, gently sloping ridge of dry land which accompanies it through the swamp in which its course lies. Below the mouth of Red River it forms distributaries which aid in carrying off its surplus water in times of flood. In this part of its course its slope is scarcely appreciable, and yet it flows with a strong current.

It discharges into the gulf through a delta composed of several arms or passes—South Pass, Southwest Pass, Pass a l'Outre, etc. Its entire drainage basin comprises 1,240,039 square miles.

The profile is from the levels of the Mississippi River Commission; the heights are those of ordinary low water.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Carrollton, La | 140 | 1 | |
| College Point, La | 194 | 2 | |
| Plaquemine, La | 222 | 2 | |
| Baton Rouge, La | 245 | 3 | |
| Port Hickory, La | 287 | 3 | |
| Mouth of Red River, Ark | 316 | 7 | 0.0 |
| Natchez, Miss | 378 | 21 | 0.2 |
| St. Joseph, La | 449 | 36 | 0.2 |
| Vicksburg, Miss | 487 | 48 | 0.3 |
| Lake Providence, La | 555 | 73 | 0.4 |
| Greenville, Miss | 618 | 93 | 0.3 |
| Arkansas City, Ark | 658 | 100 | 0.2 |
| Mouth of White River, Ark | 700 | 114 | 0.3 |
| Helena, Ark | 791 | 147 | 0.4 |
| Mahoons landing, Miss | 821 | 163 | 0.5 |
| Memphis, Tenn | 862 | 185 | 0.5 |
| Fulton, Tenn | 922 | 212 | 0.5 |
| Cottonwood Point, Mo | 974 | 230 | 0.3 |
| New Madrid, Mo | 1,028 | 256 | 0.5 |
| Columbus, Ky | 1,076 | 271 | 0.3 |
| Cairo, Ill | 1,097 | 274 | 0.1 |
| Thebes, Ill | 1,137 | 291 | 0.4 |
| Fountain Bluff, Ill | 1,177 | 313 | 0.5 |
| St. Louis, Mo | 1,270 | 380 | 0.7 |
| Mouth of Missouri River, Mo | 1,288 | 395 | 0.8 |
| Grafton, Ill | 1,308 | 405 | 0.5 |
| Clarksville, Mo | 1,361 | 433 | 0.5 |
| Louisiana, Mo | 1,371 | 437 | 0.4 |
| Hannibal, Mo | 1,397 | 450 | 0.5 |
| Quincy, Ill | 1,413 | 458 | 0.5 |
| Canton, Mo | 1,428 | 466 | 0.5 |
| Gregory landing, Mo | 1,439 | 472 | 0.5 |
| Alexandria, Mo | 1,445 | 475 | 0.5 |
| Keokuk, Iowa | 1,450 | 477 | 0.4 |
| Montrose, Iowa (rapids) | 1,462 | 500 | 1.9 |
| Fort Madison, Iowa | 1,470 | 502 | 0.3 |
| Burlington, Iowa | 1,492 | 511 | 0.4 |
| Oquawka, Ill | 1,505 | 516 | 0.4 |
| Keithsburg, Ill | 1,516 | 523 | 0.6 |
| New Boston, Ill | 1,522 | 524 | 0.2 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Port Louisa, Iowa | 1,530 | 526 | 0.3 |
| Muscatine, Iowa | 1,544 | 530 | 0.3 |
| Rock Island, Ill | 1,571 | 542 | 0.4 |
| Le Claire, Iowa (rapids) | 1,587 | 562 | 1.2 |
| Clinton, Iowa | 1,608 | 566 | 0.2 |
| Savanna, Ill | 1,629 | 572 | 0.3 |
| Bellevue, Iowa | 1,649 | 578 | 0.3 |
| Dubuque, Iowa | 1,672 | 585 | 0.3 |
| Cassville, Wis | 1,699 | 599 | 0.5 |
| Prairie du Chien, Wis | 1,727 | 604 | 0.2 |
| Lansing, Iowa | 1,756 | 612 | 0.3 |
| Brownsville, Minn | 1,782 | 622 | 0.4 |
| La Crosse, Wis | 1,791 | 628 | 0.7 |
| Winona, Minn | 1,821 | 637 | 0.3 |
| Fountain, Wis | 1,829 | 644 | 0.9 |
| Minneiska, Minn | 1,839 | 650 | 0.6 |
| Alma, Wis | 1,849 | 656 | 0.6 |
| Wabasha, Minn | 1,857 | 662 | 0.8 |
| Red Wing, Minn., Lake Pepin | 1,888 | 665 | 0.1 |
| Hastings, Minn | 1,911 | 671 | 0.3 |
| St. Paul, Minn | 1,937 | 683 | 0.5 |
| Mouth of Minnesota River, Minn | 1,943 | 688 | 0.8 |
| Minneapolis, Minn. (St. Anthony falls) | 1,952 | 794 | 11.8 |
| Anoka, Minn | 1,970 | 825 | 1.7 |
| Mouth of Elk River, Minn | 1,985 | 851 | 1.7 |
| Monticello, Minn | 1,997 | 891 | 3.3 |
| Clearwater, Minn | 2,015 | 936 | 2.5 |
| St. Cloud, Minn | 2,025 | 965 | 2.9 |
| Watab, Minn | 2,033 | 1,001 | 4.5 |
| Mouth of Platte River, Minn | 2,045 | 1,026 | 2.1 |
| Little Falls, Minn | 2,060 | 1,090 | 4.3 |
| Mouth of Crow Wing River, Minn | 2,085 | 1,145 | 2.2 |
| Brainerd, Minn | 2,095 | 1,150 | 0.5 |
| Aitkin | 2,128 | 1,190 | 1.2 |
| Foot Grand Rapids | 2,182 | 1,248 | 1.1 |
| Mouth of Leech Lake River | 2,210 | 1,281 | 1.2 |
| Lake Winnebagoshish | 2,222 | 1,290 | 0.8 |
| Lake Pemidgi | 2,263 | 1,355 | 1.6 |
| Lake Itasca | 2,296 | 1,462 | 3.2 |

## OHIO RIVER.

Ohio River drains nearly all of the Allegheny Plateau from New York to Alabama. Its two head branches, the Allegheny and Monongahela, head respectively in southern New York and in West Virginia, and both these streams have a rapid descent to their point of junction at Pittsburg. From that point to Cairo, the mouth of the Ohio, the slope of the river is gentle, being, on an average, much less than that of the Mississippi between Minneapolis and Cairo. Its long course of over 963 miles is broken by only one fall of importance, that at Louisville. Its drainage basin, including all its branches, is 201,720 square miles.

Its branches upon the left come out of the Allegheny Plateau. Of these streams one, however, Kanawha River, heads far to the southeast of the plateau among the high mountains of western North Carolina, and after a tortuous and irregular course in these mountains and among the valley ridges under the name of New River, it crosses the Allegheny Front and cuts a tremendous gorge through the plateau. Just below its junction with the Gauley, its principal tributary, it flows over Kanawha Falls, caused by the presence of a bed of hard sandstone, lying nearly horizontal. From the foot of these falls its slope is greatly reduced, so that it is navigable to this point. The Greenbrier and Gauley, which are its main tributaries, have steep and irregular profiles. The Guyandot, Big Sandy, and Little Kanawha rivers, all of which are tributaries of the Ohio on the left, head in the Allegheny Plateau and flow down canyons which they have cut in it.

The profiles of the Ohio, Allegheny, and Clarion are from levels by the Corps of Engineers, U. S. A. That of the Ohio refers to ordinary low water.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Cairo, Ill | 0 | 277 | ..... |
| Hillerman, Ill | 27 | 281 | 0.1 |
| Paducah, Ky | 47 | 284 | 0.2 |
| Smithland, Ky | 60 | 286 | ..... |
| Bay City, Ill | 70 | 287 | 0.1 |
| Golconda, Ill | 80 | 290 | ..... |
| Rosiclare, Ill | 91 | 290 | 0.1 |
| Weston, Ky | 107 | 295 | ..... |
| Caseyville, Ky | 111 | 297 | ..... |
| Shawneetown, Ill | 123 | 301 | 0.3 |
| Raleigh, Ind | 130 | 302 | ..... |
| Uniontown, Ky | 140 | 306 | ..... |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet..* | *Feet.* |
| Mount Vernon, Ind | 153 | 308 | 0.2 |
| West Franklin, Ind | 165 | 312 | |
| Henderson, Ky | 178 | 316 | 0.3 |
| Evansville, Ind | 190 | 318 | |
| Newburg, Ind | 204 | 320 | 0.2 |
| Enterprise, Ind | 219 | 326 | |
| Owensboro, Ky | 226 | 328 | 0.4 |
| Rockport, Ind | 235 | 330 | |
| Grandview, Ind | 240 | 331 | |
| Lewisport, Ky | 244 | 333 | |
| Troy, Ind | 252 | 335 | 0.3 |
| Tell City, Ind | 356 | 337 | |
| Hawsville, Ky | 260 | 348 | |
| Cloversport, Ky | 272 | 340 | 0.3 |
| Stevensport, Ind | 283 | 340 | |
| Derby, Ind | 292 | 343 | |
| Concordia, Ky | 297 | 346 | 0.2 |
| Reno, Ind | 301 | 346 | |
| Alton, Ind | 305 | 347 | |
| Leavenworth, Ky | 319 | 349 | |
| New Amsterdam, Ind | 327 | 353 | 0.2 |
| Mauckport, Ind | 336 | 354 | |
| Brandenburg, Ky | 338 | 356 | |
| New Albany, Ind | 374 | 367 | 0.3 |
| Louisville, Ky | 378 | 394 | 6.7 |
| Utica, Ind | 386 | 395 | |
| Herculaneum | 396 | 399 | |
| Bethlehem, Ind | 405 | 399 | 0.2 |
| Madison, Ind | 423 | 401 | |
| Carrollton, Ky | 435 | 404 | 0.2 |
| Vevay, Ind | 443 | 408 | |
| Florence, Ind | 452 | 411 | |
| Warsaw, Ky | 454 | 411 | |
| Patriot, Ind | 462 | 413 | 0.3 |
| Rising Sun, Ind | 474 | 420 | |
| Aurora, Ind | 482 | 425 | |
| Lawrenceburg, Ind | 486 | 425 | 0.5 |
| Taylorsville, Ky | 498 | 429 | |
| Anderson Ferry, Ky | 504 | 429 | |
| Cincinnati, Ohio | 511 | 431 | 0.2 |
| New Palestine, Ohio | 528 | 437 | |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| New Richmond, Ohio | 532 | 438 | ..... |
| Point Pleasant, Ohio | 537 | 439 | 0.3 |
| Moscow, Ohio | 540 | 439 | ..... |
| Neville, Ohio | 544 | 440 | ..... |
| Chilo, Ohio | 549 | 441 | ..... |
| Utopia, Ohio | 553 | 442 | ..... |
| Augusta, Ky | 556 | 444 | ..... |
| Higginsport, Ohio | 558 | 445 | ..... |
| Dover, Ohio | 564 | 446 | ..... |
| Ripley, Ohio | 566 | 447 | ..... |
| Maysville, Ky | 576 | 448 | 0.2 |
| Manchester, Ohio | 587 | 451 | ..... |
| Wrightsville, Ohio | 593 | 454 | ..... |
| Rome, Ohio | 600 | 457 | 0.4 |
| Buena Vista, Ohio | 611 | 460 | ..... |
| Rockport, Ky | 614 | 461 | ..... |
| Quincy, Ky | 618 | 464 | ..... |
| Portsmouth, Ohio | 630 | 468 | 0.4 |
| Sciotoville, Ohio | 638 | 472 | ..... |
| Greenup, Ky | 651 | 478 | ..... |
| Ironton, Ohio | 660 | 483 | 0.5 |
| Ashland, Ky | 665 | 486 | ..... |
| Ceredo, W. Va | 672 | 490 | ..... |
| Haskelville, Ohio | 690 | 501 | 0.6 |
| Miller, Ohio | 692 | 501 | ..... |
| Gallipolis, Ohio | 717 | 511 | 0.4 |
| Ravenswood, W. Va | 744 | 544 | ..... |
| Portland, Ohio | 749 | 546 | 1.1 |
| Parkersburg, W. Va | 780 | 564 | 0.6 |
| Marietta, Ohio | 792 | 570 | 0.5 |
| Newport, Ohio | 807 | 579 | ..... |
| New Matamoras, Ohio | 822 | 588 | ..... |
| Sistersville, W. Va | 826 | 590 | 0.6 |
| Moundsville, W. Va | 861 | 614 | ..... |
| Wheeling, W. Va | 871 | 622 | 0.7 |
| Burlington, Ohio | 875 | 628 | ..... |
| Warrenton, Ohio | 882 | 632 | ..... |
| Wellsburg, W. Va | 889 | 635 | ..... |
| Steubenville, Ohio | 896 | 641 | 0.8 |
| Wellsville, Ohio | 915 | 656 | ..... |
| East Liverpool, Ohio | 920 | 657 | 0.7 |
| Vanport, Pa | 935 | 669 | ..... |
| Baden, Pa | 942 | 673 | 0.7 |
| Pittsburg, Pa | 963 | 702 | 1.4 |

## ALLEGHENY RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Pittsburg | 0 | 696 | ..... |
| Sharpsburg | 5 | 704 | 1.6 |
| Pittsburg waterworks | 7 | 710 | 3.0 |
| Springdale | 17 | 721 | 1.1 |
| Tarentum | 22 | 728 | 1.4 |
| Freeport | 30 | 744 | 2.0 |
| Mouth of Mahoning River | 55 | 797 | 2.1 |
| Mouth of Red Bank River | 64 | 821 | 2.7 |
| Mouth of Clarion River | 85 | 862 | 2.0 |
| Mouth of East Sandy Creek | 118 | 953 | 2.8 |
| Mouth of French Creek | 123 | 969 | 3.2 |

## CLARION RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 862 | ..... |
| Big falls | 3 | 882 | 6.7 |
| Turnip Hole | 12 | 932 | 5.6 |
| Callensburg | 18 | 992 | 10.0 |
| Clarion | 32 | 1,042 | 3.6 |
| Mill Creek | 38 | 1,062 | 3.3 |
| State road | 42 | 1,080 | 4.5 |
| Hemlock | 46 | 1,095 | 3.8 |
| Cooksburg | 48 | 1,114 | 9.5 |
| Clarington | 53 | 1,156 | 8.4 |
| Millstone | 58 | 1,181 | 5.0 |
| Spring Creek | 69 | 1,255 | 6.7 |
| Peach Bottom | 80 | 1,328 | 6.6 |
| Portland shoals | 86 | 1,378 | 8.3 |

## ROUGH RIVER.

[From levels of the Corps of Engineers, U. S. A.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Livermore | 0 | 0 | |
| Hartford | 28 | 17 | 0.6 |
| Hedge River | 45 | 31 | 0.8 |
| Comb of Hines dam | 55 | 44 | 1.3 |
| Comb of Landrum dam | 72 | 57 | 0.8 |
| Comb of Greens dam | 81 | 79 | 2.4 |
| Frank mill | 105 | 89 | 0.4 |
| Lampton mill | 114 | 101 | 1.3 |

## BIG SANDY RIVER.

[From levels by the Corps of Engineers, U. S. A.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Catlettsburg | 0 | 488 | |
| White Creek landing | 8 | 502 | 1.8 |
| Turnam ferry | 13 | 504 | 0.4 |
| Louisa | 26 | 515 | 0.9 |

## LOUISA FORK.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Louisa | 0 | 515 | |
| Peach Orchard | 17 | 539 | 1.4 |
| Red House shoal | 27 | 563 | 2.4 |
| Paintville | 36 | 576 | 1.4 |
| Prestonburg | 52 | 596 | 1.3 |
| Lanesville | 72 | 627 | 1.6 |
| Piketon | 87 | 649 | 1.5 |

## TUG FORK.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Louisa | 0 | 515 | ..... |
| Falls, head | 11 | 538 | 2.1 |
| Double shoal | 20 | 551 | 1.4 |
| Warfield | 35 | 577 | 1.7 |

## GUYANDOT RIVER.

[From levels by the Corps of Engineers, U. S. A.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 497 | ..... |
| Rogers mill | 13 | 523 | 2.0 |
| Salt Rock dam | 25 | 539 | 1.3 |
| Falls | 31 | 549 | 1.7 |
| Laurel shoals | 42 | 562 | 1.2 |
| Lambert mill | 54 | 584 | 1.8 |
| Big Creek shoal | 64 | 599 | 1.5 |
| Peck mill | 75 | 627 | 2.5 |
| Logan | 82 | 645 | 2.6 |

## KANAWHA AND NEW RIVERS.

[From levels by the Corps of Engineers, U. S. A.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth at Point Pleasant | 0 | 510 | ..... |
| Eighteen-mile ripple | 18 | 517 | 0.4 |
| | 25 | 524 | 1.0 |
| | 36 | 532 | 0.7 |
| Near St. Albans | 44 | 540 | 1.0 |
| Tyler shoal | 55 | 549 | 0.8 |
| Charleston | 58 | 555 | 2.0 |
| Brownstown | 68 | 557 | 0.2 |

KANAWHA AND NEW RIVERS—continued.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Cabin Creek | 74 | 565 | 1.3 |
| Paint Creek | 80 | 572 | 1.2 |
| Cannelton | 85 | 585 | 2.6 |
| Foot of Kanawha falls | 95 | 617 | 3.2 |
| Mouth of Gauley River | 98 | 650 | 11.0 |
| | 117 | 1,000 | 18.4 |
| | 129 | 1,100 | 8.3 |
| | 143 | 1,200 | 7.1 |
| | 155 | 1,300 | 8.3 |
| | 172 | 1,400 | 5.9 |
| Mouth of East River | 193 | 1,500 | 4.8 |
| Ripplemead | 211 | 1,600 | 5.6 |
| Churchwood | 229 | 1,700 | 5.6 |
| | 253 | 1,800 | 4.2 |
| Mouth of Reed Creek | 280 | 1,900 | 3.7 |
| | 293 | 2,000 | 7.7 |
| | 299 | 2,100 | 16.6 |
| | 306 | 2,200 | 14.3 |
| Daughten ford | 330 | 2,300 | 4.2 |
| Bridle Creek | 348 | 2,400 | 5.6 |
| Weaversford, forks | 356 | 2,500 | 12.5 |
| | 376 | 2,600 | 5.0 |
| | 392 | 2,700 | 6.3 |

## GAULEY RIVER.

[From the atlas sheets of the United States Geological Survey.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 650 | ..... |
| | 10 | 700 | 5.0 |
| | 15 | 800 | 20.0 |
| | 19 | 900 | 25.0 |
| | 23 | 1,000 | 25.0 |
| | 26 | 1,100 | 33.3 |
| | 30 | 1,200 | 25.0 |
| | 33 | 1,300 | 33.3 |
| | 37 | 1,400 | 25.0 |
| | 40 | 1,500 | 33.3 |
| | 45 | 1,600 | 20.0 |
| | 49 | 1,700 | 25.0 |
| | 56 | 1,800 | 14.3 |
| | 60 | 1,900 | 25.0 |
| | 65 | 2,000 | 20.0 |
| | 74 | 2,100 | 11.1 |
| | 83 | 2,200 | 11.1 |
| | 93 | 2,300 | 10.0 |
| | 95 | 2,400 | 50.0 |
| | 99 | 2,500 | 25.0 |
| Head | 109 | 4,000 | 150 |

## GREENBRIER RIVER.

[From the atlas sheets of the United States Geological Survey.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Hinton | 0 | 1,350 | ..... |
| | 5 | 1,400 | 10.0 |
| | 17 | 1,500 | 8.3 |
| | 31 | 1,600 | 7.1 |
| Near Caldwell | 48 | 1,700 | 5.9 |
| | 51 | 1,800 | 33.3 |
| | 69 | 1,900 | 5.6 |
| | 86 | 2,000 | 5.9 |
| | 97 | 2,100 | 9.1 |

LITTLE KANAWHA RIVER.

[From levels by the Corps of Engineers, U. S. A.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Parkersburg | 0 | 564 | |
| Leachtown | 14 | 579 | 1.1 |
| Elizabeth | 26 | 601 | 1.8 |
| Buffington shoals | 44 | 613 | 0.7 |
| Nailor bend | 54 | 628 | 1.5 |
| Mouth of Anna Maria Creek | 64 | 640 | 1.2 |
| Mouth of Pine Creek | 76 | 655 | 1.3 |
| Grantsville | 78 | 661 | 3.0 |
| Acre Island | 86 | 672 | 1.4 |
| Cedar Creek | 96 | 688 | 1.6 |
| Glenville | 103 | 696 | 1.1 |
| Stout mill | 114 | 724 | 2.5 |
| Lumberport | 122 | 742 | 2.3 |
| Bulltown | 130 | 761 | 2.4 |

TENNESSEE RIVER.

Tennessee River heads in many branches, under a variety of topographic conditions, in the Appalachian Valley and in the mountains of western North Carolina. Certain of the heads of the Tennessee—the Hiwassee, the Little Tennessee with its branches, the Nantahala, Tuckaseegee, Big Pigeon, French Broad, and Nolichucky—rise in this region. Among the mountains their courses are steep, and they emerge into the Appalachian Valley through gorges cut in the Great Smoky range. Below these gorges their slopes are comparatively gentle.

Other of its head streams, including the Holston, with its branches, and the Clinch and Powell rivers, head in southwest Virginia in the Appalachian Valley, and their courses, for the most part, follow down secondary valleys on limestone formations, in which they have established gentle slopes. Here and there, however, these streams cut their way across valley ridges from one of these secondary valleys to its neighbor, and in these water gaps the uniformity of their slopes is interrupted and rapids and falls result.

Tennessee River is formed by the union of the Holston and French Broad rivers, a few miles above Knoxville. From the point of junction it flows southwest down the Appalachian Valley to Chattanooga. Here it turns abruptly westward, cutting through the Cumberland

Plateau. A few miles below, it receives the waters of Sequatchie River. This stream flows in a southwest course throughout, draining a portion of the plateau.

The Tennessee River below Knoxville has a gentle slope, averaging not more than a foot to a mile as far as Mussel shoals. Here the river flows over a succession of beds of hard limestone, which have retarded its work of erosion and given rise to rapids known as Big and Little Mussel and Colbert shoals. Below the latter the river has a very slight fall, averaging only about three-tenths of a foot to a mile.

The drainage basin of Tennessee River, including all its branches, is 43,897 square miles.

The profile of Tennessee River is from levels by the Corps of Engineers, U. S. A. Those of its branches, the Sequatchie, Hiwassee, Little Tennessee, Nantahala, Tuckaseegee, French Broad, Big Pigeon, Nolichucky, Holston, Powell, and Clinch rivers, have been made up from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Paducah | 0 | 286 | ..... |
| Johnsonville | 95 | 315 | 0.3 |
| Riverton | 225 | 358 | 0.3 |
| Colbert shoals | 233 | 384 | 3.3 |
| Florence | 255 | 396 | 0.6 |
| Little Mussel shoals | 259 | 418 | 5.5 |
| Lock No. 1 | 275 | 503 | 5.3 |
| Lock B | 283 | 509 | 0.8 |
| Milton bluff | 285 | 523 | 7.0 |
| Decatur | 303 | 529 | 0.3 |
| Guntersville | 347 | 531 | 0.1 |
| Bridgeport | 402 | 593 | 1.1 |
| Shellmound | 412 | 598 | 0.5 |
| The Skillet | 436 | 606 | 0.3 |
| The Suck | 440 | 613 | 1.8 |
| Chattanooga Creek | 448 | 626 | 1.6 |
| Chattanooga | 452 | 631 | 1.3 |
| Charleston | 508 | 684 | 0.9 |
| Rockwood | 541 | 699 | 0.5 |
| Kingston | 556 | 712 | 0.9 |
| Loudon | 579 | 736 | 1.0 |
| Knoxville | 635 | 806 | 1.3 |
| Head, junction Holston and French Broad rivers | 639 | 810 | 1.0 |

SEQUATCHIE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 595 | |
| Near Dunlap, Tenn | 32 | 700 | 3.3 |
| | 45 | 800 | 7.7 |
| | 61 | 900 | 6.25 |
| | 71 | 1,000 | 10.0 |

HIWASSEE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 662 | |
| Bean Mountain Canyon | 36 | 700 | 0.9 |
| Narrows | 50 | 1,000 | 21.4 |
| | 54 | 1,200 | 50.0 |
| Murphy | 84 | 1,500 | 10.0 |
| Hayesville | 105 | 1,800 | 14.3 |
| Above Hiwassee | 116 | 2,000 | 18.2 |
| Head | 126 | 3,800 | 180.0 |

LITTLE TENNESSEE RIVER.

| Locality. | Distance from mouth. | Height above. sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth at Lenoir, Tenn | 0 | 750 | |
| Morgantown | 12 | 800 | 4.2 |
| | 35 | 900 | 4.3 |
| | 40 | 1,000 | 20.0 |
| | 43 | 1,100 | 33.3 |
| | 47 | 1,200 | 25.0 |
| | 55 | 1,300 | 12.5 |
| | 65 | 1,400 | 10.0 |
| Mouth of Tuckaseegee River | 71 | 1,500 | 16.6 |
| Mouth of Nantahala River | 77 | 1,550 | 8.3 |
| | 82 | 1,700 | 30.0 |
| Above Franklin | 104 | 2,000 | 13.6 |
| Rabun Gap, head | 118 | 2,200 | 14.3 |

NANTAHALA RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 1,550 | ..... |
| | 6 | 1,700 | 25.0 |
| | 11 | 2,000 | 60.0 |
| | 17 | 2,500 | 83.3 |
| | 25 | 3,000 | 40.0 |
| Head | 40 | 4,200 | 80.0 |

TUCKASEEGEE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 1,500 | ..... |
| Bryson | 10 | 1,753 | 15.3 |
| Dillsboro | 27 | 2,000 | 14.5 |
| Tuckaseegee | 39 | 2,184 | 15.3 |
| | 48 | 2,700 | 57.3 |

FRENCH BROAD RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet* |
| Mouth, Knoxville | 0 | 810 | ..... |
| | 38 | 1,000 | 5.0 |
| Delrio | 49 | 1,100 | 9.1 |
| Paint Rock | 56 | 1,200 | 14.3 |
| Barnard | 76 | 1,500 | 15.0 |
| Alexander | 92 | 1,800 | 18.7 |
| Above Asheville | 111 | 2,000 | 10.5 |
| Horseshoe | 128 | 2,100 | 5.8 |
| | 160 | 2,200 | 3.1 |
| Sassafras gap, head | 169 | 2,800 | 66.6 |

BIG PIGEON RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 980 | |
| | 6 | 1,000 | 3.3 |
| | 16 | 1,100 | 6.2 |
| State line, Tennessee and North Carolina | 24 | 1,200 | 12.5 |
| | 26 | 1,300 | 50.0 |
| | 30 | 1,400 | 25.0 |
| | 34 | 1,500 | 25.0 |
| | 38 | 1,600 | 25.0 |
| | 43 | 1,700 | 20.0 |
| | 49 | 1,800 | 16.6 |
| | 50 | 1,900 | 100.0 |
| | 51 | 2,000 | 100.0 |
| | 54 | 2,100 | 33.3 |
| | 55 | 2,200 | 100.0 |
| | 56 | 2,300 | 100.0 |
| | 58 | 2,400 | 50.0 |
| | 69 | 2,500 | 9.1 |
| | 74 | 2,600 | 20.0 |
| | 80 | 2,700 | 16.6 |
| Head | 91 | 5,500 | 254.5 |

NOLICHUCKY RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 975 | |
| | 30 | 1,100 | 4.2 |
| Bird bridge | 45 | 1,200 | 6.6 |
| Henshaw | 53 | 1,300 | 12.5 |
| | 63 | 1,400 | 10.0 |
| Near Conkling | 75 | 1,500 | 8.3 |
| | 85 | 1,600 | 10.0 |
| | 90 | 1,700 | 20.0 |
| | 94 | 1,800 | 25.0 |
| | 96 | 1,900 | 50.0 |
| | 99 | 2,000 | 33.3 |
| | 101 | 2,100 | 50.0 |
| | 102 | 2,200 | 100.0 |
| | 104 | 2,300 | 50.0 |
| Junction North and South Toe rivers | 118 | 2,400 | 7.1 |
| | 123 | 2,500 | 20.0 |
| | 140 | 3,000 | 29.4 |
| Head South Toe River | 143 | 5,000 | 666.6 |

HOLSTON RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, near Knoxville | 0 | 810 | |
| Near Morristown | 78 | 900 | 1.2 |
| Spears | 105 | 1,000 | 3.7 |
| | 117 | 1,100 | 8.3 |
| Rotherwood | 143 | 1,156 | 2.2 |

SOUTH FORK OF HOLSTON RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 1,156 | |
| | 11 | 1,200 | 4.0 |
| Mouth of Watauga River | 16 | 1,300 | 20.0 |
| Bluff | 28 | 1,400 | 8.3 |
| | 41 | 1,500 | 7.7 |
| Mouth of Fifteen-mile Creek | 54 | 1,700 | 15.4 |
| Mouth of Middle Fork | 62 | 1,900 | 25.0 |
| | 74 | 2,100 | 16.6 |
| | 86 | 2,500 | 33.3 |

NORTH FORK OF HOLSTON RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Rotherwood | 0 | 1,156 | |
| | 11 | 1,200 | 4.0 |
| | 21 | 1,300 | 10.0 |
| | 37 | 1,400 | 6.25 |
| | 50 | 1,500 | 7.7 |
| | 64 | 1,700 | 14.3 |
| | 82 | 2,000 | 16.6 |
| Head | 92 | 3,000 | 100.0 |

MIDDLE FORK OF HOLSTON RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 1,900 | |
| Seven-mile ford | 24 | 2,000 | 8.3 |
| Head | 44 | 2,500 | 25.0 |

POWELL RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 900 | |
| | 33 | 1,000 | 3.03 |
| | 61 | 1,100 | 3.6 |
| Near Jonesville, Va | 91 | 1,200 | 3.3 |
| | 103 | 1,300 | 8.3 |
| Big Stone Gap | 117 | 1,500 | 14.3 |
| Near Norton | 129 | 2,000 | 41.6 |

CLINCH RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Kingston | 0 | 712 | |
| Clinton | 52 | 800 | 1.7 |
| Near Mouth of Powell River | 88 | 900 | 2.8 |
| | 116 | 1,000 | 3.6 |
| Sneedville | 128 | 1,100 | 8.3 |
| | 155 | 1,200 | 3.7 |
| Dungannon | 177 | 1,300 | 4.5 |
| Near St. Paul | 187 | 1,400 | 10.0 |
| Artrip | 207 | 1,500 | 5.0 |
| | 234 | 2,000 | 18.5 |
| Near Tazewell | 249 | 2,500 | 33.3 |

CUMBERLAND RIVER.

Cumberland River heads in the Cumberland Plateau in southeastern Kentucky and flows southwestward in a broad curve down into Ten-

nessee, and thence northwestward to its junction with the Ohio. The steep slope near its head is quickly reduced, and over much the greater part of its course its average descent is scarcely 1 foot to a mile, although it is interrupted in several places by slight rapids.

Its drainage basin comprises 18,573 square miles.

The profile is mainly from levels of the Engineer Corps, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 286 | ..... |
| C. O. & S. W. R. R. bridge | 30 | 293 | 0.2 |
| Glenwood landing | 34 | 294 | 0.3 |
| Eddyville | 42 | 296 | 0.3 |
| Commerce landing | 49 | 299 | 0.4 |
| Empire landing | 54 | 302 | 0.6 |
| Blight landing | 58 | 304 | 0.5 |
| Canton | 61 | 306 | 0.7 |
| Linton | 72 | 309 | 0.3 |
| Brandon landing | 81 | 312 | 0.3 |
| Carney landing | 91 | 319 | 0.7 |
| Cumberland City | 104 | 325 | 0.5 |
| Yellow Creek towhead | 109 | 327 | 0.4 |
| Palmyra | 115 | 328 | 0.2 |
| Clarksville | 126 | 331 | 0.3 |
| Seven-mile Island | 132 | 334 | 0.5 |
| Harrison landing | 143 | 341 | 0.6 |
| Harpeth shoals | 156 | 352 | 0.8 |
| Hickman ferry | 166 | 363 | 1.1 |
| Robertson Island | 177 | 364 | 0.1 |
| Nashville | 189 | 366 | 0.2 |
| Donelson ford | 206 | 374 | 0.5 |
| Lindsey Island | 223 | 387 | 0.8 |
| Gallatin | 236 | 392 | 0.4 |
| Cunningham Island | 247 | 399 | 0.6 |
| Buzzard Island | 257 | 404 | 0.5 |
| Whitley Island | 265 | 410 | 0.8 |
| Hartsville | 276 | 415 | 0.5 |
| Bradley Island | 284 | 423 | 1.0 |
| Lovell Island | 294 | 432 | 0.9 |
| Carthage | 305 | 440 | 0.7 |
| Beasley bar | 318 | 448 | 0.6 |
| Sullivan Island | 323 | 450 | 0.4 |
| Salt Lick Island | 339 | 461 | 0.7 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Tackett Island | 345 | 466 | 0.8 |
| Simpson Island | 353 | 475 | 1.1 |
| Rose bar | 364 | 478 | 0.3 |
| Butler landing | 373 | 489 | 1.2 |
| Kentucky and Tennessee boundary | 386 | 497 | 0.6 |
| Sulphur Lick shoal | 393 | 502 | 0.7 |
| Stalcup Island | 407 | 508 | 0.4 |
| Cloyd Island | 410 | 513 | 1.7 |
| Green Island | 432 | 527 | 0.6 |
| Spearman Island | 439 | 529 | 0.3 |
| Wells Island | 450 | 535 | 0.5 |
| Blankenship Island | 457 | 542 | 1.0 |
| Long Bottom Island | 461 | 546 | 1.0 |
| Belks Island | 472 | 554 | 0.7 |
| Gauns Island | 487 | 570 | 1.1 |
| Ford Island | 507 | 580 | 0.5 |
| | 513 | 585 | 0.8 |
| Point Burnside | 516 | 586 | 0.3 |
| | 548 | 700 | 3.6 |
| | 558 | 800 | 10.0 |
| Williamsburg | 587 | 900 | 3.4 |
| Prineville | 645 | 1,000 | 1.7 |
| Forks, Mount Pleasant | 678 | 1,100 | 3.0 |

KENTUCKY RIVER.

Kentucky River, like the Big Sandy, Guyandot, and Little Kanawha, heads in the Allegheny Plateau. Its head branches have steep slopes in the plateau, becoming more gentle in the Blue Grass country.

The profile is from levels by the Engineer Corps, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 410 | ..... |
| Frankfort | 65 | 452 | 0.6 |
| Beattyville | 254 | 636 | 1.0 |
| Mouth, Middle Fork | 258 | 638 | 0.5 |

MIDDLE FORK OF KENTUCKY RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 638 | |
| Mouth of War Creek | 24 | 681 | 1.8 |
| Troublesome Creek | 54 | 731 | 1.7 |
| Brashear's salt works | 120 | 935 | 3.1 |

NORTH FORK OF KENTUCKY RIVER.

| Locality. | Distance from Leatherwood. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth of Leatherwood Creek | 0 | 935 | |
| Mouth of Rockhouse Creek | 9 | 994 | 6.6 |
| Gum Spring | 21 | 1,088 | 7.8 |
| Whitesburg | 27 | 1,141 | 8.8 |
| Mouth of Boone Fork | 38 | 1,252 | 10.1 |
| Pound Gap | 45 | 2,427 | 167.9 |

SOUTH FORK OF KENTUCKY RIVER.

| Locality. | Distance from Leatherwood. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Beattyville | 0 | 636 | |
| Booneville | 12 | 661 | 2.1 |
| Red Bird | 42 | 767 | 3.5 |
| Collins Fork | 69 | 842 | 2.8 |

WABASH RIVER.

This branch of Ohio River, having a drainage basin of 33,725 square miles, heads in northwestern Ohio and flows west and south to its mouth, after a course of 517 miles.

The profiles of Wabash and Eel rivers were compiled by Mr. Frank Leverett.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 311 | |
| Mouth of Little Wabash | 16 | 323 | 0.8 |
| Grayville | 62 | 365 | 0.9 |
| Mouth of White River | 90 | 377 | 0.4 |
| Vincennes | 122 | 399 | 0.7 |
| Hutsonville | 168 | 425 | 0.6 |
| State line | 197 | 441 | 0.6 |
| Terre Haute | 212 | 448 | 0.5 |
| Covington | 267 | 470 | 0.4 |
| Attica | 287 | 487 | 0.9 |
| Lafayette | 312 | 506 | 0.8 |
| Logansport | 362 | 583 | 1.5 |
| Mouth of Mississinewa River | 382 | 636 | 2.7 |
| Mouth of Salamonie River | 402 | 667 | 1.6 |
| Huntington | 417 | 699 | 2.1 |
| Source | 517 | 1,000 | 3.0 |

EEL RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth at Logansport | 0 | 583 | |
| Railroad bridge in Miami County | 30 | 688 | 3.5 |
| North Manchester | 45 | 721 | 2.2 |
| Liberty mills | 50 | 750 | 5.8 |
| Collamer | 58 | 768 | 2.3 |
| Columbia | 70 | 816 | 4.0 |
| Source | 85 | 850 | 2.3 |

MUSKINGUM RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 570 | |
| Foot of Zanesville dam | 75 | 674 | 1.4 |
| Dresden | 91 | 700 | 1.6 |

MIAMI RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 427 | |
| Middleton | 55 | 656 | 4.2 |
| Dayton | 77 | 725 | 3.1 |
| Piqua | 108 | 840 | 3.7 |
| Source | 158 | 972 | 2.6 |

ILLINOIS RIVER.

Illinois River rises near the head of Lake Michigan and flows nearly southwest to its mouth, just above Alton. The slope of this river is very slight, being much less than that of the Mississippi above the mouth of the Illinois, its fall being only 110 feet in 324 miles, or about three-tenths of a foot per mile.

The profile is from levels by the Engineer Corps, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 405 | |
| Peru, Ill | 261 | 440 | 0.1 |
| Little Rock ferry | 265 | 446 | 1.5 |
| Utica, Ill | 266 | 448 | 2.0 |
| Starved Rock | 268 | 454 | 3.0 |
| Buffalo Rock | 271 | 459 | 1.7 |
| Ottawa, Ill | 277 | 463 | 0.7 |
| Marseilles, Ill | 284 | 475 | 1.7 |
| Ballards Island | 285 | 477 | 2.0 |
| Seneca, Ill | 289 | 484 | 1.8 |
| S. & K. R. R. bridge | 293 | 486 | 0.5 |
| Morris, Ill | 300 | 492 | 0.9 |
| Aux Sable township | 305 | 496 | 0.8 |
| Kankakee feeder | 310 | 501 | 1.0 |
| Adams dam | 324 | 515 | 1.0 |
| Upper dam, Joliet | 325 | 531 | 16.0 |

ROCK RIVER.

This stream heads in southern Wisconsin and flows south and southwest to its junction with the Mississippi at Rock Island. Although its profile is gentle throughout, it affords a number of fine water powers, several of which have been improved.

Its drainage basin is 9,792 square miles.

The profile is from the report on Water Power of the Tenth Census.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth at Rock Island, Ill | 0 | 541 | |
| Mouth of Green River | 12 | 556 | 1.3 |
| Mouth of Rock Creek | 36 | 574 | 0.8 |
| Mouth of Elkhorn Creek | 65 | 601 | 0.9 |
| Mouth of Leaf River | 113 | 669 | 1.4 |
| Mouth of Kishwaukee Creek | 126 | 692 | 1.8 |
| Mouth of Pecatonica River | 151 | 716 | 1.0 |
| Mouth of Catfish River | 181 | 773 | 1.9 |
| Fort Atkinson | 199 | 784 | 0.6 |
| Outlet Lake Horicon | 261 | 861 | 1.2 |

RED RIVER.

The Red River of Texas has its source in the northern part of the Staked Plains. Its course for several hundred miles is a little south of east, along the northern boundary of Texas. At Fulton, Arkansas, it turns southeast and retains that general course to its mouth.

Throughout most of its course this river is graded, with a slope of only a few tenths of a foot to the mile, and along the south boundary of Indian Territory its slope is less than 2 feet per mile.

The drainage basin of Red River is 89,970 square miles, and its length considerably exceeds 1,000 miles.

The profile is derived in part from the levels of the Engineer Corps, U. S. A., and in part from levels by the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 4 | |
| Barbre landing | 7 | 4 | 0.0 |
| Black River | 35 | 6 | 0.1 |
| Ware landing | 67 | 24 | 0.6 |
| Cassandria | 81 | 34 | 0.7 |
| Casa landing | 97 | 36 | 0.1 |
| Alexandria | 118 | 42 | 0.3 |
| Colfax | 152 | 52 | 0.3 |
| Bell landing | 165 | 58 | 0.5 |
| St. Maurice | 181 | 69 | 0.7 |
| Tessier landing | 188 | 72 | 0.4 |
| Le Compte bluffs | 211 | 86 | 0.6 |
| Coushatta | 237 | 96 | 0.4 |
| Nicock bayou | 273 | 125 | 0.8 |
| Locust landing | 305 | 131 | 0.2 |
| Shreveport | 327 | 138 | 0.3 |
| Pandora bend | 339 | 148 | 0.8 |
| Cottonwood bayou | 357 | 168 | 1.1 |
| Elmer slough | 375 | 179 | 0.6 |
| Kouns canal | 386 | 182 | 0.3 |
| Blanton bluff | 398 | 186 | 0.3 |
| Collins bluff | 407 | 188 | 0.2 |
| Dukes bend landing | 420 | 192 | 0.3 |
| Booker landing | 448 | 197 | 0.2 |
| Garland | 457 | 204 | 0.8 |
| Person landing | 468 | 208 | 0.4 |
| Dobson landing | 474 | 212 | 0.7 |
| Dooley ferry | 490 | 216 | 0.3 |
| Kye Smith landing | 504 | 221 | 0.4 |
| Fulton, Ark | 515 | 227 | 0.5 |
| | 705 | 500 | 1.4 |
| | 840 | 750 | 1.8 |
| | 955 | 1,000 | 2.2 |
| | 995 | 1,250 | 6.2 |
| Western boundary of Oklahoma | 1,045 | 1,500 | 5.0 |

## OUACHITA RIVER.

The Ouachita River heads in the Ozark Hills of western Arkansas. In that part of its course which lies within the hills it flows in limestone

valleys between quartzite ridges, and has a considerable slope. Upon emerging into the level country near Arkadelphia, Arkansas, its slope greatly diminishes, and in its long course thence to its junction with Black River the fall per mile is very slight.

The profile is derived in part from levels by the Corps of Engineers, U. S. A., and in part from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 60 | ------ |
| Harrisonburg | 16 | 67 | 0.4 |
| Monroe | 122 | 88 | 0.2 |
| Mouth Bartholomew bayou | 148 | 93 | 0.2 |
| Camden | 304 | 114 | 0.1 |
| Arkadelphia | 380 | 188 | 1.0 |
| | 417 | 300 | 3.0 |
| | 457 | 500 | 5.0 |
| | 476 | 600 | 5.3 |
| | 500 | 700 | 4.2 |
| | 514 | 800 | 7.1 |
| | 534 | 1,000 | 10.0 |
| Head | 545 | 1,750 | 68.2 |

ARKANSAS RIVER.

This large branch of the Mississippi heads in central Colorado, in the Rocky Mountains, at an altitude of 10,000 feet. It flows first south and then east, getting clear of the mountains at Canyon City, Colorado. Within the mountains its slope is extremely steep, averaging 40 feet to the mile; upon entering the plains its slope rapidly diminishes, and from Pueblo as far as the south boundary of Kansas, a distance of 500 miles, it remains almost constant, with an average slope of 7 feet per mile. In this part of its course it resembles the Platte. Although having a steep slope, it is so heavily loaded with detritus that it deposits rather than erodes. It is in effect a graded stream. From Wichita downward to its mouth its slope constantly diminishes, although not uniformly, and near its mouth it has no greater fall than the Mississippi in this neighborhood.

The drainage basin of the Arkansas is 185,671 square miles; the total length of the river is 1,497 miles.

The profile is derived as far as Argenta from levels of the Corps of Engineers, U. S. A.; thence to its head from atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 117 | ..... |
| Cut-off | 15 | 118 | 0.1 |
| Hopedale | 22 | 119 | 0.1 |
| Red Fork | 27 | 121 | 0.4 |
| Arkansas Post | 38 | 130 | 0.8 |
| Auburn | 64 | 137 | 0.3 |
| Little Bayou Meto | 71 | 141 | 0.6 |
| Sarassa | 78 | 149 | 1.1 |
| Bankhead | 88 | 158 | 0.9 |
| Rob Roy bridge | 101 | 161 | 0.2 |
| Pine Bluff | 110 | 164 | 0.3 |
| McAlister | 121 | 170 | 0.5 |
| Mokes landing | 133 | 176 | 0.5 |
| Red Bluff | 142 | 188 | 1.3 |
| Troy Landing | 158 | 202 | 0.9 |
| Argenta | 176 | 216 | 0.8 |
| | 199 | 250 | 1.5 |
| | 249 | 300 | 1.0 |
| | 307 | 350 | 0.9 |
| Fort Smith | 403 | 400 | 0.5 |
| Mouth of Grand River | 497 | 500 | 1.1 |
| Mouth of Cimarron River | 584 | 652 | 1.7 |
| Mouth of Black Bear Creek | 646 | 764 | 1.8 |
| Mouth of Salt Creek | 661 | 797 | 2.2 |
| Kaw Agency | 723 | 933 | 2.2 |
| Arkansas City | 767 | 1,043 | 2.5 |
| Oxford | 792 | 1,108 | 2.6 |
| El Paso | 817 | 1,177 | 2.8 |
| Wichita | 832 | 1,222 | 3.0 |
| Lyons | 853 | 1,400 | 8.5 |
| Hutchinson | 871 | 1,500 | 5.6 |
| Nickerson | 889 | 1,600 | 5.6 |
| Raymond | 906 | 1,700 | 5.9 |
| | 926 | 1,800 | 5.0 |
| | 942 | 1,900 | 6.2 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Larned | 958 | 2,000 | 6.2 |
| | 973 | 2,100 | 6.7 |
| | 989 | 2,200 | 6.2 |
| | 1,005 | 2,300 | 6.2 |
| | 1,020 | 2,400 | 6.7 |
| | 1,036 | 2,500 | 6.2 |
| Cimarron | 1,051 | 2,600 | 6.7 |
| | 1,066 | 2,700 | 6.7 |
| Garden | 1,081 | 2,800 | 6.7 |
| | 1,159 | 3,400 | 7.7 |
| | 1,172 | 3,500 | 7.7 |
| Lamar | 1,187 | 3,600 | 6.7 |
| | 1,200 | 3,700 | 7.7 |
| | 1,214 | 3,800 | 7.1 |
| | 1,229 | 3,900 | 6.7 |
| Robinson | 1,240 | 4,000 | 9.1 |
| | 1,254 | 4,100 | 7.1 |
| | 1,269 | 4,200 | 6.7 |
| | 1,283 | 4,300 | 7.1 |
| | 1,296 | 4,400 | 7.7 |
| Mouth of Huerfano River | 1,309 | 4,500 | 7.7 |
| Mouth of St. Charles River | 1,322 | 4,600 | 7.7 |
| Pueblo | 1,334 | 4,700 | 8.3 |
| | 1,345 | 4,800 | 9.1 |
| | 1,352 | 4,900 | 14.3 |
| | 1,359 | 5,000 | 14.3 |
| | 1,370 | 5,200 | 18.2 |
| Canyon | 1,375 | 5,300 | 20.0 |
| Parkdale | 1,385 | 5,700 | 40.0 |
| | 1,399 | 6,000 | 21.4 |
| Mouth of South Arkansas River | 1,428 | 6,500 | 17.2 |
| | 1,439 | 7,000 | 45.5 |
| | 1,457 | 8,000 | 55.6 |
| Granite | 1,475 | 9,000 | 55.6 |
| Tennessee pass, head | 1,497 | 10,400 | 63.6 |

## CANADIAN RIVER.

This is a long branch of the Arkansas, heading in Raton pass, in northern New Mexico, and, flowing first south and then east down the slope of the plains, it joins the Arkansas in Indian Territory.

The profile is derived mainly from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 460 | |
| | 22 | 500 | 1.8 |
| | 82 | 600 | 1.7 |
| | 104 | 700 | 4.5 |
| | 134 | 800 | 3.3 |
| | 152 | 900 | 5.6 |
| Near Purcell | 190 | 1,040 | 3.7 |
| C. R. I. & P. R. R. crossing | 240 | 1,200 | 3.2 |
| Canadian | 435 | 2,300 | 5.6 |
| Tascosa | 550 | 3,150 | 7.4 |
| | 727 | 5,972 | 15.9 |
| | 745 | 6,292 | 17.8 |
| Raton pass, head | 758 | 7,893 | 123.2 |

## NEOSHO RIVER.

Neosho River heads in Kansas, not far east of the center of the State, and flows at first eastward and then southward to its junction with the Arkansas in Indian Territory. Its course of 346 miles is mainly through a prairie region, and its profile departs but little from a normal one.

The profile is derived from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 470 | |
| | 12 | 500 | 2.5 |
| Markham ferry, Ind. T | 42 | 550 | 1.7 |
| | 69 | 600 | 1.8 |
| Above Oswego, Kans | 177 | 800 | 1.8 |
| | 206 | 850 | 1.7 |
| Humboldt | 228 | 900 | 2.3 |
| Leroy | 255 | 950 | 1.8 |
| Ottumwa | 274 | 1,000 | 2.6 |
| Emporia | 296 | 1,050 | 2.3 |
| | 310 | 1,100 | 3.6 |
| Council Grove | 326 | 1,200 | 6.25 |
| Head | 346 | 1,500 | 15.0 |

## VERDIGRIS RIVER.

This river heads in southeastern Kansas and flows nearly south to its junction with the Neosho, in the northern part of Indian Territory. It drains a region mainly composed of prairie land. The river has slight fall except near its head, and with the exception of one point in its course it has a symmetrical profile.

The profile is derived from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 475 | |
| | 11 | 500 | 2.3 |
| | 60 | 550 | 1.02 |
| | 105 | 600 | 1.1 |
| | 133 | 650 | 1.8 |
| | 154 | 700 | 2.4 |
| | 179 | 750 | 2.0 |
| | 185 | 800 | 8.3 |
| | 206 | 850 | 2.4 |
| | 231 | 900 | 2.0 |
| | 242 | 950 | 4.5 |
| | 248 | 1,000 | 8.3 |
| | 258 | 1,100 | 10.0 |
| | 265 | 1,200 | 14.3 |
| Head | 275 | 1,500 | 30.0 |

## WHITE RIVER.

This stream heads in northwestern Arkansas, in the Ozark Plateau, and flows southeastwardly through it in a canyon, with a steep slope. Emerging from the plateau, it flows southward through the alluvial region of southeastern Arkansas to its junction with Mississippi River, at the mouth of the Arkansas. Its slope throughout the alluvial region is extremely gentle. Its drainage basin is 27,925 square miles.

The profile is derived mainly from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 107 | |
| Jacksonport | 330 | 193 | 0.3 |
| Grigsby ferry | 380 | 250 | 1.1 |
| | 410 | 300 | 1.7 |
| | 439 | 350 | 1.7 |
| | 463 | 400 | 2.1 |
| | 487 | 450 | 2.1 |
| | 509 | 500 | 2.3 |
| | 536 | 550 | 1.9 |

ST. FRANCIS RIVER.

This stream heads in southeast Missouri and flows nearly south to its junction with the Mississippi, in eastern Arkansas. Nearly all its course is in low bottom lands of the Mississippi River, and its slope is extremely gentle.

The profile comes from levels by the Mississippi River Commission.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Ark | 0 | 144 | ..... |
| Wittsburg, Ark | 135 | 161 | 0.1 |
| Ebdy, Butler County, Mo | 308 | 314 | 0.9 |
| Ironton, Mo | 438 | 887 | 4.4 |

MERAMEC RIVER.

This is a small branch of the Mississippi, in eastern Missouri. It heads in the Ozark Plateau, and flows generally northeastward to its mouth, just below St. Louis.

The profile is derived from levels of the Engineer Corps, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 365 | ..... |
| Mouth of Big River | 56 | 407 | 0.8 |
| Mouth of Bourbeuse River | 84 | 458 | 1.8 |
| Mouth of Courtois River | 134 | 615 | 3.1 |
| Head | 174 | 755 | 3.5 |

MISSOURI RIVER.

Missouri River has its source in southwest Montana, in three large branches—the Jefferson, Madison, and Gallatin—which meet at the Three Forks. These three streams have steep descents, mainly through mountainous regions, but from its head, at the Three Forks, the Missouri has a long course down the incline of the Great Plains, with a gentle slope, which is broken at only one point—Great Falls—by a succession of falls and rapids, in the course of which it descends nearly 200 feet. Below these falls it has the characteristics of a graded river, flowing through a broad bottom land, with wide curves and numerous shifts of its course. These characteristics become more and more marked in descending the river, accompanied by a gradually diminishing slope.

Its drainage basin, including all its branches, is 527,155 square miles.

The profile of Missouri River, from its mouth to the Three Forks, in Montana, is from levels of the Missouri River Commission. Those of the Jefferson, Madison, and Gallatin rivers are from atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 395 | |
| Jamestown landing, Mo | 9 | 403 | 0.9 |
| St. Charles, Mo | 28 | 416 | 0.7 |
| Cottleville Landing, Mo | 44 | 437 | 1.3 |
| Washington, Mo | 71 | 458 | 0.8 |
| Hermann, Mo | 103 | 479 | 0.7 |
| Fishers landing, Mo | 124 | 502 | 1.1 |
| Jefferson City, Mo | 151 | 523 | 0.8 |
| Providence, Mo | 180 | 545 | 0.8 |
| Boonville, Mo | 206 | 564 | 0.7 |
| Glasgow, Mo | 237 | 591 | 0.9 |
| New Frankfort, Mo | 252 | 602 | 0.8 |
| Dewitt, Mo | 267 | 614 | 0.8 |
| Waverly, Mo | 299 | 645 | 1.0 |
| Lexington, Mo | 322 | 664 | 0.8 |
| Camden, Mo | 337 | 678 | 0.9 |
| Missouri City, Mo | 363 | 695 | 0.7 |
| Kansas City, Mo | 391 | 716 | 0.8 |
| Leavenworth, Kans | 422 | 742 | 0.8 |
| Atchison, Kans | 448 | 765 | 0.9 |
| St. Joseph, Mo | 479 | 790 | 0.8 |
| White Cloud, Kans | 525 | 829 | 0.8 |
| Brownsville, Nebr | 578 | 875 | 0.9 |
| Nebraska City, Nebr | 608 | 908 | 1.1 |
| Plattsmouth, Nebr | 634 | 940 | 1.2 |
| Omaha, Nebr | 660 | 960 | 0.8 |
| Blair, Nebr | 695 | 986 | 0.7 |
| Decatur, Nebr | 745 | 1,033 | 0.9 |
| Sioux City, Iowa | 807 | 1,077 | 0.7 |
| Vermilion, S. Dak | 855 | 1,131 | 1.1 |
| Mouth of James River, S. Dak | 888 | 1,150 | 0.6 |
| Yankton, S. Dak | 898 | 1,161 | 1.1 |
| Running Water, S. Dak | 929 | 1,203 | 1.4 |
| Fort Randall, S. Dak | 969 | 1,236 | 0.8 |
| Chamberlain, S. Dak | 1,058 | 1,323 | 1.0 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth of Cheyenne River, S. Dak | 1,112 | 1,460 | 2.5 |
| Bismarck, N. Dak | 1,239 | 1,618 | 1.2 |
| Mouth of Little Missouri River | 1,371 | 1,740 | 0.9 |
| Williston, N. Dak | 1,509 | 1,825 | 0.6 |
| Mouth of Yellowstone River, N. Dak | 1,549 | 1,855 | 0.8 |
| Mouth of Poplar River, Mont | 1,647 | 1,935 | 0.8 |
| Mouth of Milk River, Mont | 1,726 | 2,020 | 1.1 |
| Mouth of Marias River, Mont | 2,052 | 2,545 | 1.6 |
| Fort Benton, Mont | 2,074 | 2,565 | 0.9 |
| Mouth of Portage River, Mont | 2,099 | 2,783 | 8.7 |
| Great Falls, Mo | 2,111 | 3,295 | 42.7 |
| Mouth of Sunrise River, Mo | 2,123 | 3,299 | 0.3 |
| Townsend, Mo | 2,295 | 3,793 | 2.9 |
| Three Forks, Mo | 2,340 | 4,000 | 4.6 |

JEFFERSON RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Three Forks, mouth | 0 | 4,000 | ..... |
| | 24 | 4,200 | 8.3 |
| | 56 | 4,400 | 6.3 |
| | 66 | 4,600 | 20.0 |

BIGHOLE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 4,600 | ..... |
| | 16 | 4,800 | 12.5 |
| | 31 | 5,000 | 13.3 |
| | 43 | 5,200 | 16.7 |
| | 54 | 5,400 | 18.2 |
| | 64 | 5,600 | 20.0 |

BEAVERHEAD RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 4,600 | |
| | 19 | 4,800 | 10.5 |
| | 31 | 5,000 | 16.7 |
| | 51 | 5,200 | 10.0 |
| | 61 | 5,400 | 20.0 |

MADISON RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Three Forks, mouth | 0 | 4,000 | |
| | 11 | 4,200 | 18.2 |
| | 21 | 4,400 | 20.0 |
| | 29 | 4,600 | 25.0 |
| | 40 | 4,800 | 18.2 |
| | 54 | 5,000 | 14.3 |
| | 63 | 5,200 | 22.2 |
| | 69 | 5,400 | 33.3 |
| | 79 | 5,600 | 20.0 |

GALLATIN RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Three Forks, mouth | 0 | 4,000 | |
| | 12 | 4,200 | 16.7 |
| | 20 | 4,400 | 25.0 |
| | 24 | 4,600 | 50.0 |
| | 28 | 4,800 | 50.0 |
| | 34 | 5,000 | 33.3 |
| | 40 | 5,200 | 33.3 |
| | 44 | 5,400 | 50.0 |
| | 51 | 5,600 | 28.6 |
| | 59 | 5,800 | 25.0 |
| | 65 | 6,000 | 33.3 |
| | 69 | 6,200 | 50.0 |
| | 73 | 6,400 | 50.0 |
| | 77 | 6,600 | 50.0 |
| | 83 | 6,800 | 33.3 |
| | 88 | 7,000 | 40.0 |

## OSAGE RIVER.

Osage River heads in eastern Kansas, under the name of Marais des Cygnes. Its slope throughout its course, of nearly 500 miles, is very gentle; indeed, for three-fourths of it it is less than a foot to a mile. This portion of Kansas is mainly through a prairie region, and here it is interrupted by marshes. In Missouri the river is extremely winding, in great curves, which are deeply incised.

The profile is derived from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Osage City | 0 | 520 | |
| Foot of Rice Island | 12 | 524 | 0.3 |
| Mouth of Big Gravois Creek | 85 | 550 | 0.4 |
| Near Crittenden | 148 | 600 | 0.8 |
| | 216 | 650 | 0.7 |
| Near Rockville | 280 | 700 | 0.8 |
| Near Pleasanton | 350 | 750 | 0.7 |
| | 402 | 800 | 1.0 |
| Ottawa | 434 | 850 | 1.6 |
| Near Melvern | 486 | 950 | 1.9 |
| Near Olivet | 494 | 1,000 | 6.3 |

## KANSAS RIVER.

The Kansas River and its branches, Smoky Hill and Republican rivers, are streams of the plains, heading in eastern Colorado and flowing down the long eastern slope of the country. Their courses are throughout gentle, although a little steeper toward the head, and less so in their lower courses.

Their drainage basins, comprising altogether 59,256 square miles, are treeless, except on the lower course of the main river.

These profiles are from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Kansas City, mouth | 0 | 720 | |
| Tiblow | 20 | 754 | 1.7 |
| Lawrence | 50 | 796 | 1.4 |
| Topeka | 87 | 864 | 1.8 |
| St. Mary | 123 | 925 | 1.7 |
| Wamego | 139 | 959 | 2.1 |
| St. George | 150 | 977 | 1.6 |
| Manhattan | 160 | 996 | 1.9 |
| Junction City | 191 | 1,080 | 2.7 |
| Abilene | 254 | 1,100 | 0.3 |
| Solomon | 274 | 1,125 | 1.3 |
| Salina | 310 | 1,200 | 2.1 |
| | 353 | 1,300 | 2.3 |
| | 378 | 1,400 | 4.0 |
| Ellsworth | 408 | 1,500 | 3.3 |
| | 436 | 1,600 | 3.6 |
| | 463 | 1,700 | 3.7 |
| | 479 | 1,800 | 6.2 |
| | 496 | 1,900 | 5.9 |
| | 512 | 2,000 | 6.2 |
| | 528 | 2,100 | 6.2 |
| | 544 | 2,200 | 6.2 |
| Wallace | 654 | 3,280 | 9.8 |

REPUBLICAN RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth at Junction City | 0 | 1,080 | |
| Near Clay Center | 38 | 1,200 | 3.2 |
| Lawrenceburg | 66 | 1,300 | 3.6 |
| | 86 | 1,400 | 5.0 |
| | 100 | 1,500 | 7.1 |
| Near Bostwick | 122 | 1.600 | 4.5 |
| Near Red Cloud | 143 | 1,700 | 4.8 |
| Near Franklin | 161 | 1,800 | 5.5 |
| Republican | 181 | 1,900 | 5.0 |
| | 199 | 2,000 | 5.5 |
| Edson | 215 | 2,100 | 6.3 |
| | 227 | 2,200 | 8.3 |

## PLATTE RIVER.

Platte River heads in Colorado in two branches, North and South Platte. The former has its source in North Park and the mountains adjacent and has a steep descent within the mountains, dropping to 6 or 7 feet per mile when it enters the plains. The South Platte heads in the mountains at the north end of South Park and enters the plains just above Denver. Within the mountains its slope is extremely steep and irregular, but upon reaching the plains it suddenly diminishes greatly, falling to 8 or 9 feet to the mile. These two branches meet at North Platte, and below their junction the Platte has an average fall of about 6 feet per mile, maintaining that slope with remarkable uniformity. The river is a peculiar one in the fact that it has a relatively steep slope and an extremely straight course, while at the same time it is building up its bed. This peculiarity is due to the fact that it is, taking the year as a whole, an overloaded stream. It is subject to great fluctuations in volume. In the springtime, when the mountain snows are melting, it is a river a mile in width, and although rather shallow carries a large body of water, while at other times of the year it is almost or quite dry.

The drainage basin of Platte River comprises 90,011 square miles.

The profiles of the Platte and its branches are from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 940 | |
| | 15 | 1,000 | 4.0 |
| | 38 | 1,100 | 4.3 |
| | 63 | 1,200 | 4.0 |
| | 81 | 1,300 | 5 5 |
| | 101 | 1,400 | 5.0 |
| | 118 | 1,500 | 5.9 |
| | 133 | 1,600 | 6.7 |
| Central City | 149 | 1,700 | 6.3 |
| | 161 | 1,800 | 8.3 |
| | 176 | 1,900 | 6.7 |
| | 191 | 2,000 | 6.7 |
| | 206 | 2,100 | 6.7 |
| Kearney | 221 | 2,200 | 6.7 |
| | 237 | 2,300 | 6.3 |
| Lexington | 253 | 2,400 | 6.3 |
| | 270 | 2,500 | 5.9 |
| | 282 | 2,600 | 8.3 |
| | 300 | 2,700 | 5.6 |
| North Platte | 315 | 2,800 | 6.7 |

NORTH PLATTE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, near North Platte | 0 | 2,800 | |
| | 15 | 2,900 | 6.7 |
| Camp Clark | 145 | 3,700 | 6.2 |
| | 161 | 3,800 | 6.3 |
| | 177 | 3,900 | 6.3 |
| | 193 | 4,000 | 6.3 |
| | 208 | 4,100 | 6.7 |
| Fort Laramie | 226 | 4,200 | 5.5 |
| | 239 | 4,300 | 7.7 |
| | 251 | 4,400 | 8.3 |
| | 265 | 4,500 | 7.1 |
| | 275 | 4,600 | 10.0 |
| Douglas | 310 | 4,827 | 6.5 |
| Casper | 370 | 5,100 | 4.6 |
| Fort Steele | 510 | 6,500 | 10.0 |

SOUTH PLATTE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, near North Platte | 0 | 2,800 | |
| Ogalalla | 51 | 3,209 | 8.0 |
| Big Spring | 70 | 3,364 | 8.2 |
| Denver Junction | 81 | 3,456 | 8.4 |
| Sedgwick | 96 | 3,571 | 7.7 |
| Crook | 111 | 3,695 | 8.3 |
| Iliff | 127 | 3,820 | 7.8 |
| Sterling | 138 | 3,920 | 9.0 |
| Merino | 151 | 4,021 | 7.8 |
| Snyder | 168 | 4,160 | 8.2 |
| Orchard | 199 | 4,391 | 7.5 |
| Hardin | 216 | 4,513 | 7.2 |
| Lasalle | 232 | 4,663 | 9.4 |
| Nantes | 239 | 4,732 | 9.9 |
| Platteville | 244 | 4,807 | 15.0 |
| Lupton | 253 | 4,891 | 9.3 |
| Brighton | 260 | 4,968 | 11.0 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Henderson | 265 | 5,023 | 11.0 |
| Denver | 288 | 5,170 | 6.4 |
| Platte Canyon | 308 | 5,492 | 16.1 |
| South Platte | 317 | 6,085 | 65.9 |
| | 332 | 6,500 | 27.7 |
| | 347 | 7,000 | 33.3 |
| Mouth of Tarryall Creek | 354 | 7,500 | 71.4 |
| Foot of upper canyon | 365 | 8,000 | 45.5 |
| Head of upper canyon | 375 | 8,165 | 16.5 |
| | 380 | 8,500 | 67.0 |
| Mouth of Little Platte River | 386 | 8,683 | 30.5 |
| | 405 | 9,000 | 16.7 |
| Above Fairplay | 415 | 9,500 | 50.0 |
| | 427 | 10,000 | 41.7 |

YELLOWSTONE RIVER.

Yellowstone River heads in the mountains above Yellowstone Lake, flowing into the lake at the head of its southeastern arm. On emerging from the lake the river has a very gentle slope for a few miles, then plunges over two falls, the upper fall 90 feet and the lower 325 feet. Thence follows a succession of canyons in volcanic rock, in which the river has a rapid descent. At Livingston it turns from its northern course to the east and flows through a broad valley with a diminishing slope to its mouth at Fort Buford.

The profile is in large part from the levels of the Northern Pacific Railway.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 1,855 | ..... |
| Diamond Island | 30 | 1,916 | 2.0 |
| Beef slough | 46 | 1,950 | 2.1 |
| Reno bend | 60 | 1,988 | 2.7 |
| Monroe rapids | 100 | 2,100 | 2.8 |
| Walker Island shoal | 108 | 2,123 | 2.9 |
| De Russy | 113 | 2,133 | 2.0 |
| White sand | 124 | 2,160 | 2.5 |
| McEwens rapids | 133 | 2,182 | 2.4 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth of Powder River | 137 | 2,200 | 4.5 |
| Baker rapids | 144 | 2,224 | 3.4 |
| Buffalo rapids | 163 | 2,300 | 4.0 |
| Keogh, ferry at Tongue River | 176 | 2,355 | 4.2 |
| Benteen Island | 196 | 2,402 | 2.3 |
| Rosebud | 215 | 2,465 | 3.3 |
| Big Porcupine Creek | 234 | 2,522 | 3.0 |
| Head of Rosebud Island | 252 | 2,583 | 3.4 |
| Mouth of Bighorn River | 274 | 2,668 | 3.9 |
| Junction City | 279 | 2,696 | 5.6 |
| N. P. R. R. crossing, near Billings | 331 | 3,079 | 7.4 |
| Stillwater | 373 | 3,560 | 11.5 |
| W. P. R. R., second crossing | 385 | 3,676 | 9.7 |
| Gray Cliff | 400 | 3,847 | 11.4 |
| Big Timber | 413 | 4,072 | 17.3 |
| Springdale | 427 | 4,190 | 8.4 |
| Livingston | 446 | 4,437 | 13.1 |
| Head of lower canyon | 456 | 4,600 | 16.3 |
| Chicory | 468 | 4,800 | 16.7 |
| Foot second canyon | 486 | 5,000 | 11.1 |
| | 533 | 6,000 | 21.3 |
| Foot of lower falls | 552 | 7,300 | 68.4 |
| Top of upper falls | 553 | 7,725 | 425.0 |
| Yellowstone Lake | 569 | 7,741 | 1.0 |

## MILK RIVER.

This is a long branch of Missouri River, in northern Montana. It heads in the plains near the international boundary, and flows in a course generally a little south of east, to its mouth. Its slope conforms to that of the plains, averaging about 2 feet per mile.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 2,020 | ..... |
| Glasgow, 2 miles above | 22 | 2,055 | 1.6 |
| Malta | 106 | 2,220 | 2.0 |
| Yantic | 184 | 2,415 | 2.5 |

## JAMES RIVER.

James River, of the Dakotas, is a stream of the plains, flowing through its entire course in a region recently occupied by the great northern glacier. It heads in North Dakota and flows nearly south 433 miles, to its junction with Missouri River at Yankton. Its entire course is newly occupied and the river has made but little progress in erosion. It follows closely in its profile the slopes of the country, which are very gentle.

The profile is derived from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 1,150 | ..... |
| Olivet, 4 miles above | 42 | 1,180 | 0.7 |
| | 64 | 1,200 | 0.9 |
| | 105 | 1,220 | 0.5 |
| | 172 | 1,240 | 0.3 |
| | 211 | 1,260 | 0.5 |
| | 265 | 1,280 | 0.4 |
| Grand Rapids | 315 | 1,300 | 0.4 |
| Dickey, 2 miles above | 326 | 1,320 | 1.8 |
| | 334 | 1,340 | 2.5 |
| | 348 | 1,360 | 1.4 |
| Jamestown, 3 miles below | 358 | 1,380 | 2.0 |
| Jim Lake | 382 | 1,435 | 2.3 |
| Arrowhead Lake | 394 | 1,440 | 0.4 |
| New Rockford | 433 | 1,502 | 1.6 |

## DES MOINES RIVER.

This river heads in southwest Minnesota and flows in a southeast course across Iowa to its junction with the Mississippi at Keokuk. Its slope is gentle throughout its course and fairly uniform.

Its drainage basin is 14,652 square miles.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Keokuk, Iowa | 0 | 476 | ..... |
| Ottumwa, Iowa | 94 | 636 | 1.7 |
| Des Moines, Iowa | 205 | 786 | 1.4 |
| Moingona, Iowa | 245 | 877 | 2.3 |
| Southeast part of Webster County, Iowa | 269 | 921 | 1.8 |
| Fort Dodge, Iowa | 300 | 964 | 1.4 |
| Windom, Minn | 411 | 1,329 | 3.3 |

### IOWA RIVER.

This branch of the Mississippi heads in northern Iowa and flows southeast to its mouth. Its course is through a prairie region and its slope is gentle throughout.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 522 | |
| Iowa City | 60 | 607 | 1.4 |
| Montour | 150 | 845 | 2.6 |
| Iowa Falls | 215 | 1,007 | 2.5 |

### SKUNK RIVER.

A branch of Mississippi River in eastern Iowa. This stream shows, so far as the data at hand indicates, a very regular profile.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 505 | |
| Rome | 38 | 550 | 1.2 |
| Vowell | 146 | 750 | 1.9 |
| Ames | 182 | 907 | 4.4 |
| Southeast part of Hamilton County | 203 | 1,056 | 7.1 |

### MINNESOTA RIVER.

This river heads in Bigstone Lake, on the boundary between Minnesota and South Dakota. After a long course to the southeast it turns sharply northward and joins the Mississippi near Minneapolis. Its slope throughout is extremely gentle, ranging from one-tenth of a foot per mile to two and eight-tenths, and with an average slope for its entire length of 249 miles of only one and one-tenth feet per mile. Throughout its course the river flows in a bottom land of considerable breadth, entirely out of proportion to the size of the present stream, indicating that in former times a much larger river excavated its present valley. Its drainage basin is 16,000 square miles.

The profile is from levels by the Corps of Engineers, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 688 | ..... |
| Shakopee | 26 | 689 | ..... |
| Carver | 33 | 691 | 0.3 |
| Jordan ferry | 41 | 693 | 0.3 |
| Belleplaine | 52 | 697 | 0.4 |
| Blakeley | 60 | 701 | 0.5 |
| Henderson | 73 | 711 | 0.8 |
| Lesueur | 82 | 716 | 0.6 |
| Ottawa | 90 | 723 | 0.9 |
| St. Peter | 97 | 731 | 1.1 |
| Mankato | 115 | 753 | 1.2 |
| Soutlr Bend | 119 | 758 | 1.3 |
| Fort Ridgely | 131 | 791 | 2.8 |
| Mouth of Redwood River | 146 | 815 | 1.7 |
| Mouth of Yellow Medicine River | 173 | 859 | 1.6 |
| Mouth of Chippewa River | 197 | 923 | 2.7 |
| Lac qui Parle | 211 | 938 | 1.1 |
| Mouth of Pomme de Terre Creek | 227 | 946 | 0.5 |
| Bigstone Lake | 249 | 976 | 1.4 |

## RED RIVER.

Red River, of Minnesota, heads in Lake Traverse, and forms the boundary line between Minnesota on the east and the Dakotas on the west as far as the international boundary. Its course from its head to its mouth in Lake Winnipeg is very nearly north.

The profile is from levels by the Corps of Engineers, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Lake Winnipeg | 0 | 710 | ..... |
| Boundary line | 120 | 753 | 0.4 |
| Pelican | 168 | 762 | 0.2 |
| Turtle River | 238 | 783 | 0.3 |
| Grand Forks | 263 | 789 | 0.2 |
| Frog Point | 298 | 811 | 0.6 |
| Goose Rapids | 320 | 823 | 0.5 |
| Moorhead | 418 | 874 | 0.5 |
| Fort Abercrombie | 489 | 912 | 0.5 |
| Breckenridge | 515 | 948 | 1.4 |
| Fergus Falls | 548 | 1,156 | 6.3 |

## COLORADO RIVER.

Colorado River drains a peculiar region. While most of its water comes from high mountain ranges, the greater part of its course, as well as the courses of its tributaries, lies in the plateau region, an area of horizontal or slightly inclined plateaus, bordered by cliffs, in which the streams flow in steep-walled canyons; an area sparsely covered with soil and containing little vegetation. It is a region of slight rainfall, and the streams lose rather than gain in volume of water in traversing it. Colorado River heads in two main branches—Green and Grand rivers. The sources of Green River are in the Wind River Mountains of western Wyoming. At the foot of this range the river traverses for a hundred miles a broad, desert plain, known as Green River Basin. At the foot of this plain it meets Uinta Range. Through this range it has cut its way in a series of heavy gorges, emerging from them at the south base of the mountains and entering Uinta Valley, in which it flows for a short distance; then flowing southward it enters a series of uplifts, consisting of slightly inclined plateaus, three in number, dipping to the north. In each of these it burrows its way, the depth of the canyon increasing mile by mile, both by the increasing height of the plateau and the descent of the river. At the cliff which limits each of these plateaus on the south the river comes out to daylight for a short distance. At the foot of the most southern of these plateaus is Gunnison Valley, in which the Rio Grande Western Railroad crosses the river. In the canyon which succeeds this valley, caused by an uplift of the plateau, the Green is joined by the Grand, and the Colorado begins. Then follows a succession of uplifts, through which the river has been forced to cut its way, producing a continuous canyon, whose walls rise higher and higher with each succeeding uplift until the Grand Canyon is reached, whose walls are 6,000 feet in height and magnificent in their complexity. Farther west the land descends by a series of steps, produced by faults and folds, which finally bring the river to daylight at the mouth of the Grand Wash.

Grand River, which heads in the mountains in the eastern side of Middle Park, Colorado, encounters throughout its course a succession of obstacles similar to those met and overcome by Green River.

The branches of Grand River, Eagle River, Roaring Fork, Gunnison and Dolores rivers all head and have much of their courses in regions of high mountains, and naturally their slopes are both steep and irregular.

The entire area drained by Colorado River and its branches is 225,049 square miles.

The profile was prepared by Maj. J. W. Powell.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Mouth of Gila River | 150 | 125 | 0.8 |
| Mouth of Williams River | 340 | 375 | 1.3 |
| Needles | 385 | 448 | 1.6 |
| Mouth of Virgin River | 555 | 935 | 2.9 |
| Mouth of Grand Wash (fault) | 600 | 1,000 | 1.4 |
| Mouth of Diamond Creek | 650 | 1,312 | 6.2 |
| Toroweap Valley (fault) | 700 | 1,625 | 6.3 |
| Mouth of Kanab Creek | 730 | 1,810 | 6.2 |
| | 790 | 2,300 | 8.2 |
| | 800 | 2,520 | 22.0 |
| Mouth of Little Colorado River | 815 | 2,625 | 7.0 |
| Mouth of Paria River (fault—Echo Cliffs) | 880 | 3,187 | 8.6 |
| Mouth of Navajo Creek | 905 | 3,220 | 1.3 |
| Crossing of the Fathers | 920 | 3,250 | 2.0 |
| Mouth of San Juan River | 957 | 3,310 | 1.6 |
| Mouth of Escalante River | 970 | 3,325 | 1.2 |
| Mouth of Dirty Devil River | 1,030 | 3,434 | 1.8 |
| | 1,067 | 3,750 | 31.2 |
| Mouth of Grand River | 1,080 | 3,775 | 1.9 |
| Green River crossing (Book Cliffs) | 1,200 | 4,075 | 2.5 |
| Mouth of Price River | 1,220 | 4,200 | 6.25 |
| | 1,305 | 4,575 | 4.4 |
| Mouth of White River | 1,390 | 4,625 | 0.6 |
| | 1,435 | 4,750 | 2.8 |
| Mouth of Yampa River | 1,470 | 5,100 | 10.0 |
| Brown park | 1,490 | 5,375 | 13.8 |
| Mouth of Henry fork | 1,560 | 5,813 | 6.3 |
| Mouth of Black fork | 1,590 | 5,940 | 4.2 |
| Green River city | 1,620 | 6,075 | 4.5 |
| Mouth of Big Sandy River | 1,652 | 6,240 | 5.2 |
| Mouth of Slate Creek | 1,672 | 6,500 | 13.0 |
| Mouth of Fontenelle Creek | 1,684 | 6,620 | 10.0 |
| Mouth of New Fork | 1,728 | 6,900 | 6.3 |
| Mouth of Horse Creek | 1,754 | 7,180 | 10.8 |
| Mouth of Lead Creek | 1,769 | 7,383 | 13.5 |
| | 1,789 | 7,622 | 11.95 |
| Bend, near head | 1,800 | 7,808 | 16.9 |

### LITTLE COLORADO RIVER.

This stream heads in the southern edge of the Mogollon Plateau, in eastern Arizona, and flows nearly northwest to its junction with the Colorado. Near the head its slope is steep, but through most of its course across the plateau, on the surface of which it flows, its slope is gentle. Toward its mouth it begins to burrow into the plateau, and its slope increases, finally, just before reaching the Colorado, becoming very steep, producing a curve near its mouth convex upward.

The profile is derived from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 2,625 | |
| | 6 | 2,750 | 20.8 |
| | 16 | 3,000 | 25.0 |
| | 24 | 3,250 | 31.3 |
| | 32 | 3,500 | 31.3 |
| | 40 | 3,750 | 31.3 |
| | 50 | 4,000 | 25.0 |
| | 66 | 4,250 | 15.6 |
| | 84 | 4,500 | 13.9 |
| | 126 | 4,750 | 5.9 |
| | 158 | 5,000 | 7.8 |
| | 188 | 5,200 | 6.7 |
| | 204 | 5,400 | 1.3 |
| Near St. Johns | 221 | 5,600 | 11.8 |
| | 235 | 5,800 | 14.3 |
| | 244 | 6,000 | 22.2 |
| | 250 | 6,200 | 33.3 |
| | 252 | 6,400 | 100.0 |
| | 254 | 6,600 | 100.0 |
| | 256 | 6,800 | 100.0 |
| | 262 | 7,000 | 33.3 |
| Head | 277 | 8,000 | 66.7 |

### SAN JUAN RIVER.

This branch of Colorado River heads in many streams flowing south from the San Juan Mountains—Mancos, La Plata, Los Piños, and Animas rivers. At their south base it collects the waters of these several branches and thenceforward flows westward through a plateau region to its junction with the Colorado. In the mountains these streams

have steep descents, which are suddenly checked on reaching the plateau. In its course down the plateau, however, the slope of San Juan River is by no means gentle or regular. A feature of the slope of this river is the increase in its grade toward its mouth, showing that the parent stream, the Colorado, has thus far been able to cut its grade down more rapidly than the smaller stream.

The profiles of this river and its branches have been derived mainly from the reports of the Hayden survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 3,310 | ..... |
| | 16 | 3,500 | 11.8 |
| | 58 | 3,750 | 5.9 |
| | 80 | 4,000 | 11.4 |
| Bluff City | 98 | 4,250 | 13.9 |
| Four miles below mouth of Montezuma Creek | 107 | 4,390 | 15.6 |
| Mouth of McElmo Creek | 118 | 4,510 | 10.9 |
| | 130 | 4,540 | 2.5 |
| Mouth of Mancos River | 143 | 4,700 | 12.3 |
| | 164 | 4,880 | 8.6 |
| Pictured Rocks | 186 | 5,180 | 13.6 |
| Mouth of La Plata River | 197 | 5,297 | 10.6 |
| Mouth of Animas River | 200 | 5,310 | 4.3 |
| Mouth of Los Pinos River | 240 | 5,750 | 11.0 |
| Mouth of Piedra River | 265 | 6,000 | 10.0 |
| Pagosa Springs | 303 | 7,095 | 28.8 |

RIO MANCOS, COLORADO.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 4,700 | ..... |
| | 12 | 4,900 | 16.7 |
| | 22 | 5,270 | 37.0 |
| | 32 | 5,730 | 46.0 |
| | 38 | 6,250 | 86.7 |
| Merritt ranch | 52 | 7,360 | 79.3 |
| | 62 | 9,770 | 241.0 |

LA PLATA RIVER, COLORADO.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 5,297 | |
| | 10 | 5,500 | 30.3 |
| | 22 | 6,270 | 64.2 |
| | 38 | 7,922 | 103.3 |
| Parrott City | 43 | 8,500 | 115.6 |

ANIMAS RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 5,310 | |
| Mouth of Florida River | 38 | 6,106 | 20.9 |
| Foot of Animas park | 56 | 6,600 | 27.4 |
| Head of Animas park | 70 | 6,900 | 21.4 |
| Mouth of Cascade Creek | 80 | 7,700 | 80.0 |
| Foot of Bakers park | 97 | 9,400 | 100.0 |
| Head of Bakers park | 105 | 9,900 | 62.5 |
| Divide at head | 113 | 12,500 | 325.0 |

LOS PINOS RIVER, COLORADO.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 5,750 | |
| Trail crosses | 33 | 6,680 | 28.2 |
| Big bend | 42 | 7,288 | 67.6 |
| Mouth of Vallecito Creek | 48 | 7,688 | 66.7 |
| Mouth of West Branch | 60 | 8,688 | 83.3 |
| Trail leaves stream | 69 | 9,888 | 133.3 |
| Weeminuche pass | 75 | 10,670 | 130.3 |

## GRAND RIVER, COLORADO.

[The profiles of this river and its branches are from the reports of the Hayden survey.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 3,775 | ..... |
| Mouth of Dolores River | 52 | 4,250 | 9.1 |
| Horseshoe bend | 70 | 4,300 | 2.8 |
| Head of low canyon | 104 | 4,500 | 5.9 |
| Mouth of Gunnison River | 120 | 4,523 | 1.4 |
| Mouth of Roan Creek | 152 | 5,100 | 18.0 |
| Mouth of North Mam Creek | 188 | 5,645 | 15.1 |
| Mouth of Roaring Fork | 209 | 5,743 | 4.7 |
| Mouth of Eagle River | 228 | 6,125 | 20.1 |
| Foot of canyon in Park Range | 295 | 7,000 | 13.1 |
| Mouth of Muddy Creek | 302 | 7,180 | 25.7 |
| Hot Springs | 320 | 7,715 | 29.7 |
| Forks | 344 | 8,123 | 17.0 |
| Grand Lake, Middle Park | 348 | 8,153 | 7.5 |

## RIO DOLORES, COLORADO.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 4,250 | ..... |
| Mouth of Unaweep Canyon | 21 | 4,600 | 16.7 |
| Mouth of San Miguel River | 43 | 5,000 | 18.2 |
| In Paradox Valley | 49 | 5,100 | 16.7 |
| Mouth of Disappointment Creek | 83 | 6,500 | 41.2 |
| Mouth of Lost Canyon | 134 | 6,950 | 8.8 |

GUNNISON RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 4,523 | ..... |
| Mouth of Roubideau Creek | 40 | 4,925 | 10.1 |
| Mouth of Uncompahgre River | 45 | 5,100 | 35.0 |
| Mouth of North Fork | 62 | 5,405 | 17.9 |
| Mouth of Cebolla Creek | 97 | 6,800 | 39.8 |
| Mouth of Lake Fork | 112 | 7,213 | 27.5 |
| Mouth of White Earth River | 123 | 7,450 | 21.5 |
| Foot of open valley | 130 | 7,638 | 26.9 |
| Mouth of Tomichi Creek | 141 | 7,725 | 7.9 |
| Mouth of Slate River | 157 | 8,176 | 28.2 |
| Head of upper canyon | 176 | 9,576 | 73.7 |
| Mouth of Pass Creek | 185 | 9,865 | 32.1 |
| Head | 200 | 11,000 | 75.7 |

UNCOMPAHGRE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0.0 | 5,100 | ..... |
| Ford of Salt Lake road | 29.5 | 5,800 | 23.7 |
| Uncompahgre Agency | 40.0 | 6,400 | 57.1 |
| Mouth of Dallas Fork | 54.5 | 7,000 | 41.4 |
| Lower end of canyon | 68.5 | 8,000 | 71.4 |
| Lower end of small valley | 72.5 | 9,500 | 375.0 |
| Head of small valley | 74.5 | 9,700 | 100.0 |
| Divide at head | 78.5 | 11,100 | 350.0 |

LAKE FORK OF GUNNISON.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0.0 | 7,213 | ..... |
| Mouth of Indian Creek | 15.0 | 7,860 | 43.1 |
| Mouth of Goodwin Creek | 36.0 | 8,660 | 38.1 |
| Mouth of South Branch | 51.0 | 9,860 | 80.0 |
| Valley | 56.5 | 11,060 | 218.2 |
| Head | 59.0 | 13,260 | 880.0 |

ROARING FORK.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 5,743 | ..... |
| Mouth of Rock Creek | 12 | 6,000 | 21.4 |
| Mouth of Frying-pan Creek | 25 | 6,626 | 48.2 |
| Mouth of Castle Creek | 43 | 7,942 | 73.1 |
| Mouth of Difficult Creek | 48 | 8,241 | 59.8 |
| Mouth of Hunter Creek | 55 | 9,400 | 165.6 |
| Head | 64 | 11,676 | 252.9 |

EAGLE RIVER, COLORADO.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 6,125 | ..... |
| Head of canyon | 29 | 7,065 | 32.4 |
| Mouth of Gore Creek | 41 | 7,700 | 52.9 |
| Mouth of Roche Moutonnée Creek | 45 | 7,856 | 39.0 |
| Mouth of Homestake Creek | 50 | 8,693 | 167.4 |
| Head in Tennessee pass | 62 | 10,418 | 143.7 |

SEVIER RIVER.

Sevier River heads in the plateaus in southern Utah, and flows for a long distance northward through valleys separating plateaus and mountain ranges, with a steep but gradually diminishing slope. In central Utah it turns sharply, flowing west in a canyon through the Canyon Range, where its descent is somewhat steeper, and out into Sevier Desert, through which it flows with a very gentle slope to Sevier Lake, into which it sinks.

The profile is derived from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Sevier Lake, mouth | 0 | 4,600 | |
| Near Deseret | 34 | 4,638 | 1.1 |
| In canyon | 88 | 4,750 | 2.1 |
| Above Salina | 152 | 5,000 | 3.9 |
| Joseph | 180 | 5,250 | 8.9 |
| | 189 | 5,500 | 27.8 |
| | 205 | 5,750 | 15.6 |
| Circle Valley | 223 | 6,000 | 13.9 |
| | 243 | 6,250 | 12.5 |
| Near Panguitch | 255 | 6,500 | 20.8 |
| Near Hillsdale | 265 | 6,750 | 25.0 |
| | 271 | 7,000 | 41.7 |
| Head | 279 | 7,500 | 62.5 |

BEAR RIVER.

Bear River heads in the northern slope of Uinta Mountains in northeastern Utah. The steep slope of the mountain side is succeeded by a comparatively gentle slope as it flows northward through a succession of broad valleys. At Soda Springs it turns sharply upon itself and flows nearly south, and immediately descends from the surface of a basalt flow to its base, producing a succession of falls and rapids. Through Cache Valley its slope is very gentle, but at The Gates, where it emerges from Cache Valley into the valley of Great Salt Lake, it has a steep descent in a series of rapids.

The profile is from the measurements of the Hayden survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 4,218 | ..... |
| Hampton Bridge | 24 | 4,353 | 5.6 |
| Head of Gates | 30 | 4,450 | 16.2 |
| Mouth of Battle Creek | 66 | 4,499 | 1.4 |
| Foot of canyon below Gentile Valley | 73 | 4,609 | 15.7 |
| Head of canyon below Gentile Valley | 88 | 4,692 | 5.5 |
| Bend below Sheep Rock | 113 | 5,737 | 41.8 |
| Soda Springs | 125 | 5,855 | 9.8 |
| | 151 | 5,900 | 1.7 |
| Foot of canyon above Bear Lake Valley | 171 | 5,989 | 4.5 |
| Mouth of Smith Fork | 201 | 6,223 | 7.8 |
| | 216 | 6,254 | 2.1 |
| | 243 | 6,353 | 3.7 |
| Bend | 251 | 6,505 | 19.0 |
| Evanston | 270 | 6,800 | 15.5 |
| Head | 320 | 11,000 | 84.0 |

## HUMBOLDT RIVER.

This river of Nevada heads in the northeastern part of the State and flows southwestward, sinking in Humboldt Lake, in the western part of the State. In its course of more than 300 miles it flows almost directly across the series of uplifts forming the Basin ranges, but in most cases it passes through broad gaps in these ranges rather than in canyons. The drainage basin is 32,148 square miles.

The profile is from the Fortieth Parallel Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Humboldt Lake, sink | 0 | 3,900 | ..... |
| Lovelock | 8 | 3,950 | 6.3 |
| Oreana | 20 | 4,150 | 16.7 |
| Humboldt | 40 | 4,200 | 2.5 |
| Raspberry | 68 | 4,300 | 3.6 |
| Winnemucca | 90 | 4,325 | 1.1 |
| Golconda | 108 | 4,350 | 1.4 |
| Stonehouse | 133 | 4,400 | 2.0 |
| Battle Mountain | 153 | 4,500 | 5.0 |
| Shoshone | 178 | 4,600 | 4.0 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Palisade | 203 | 4,800 | 8.0 |
| Moleen | 223 | 4,975 | 8.8 |
| Osino | 244 | 5,100 | 5.9 |
| Halleck | 258 | 5,200 | 7.1 |
| Deeth | 272 | 5,300 | 7.1 |
| Humboldt Wells | 292 | 5,600 | 15.0 |
| Independence, head | 308 | 6,000 | 25.0 |

SACRAMENTO RIVER.

Sacramento River heads in the mountains of northern California, principally in the easternmost of the coast ranges. Its head streams, upon reaching the great depression between the Sierra Nevada and the Coast Ranges, turns south and by a steep descent in a deep canyon it flows off a volcanic plateau which surrounds Mount Shasta. Having reached the level of the great California Valley, its slope rapidly diminishes, and below Red Bluff becomes very slight. Indeed, from Sacramento to the bay the descent is trifling, the river meandering most of the way through great tule marshes.

This river has been in times past overloaded with detritus from placer mines, which have caused it to deposit freely, building up its course above the adjacent country. Much of the city of Sacramento lies at present below the level of the river when in flood and is protected from it by levees.

The profile is from the levels of the Engineer Corps, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| New York landing | 0 | 0 | ..... |
| Collinsville | 3 | 0 | ..... |
| Rio Vista | 17 | 1 | ..... |
| Head of Grand Island | 37 | 5 | 0.1 |
| Heacock shoals | 54 | 7 | 0.1 |
| Sacramento | 64 | 9 | 0.2 |
| Mouth of Feather River | 84 | 16 | 0.35 |
| Knight landing | 99 | 20 | 0.3 |
| Winn landing | 120 | 27 | 0.3 |
| Colusa | 155 | 43 | 0.5 |
| Caldins | 167 | 57 | 1.2 |
| John Boggs landing | 171 | 62 | 1.3 |

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Princeton | 175 | 67 | 1.3 |
| Butte | 180 | 73 | 1.2 |
| Jacinto | 192 | 93 | 1.7 |
| Parrott landing | 195 | 98 | 1.66 |
| Monroeville | 203 | 110 | 1.5 |
| Chico landing | 209 | 119 | 1.5 |
| Bidwell landing | 214 | 128 | 1.8 |
| Gazelle chute | 230 | 157 | 1.8 |
| Squaw Hill | 236 | 168 | 1.8 |
| Tehama | 247 | 201 | 3.0 |
| Sacramento bar | 255 | 225 | 3.0 |
| Last Chance | 261 | 237 | 2.0 |
| Red Bluff | 265 | 245 | 2.0 |
| | 306 | 400 | 3.8 |
| Near Buckeye | 326 | 600 | 10.0 |
| | 344 | 800 | 11.1 |
| Delta | 356 | 1,000 | 16.7 |
| | 364 | 1,200 | 25.0 |
| Southern | 368 | 1,600 | 100.0 |
| Upper Soda Spring | 379 | 2,000 | 36.4 |
| | 384 | 3,000 | 200.0 |
| Head | 399 | 7,000 | 266.7 |

## PIT RIVER.

[From the atlas sheets of the United States Geological Survey.]

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 687 | ..... |
| | 13 | 1,000 | 24.1 |
| | 17 | 1,200 | 50.0 |
| | 31 | 1,400 | 14.3 |
| | 40 | 1,600 | 22.2 |
| | 47 | 1,800 | 28.6 |
| | 51 | 2,000 | 50.0 |
| Near Fall River mills | 75 | 3,000 | 41.7 |
| Above Pittville | 86 | 3,400 | 36.4 |
| Foot of Big Valley | 107 | 4,000 | 28.6 |
| | 127 | 4,200 | 10.0 |
| Canby | 152 | 4,350 | 6.0 |
| Alturas Hill | 176 | 4,446 | 4.0 |
| Goose Lake | 196 | 4,800 | 17.7 |

## OTHER CALIFORNIA RIVERS.

The Sierra streams, Feather, American, Yuba, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Cosumnes rivers, are all characterized by extremely steep and irregular slopes.

Pit River is one of the largest branches of the Sacramento. It heads in Goose Lake, in northeastern California. For some distance below the lake it has a comparatively gentle course. It cuts its way through the Sierra Nevada in a deep gorge, in the upper part of which the slope is gentle, but after passing the divide of the range its course becomes extremely steep, and this slope is maintained with but little diminution to its mouth.

### FEATHER RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Nicolaus | 10 | 9 | 0.9 |
| Yuba River | 20 | 21 | 1.2 |
| Burt ferry | 44 | 56 | 1.5 |
| Oroville | 57 | 100 | 3.4 |
| Middle Fork | 64 | 198 | 14.0 |
| West Branch | 73 | 648 | 50.0 |
| Upper end Big Bend | 85 | 1,080 | 36.0 |
| Buck Creek | 104 | 1,954 | 46.0 |
| Chip Creek | 112 | 2,370 | 52.0 |
| East Branch | 115 | 2,559 | 63.0 |
| Carriboo | 121 | 2,949 | 65.0 |
| Bidwell bridge | 136 | 4,678 | 115.3 |

### YUBA RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Marysville | 0 | 60 | |
| Long bar | 15 | 100 | 2.6 |
| Forks, North and South | 28 | 500 | 30.8 |
| Forks of North Fork | 36 | 1,000 | 62.5 |
| Up North Fork, Slate Range bar | 53 | 2,000 | 58.8 |
| Downieville | 70 | 3,000 | 58.8 |
| Loganville | 78 | 4,000 | 125.0 |
| Tehuantepec Valley | 90 | 6,700 | 225.0 |

AMERICAN RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth at Sacramento | 0 | 10 | |
| | 23 | 100 | 3.9 |
| Forks | 28 | 200 | 20.0 |
| Up North Fork | 37 | 300 | 11.1 |
| | 41 | 400 | 25.0 |
| | 44 | 500 | 33.3 |
| Mouth Middle Fork | 48 | 600 | 25.0 |
| | 56 | 700 | 12.5 |
| | 59 | 800 | 33.3 |
| Toll House | 66 | 1,000 | 28.6 |
| | 77 | 1,500 | 45.5 |
| Mouth of North Fork | 83 | 2,000 | 83.3 |
| | 94 | 3,000 | 90.9 |
| | 100 | 4,000 | 166.7 |
| | 105 | 5,000 | 200.0 |
| | 112 | 6,000 | 142.8 |
| | 118 | 8,500 | 416.7 |

COSUMNES RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth, Benson bridge | 0 | 25 | |
| | 25 | 100 | 3.0 |
| | 34 | 200 | 11.1 |
| | 44 | 500 | 30.0 |
| Forks, North and South | 47 | 800 | 100.0 |
| Up North Fork | 54 | 1,000 | 28.6 |
| Sweeney | 66 | 2,000 | 83.3 |
| Dyer mill | 72 | 3,000 | 166.7 |
| | 78 | 4,000 | 166.7 |
| | 83 | 5,000 | 200.0 |
| | 89 | 6,000 | 166.7 |
| Head | 93 | 7,500 | 375.0 |

MOKELUMNE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Junction with Cosumnes River | 0 | 25 | |
| | 28 | 100 | 2.7 |
| | 39 | 200 | 9.1 |
| | 47 | 500 | 37.5 |
| | 58 | 1,000 | 45.5 |
| | 66 | 2,000 | 125.0 |
| | 78 | 3,000 | 83.3 |
| | 90 | 4,000 | 83.3 |
| | 98 | 5,000 | 125.0 |
| | 103 | 6,000 | 200.0 |
| Hermit Valley | 109 | 7,000 | 166.7 |
| Head | 116 | 8,000 | 142.9 |

CALAVERAS RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 5 | |
| Bellota | 23 | 100 | 4.1 |
| | 44 | 200 | 4.8 |
| | 51 | 500 | 42.9 |
| | 68 | 1,000 | 29.4 |

STANISLAUS RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 30 | |
| Oakdale | 26 | 200 | 6.5 |
| Parrott ferry | 65 | 1,000 | 20.5 |
| Forks | 75 | 1,300 | 30.0 |
| | 79 | 2,000 | 175.0 |
| | 83 | 3,000 | 250.0 |
| | 89 | 4,000 | 166.7 |
| | 97 | 5,000 | 125.0 |
| | 102 | 6,000 | 200.0 |
| | 113 | 8,000 | 181.8 |

TUOLUMNE RIVER.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 40 | |
| Lagrange | 50 | 300 | 5.2 |
| | 59 | 500 | 22.2 |
| | 74 | 1,000 | 33.3 |
| Forks | 79 | 1,200 | 40.0 |
| | 87 | 1,600 | 50.0 |
| | 98 | 2,000 | 36.4 |
| Canyon | 109 | 3,000 | 90.9 |
| | 125 | 4,000 | 62.5 |
| | 133 | 5,000 | 125.0 |
| | 137 | 6,000 | 250.0 |
| | 138 | 7,000 | 1,000.0 |
| Head of canyon | 141 | 8,000 | 333.0 |
| Meadows | 144 | 8,500 | 167.0 |
| | 154 | 9,000 | 50.0 |
| | 155 | 10,000 | 1,000.0 |

KLAMATH RIVER.

Klamath River heads in Klamath Lake, in southern Oregon, and flows westward through the Coast Mountains by a somewhat sinuous course to the Pacific. It has a rapid and an extremely irregular fall, showing that its existence under the present topographic conditions has been brief. Its drainage basin is 14,660 square miles.

The profile is from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| | 127 | 1,800 | 14.2 |
| | 146 | 2,000 | 10.5 |
| | 158 | 2,200 | 16.7 |
| | 159 | 2,400 | 200.0 |
| | 161 | 2,600 | 100.0 |
| | 177 | 2,800 | 12.5 |
| | 185 | 3,800 | 125.0 |
| | 194 | 4,000 | 22.2 |
| Linkville, outlet Klamath Lake | 214 | 4,186 | 9.3 |

## COLUMBIA RIVER.

Columbia River, including Clark Fork, heads in the Rocky Mountains, west of Helena, Montana. Its slope is great from its head to the crossing of the Northern Pacific Railroad, below the mouth of Flathead River. In northern Idaho it flows through Lake Pend Oreille, and below that, in its northward course to the international boundary, it has a steeper descent. In this part of its course it is in a deep canyon. Thenceforward for several hundred miles it has a gentle slope, interrupted by rapids of no great magnitude until Kettle falls are reached. Other rapids succeed, the most formidable being Rock Island rapids, which form a complete obstruction to navigation. In its lower course in passing the Cascade Range it encounters two notable rapids, the Cascades and the Dalles, both of which interrupt navigation.

The entire drainage area of Columbia River is 216,537 square miles, about half of which belongs to Columbia River proper, and half to its main branch, Snake River.

The profile of the Columbia is in part from the work of Lieutenant Symons, in part from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | ..... |
| Mouth of Snake River | 312 | 145 | 0.5 |
| | 331 | 400 | 13.4 |
| Rock Island rapids | 466 | 594 | 1.4 |
| Wenatchee | 473 | 618 | 3.4 |
| Orondo | 494 | 665 | 2.2 |
| Troy | 504 | 680 | 1.5 |
| Chelan falls | 515 | 700 | 1.8 |
| Mouth of Methow River | 536 | 750 | 2.4 |
| Virginia City | 542 | 760 | 1.7 |
| Mouth of Okanogan River | 546 | 770 | 2.5 |
| Mouth of Spokane River | 655 | 1,073 | 2.8 |
| Below Grand rapids | 692 | 1,167 | 2.5 |
| Below Kettle falls | 699 | 1,191 | 3.4 |
| Above Kettle falls | 699 | 1,224 | ..... |
| North boundary | 740 | 1,305 | 2.0 |
| Pend Oreille Lake, foot | 854 | 2,062 | 6.6 |
| Pend Oreille Lake, head | 881 | 2,062 | ..... |
| Crossing N. P. R. R | 930 | 2,298 | 4.8 |
| Missoula | 1,072 | 3,191 | 17.8 |
| Near Bonita | 1,097 | 3,621 | 17.2 |

## WILLAMETTE RIVER.

This river, one of the main southern branches of the Columbia in Oregon, heads in the Cascade Range. Flowing down its slopes to the center of the Willamette Valley, it turns northward and pursues this course to its junction with the Columbia, just below the city of Portland. The profile represents only a portion of its course in the Willamette Valley. It shows a fairly uniform slope, gradually diminishing downward until the falls at Oregon City are reached, where there is an abrupt drop of 41 feet, with a second drop just below it, at Clackamas rapids, amounting to 5½ feet.

The drainage basin of the Willamette River is 11,700 square miles.

The profile is from the levels of the Engineer Corps, U. S. A.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 0 | |
| Portland | 12 | 0 | |
| Foot of Clackamas rapids | 23 | 0.5 | |
| Head of Clackamas rapids | 24 | 6 | 5.5 |
| Oregon City, below falls | 26 | 6 | |
| Oregon City, above falls | 26 | 47 | |
| Rogers landing | 49 | 50 | 0.1 |
| Salem | 84 | 107 | 1.6 |
| Independence | 95 | 129 | 2.0 |
| Albany | 119 | 165 | 1.5 |
| Corvallis | 131 | 184 | 1.6 |
| Peoria | 144 | 216 | 2.5 |
| Harrisburg | 164 | 286 | 3.5 |
| Eugene | 184 | 396 | 5.5 |

## FLATHEAD RIVER.

Flathead River heads in Canada and flows southward, first with a steep and then with a gentle slope, into Flathead Lake. Below this lake it turns to the west and joins the Columbia.

Its profile is in part from the levels of the Northern Pacific Railway, in part from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 2,410 | |
| Crossing N. P. R. R. | 15 | 2,464 | 3.6 |
| Flathead Lake, foot | 81 | 2,874 | 6.2 |
| Flathead Lake, head | 101 | 2,874 | |
| | 151 | 3,000 | 2.5 |
| | 168 | 3,400 | 23.5 |
| Near north boundary | 186 | 3,800 | 22.2 |

## SNAKE RIVER.

Snake River heads in Shoshone Lake in Yellowstone Park, thence it flows through Lewis Lake and, at the head of Jackson Hole, through Jackson Lake. Below the latter lake it has a steep descent, which is greatly increased in the canyon through which it passes from Jackson Hole to Snake River plains. Here it flows on the surface of a basalt field, and its course for some distance is extremely sluggish, through a broad extent of marshes. It soon, however, begins to cut into the basalt and to quicken its course to such an extent that it was in the early days called Mad River.

In descending from bench to bench in this basalt field, produced by successive flows of lava, it has falls, American falls near the mouth of Portneuf River, and Shoshone falls, lower down. Below Shoshone falls its slope is quite gentle for a long distance, but increases greatly in the canyon by which it cuts through the Blue Mountains. Below this canyon the slope to its mouth is very gentle. It is navigable to Lewiston, Idaho.

It is a large stream, having a total length of 939 miles and a drainage area of 103,835 square miles, or nearly half that of Columbia River.

The profile is almost entirely from the atlas sheets of the United States Geological Survey.

| Locality. | Distance from mouth. | Height above sea. | Fall per mile. |
|---|---|---|---|
| | *Miles.* | *Feet.* | *Feet.* |
| Mouth | 0 | 145 | |
| Weiser | 306 | 2,123 | 6.5 |
| Mouth of Malheur and Payette rivers | 324 | 2,152 | 1.6 |
| | 363 | 2,200 | 1.2 |
| | 391 | 2,230 | 1.1 |
| | 417 | 2,300 | 2.7 |
| | 430 | 2,350 | 3.8 |
| Glenns Ferry | 480 | 2,500 | 3.0 |
| | 602 | 4,190 | 13.9 |
| | 620 | 4,205 | 0.8 |
| Mouth of Rock Creek | 644 | 4,242 | 1.5 |
| Mouth of Portneuf River | 669 | 4,335 | 3.7 |
| Anderson | 682 | 4,362 | 2.1 |
| | 750 | 5,030 | 9.8 |
| Mouth of Salt River | 807 | 5,363 | 5.8 |
| In canyon | 823 | 5,909 | 34.1 |
| Mouth of Gros Ventre River | 855 | 6,227 | 9.9 |
| Mouth of Lake Creek | 867 | 6,440 | 17.7 |
| Foot of Jackson Lake | 887 | 6,808 | 18.4 |
| Lewis Lake | 931 | 7,720 | 20.7 |
| Shoshone Lake | 939 | 7,746 | 2.5 |

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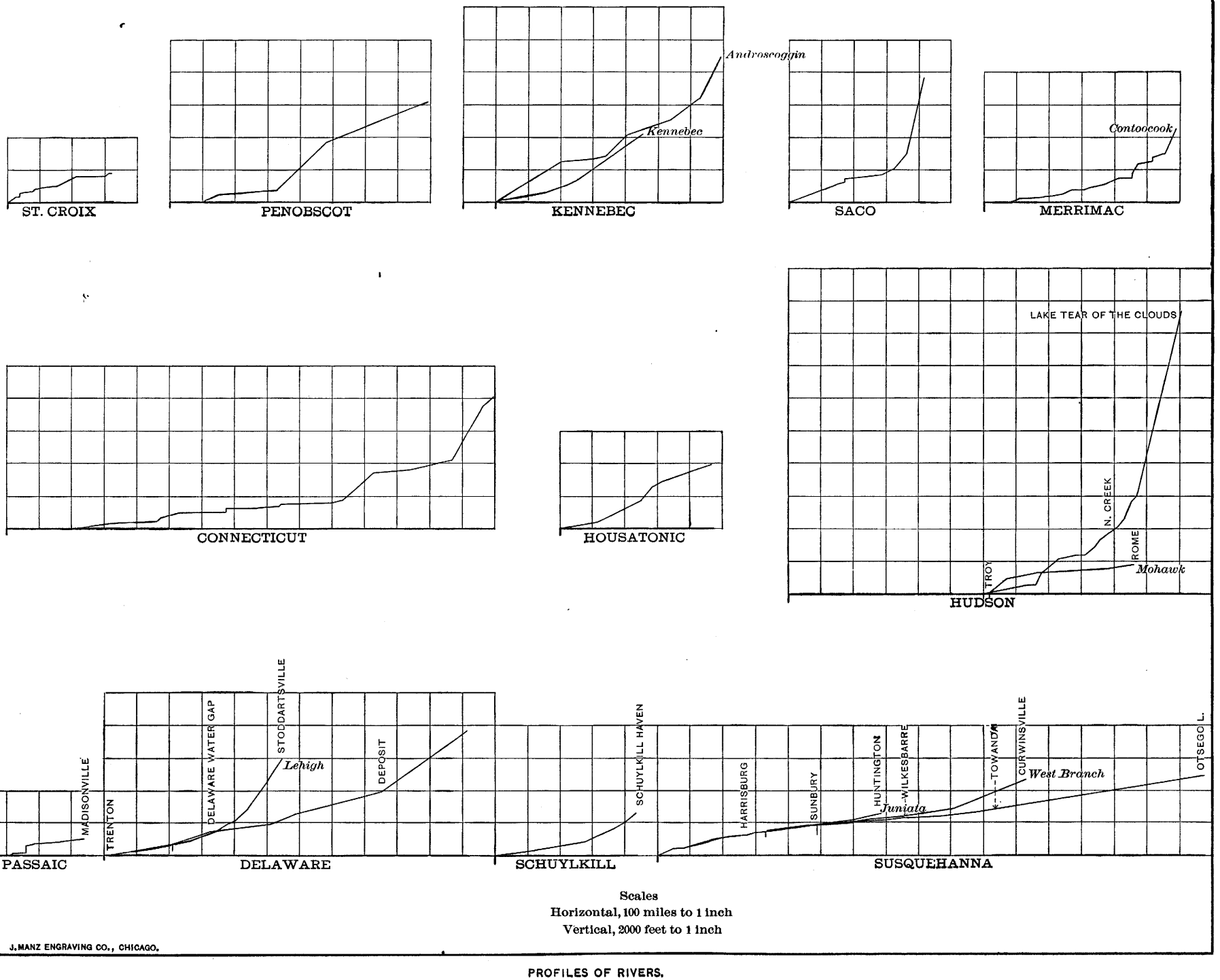
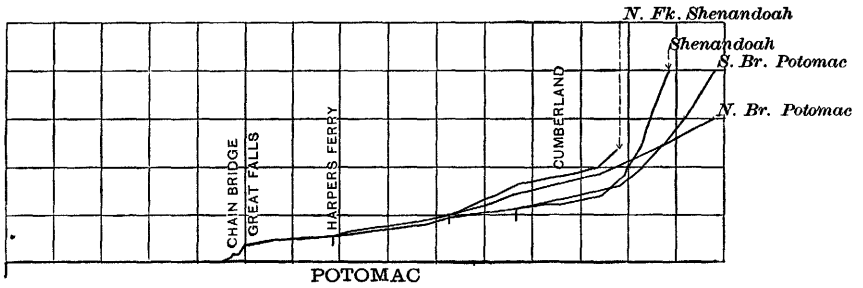


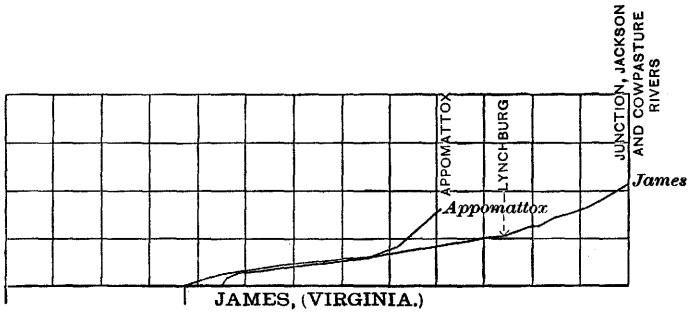

Scales
Horizontal, 100 miles to 1 inch
Vertical, 2000 feet to 1 inch

J. MANZ ENGRAVING CO., CHICAGO.

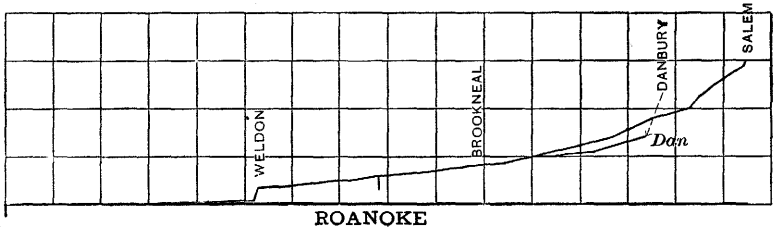
PROFILES OF RIVERS.



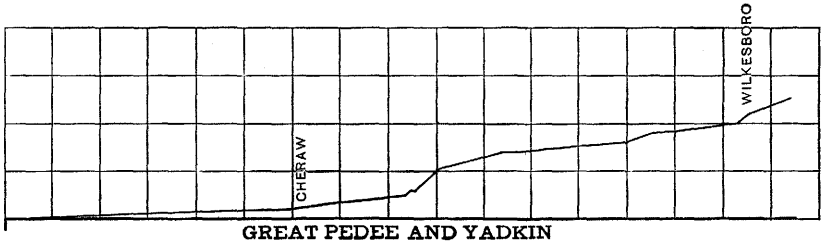

POTOMAC



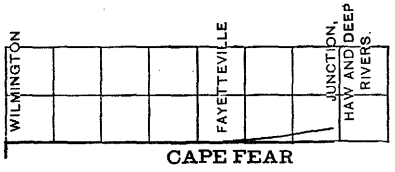

JAMES, (VIRGINIA.)




ROANOKE



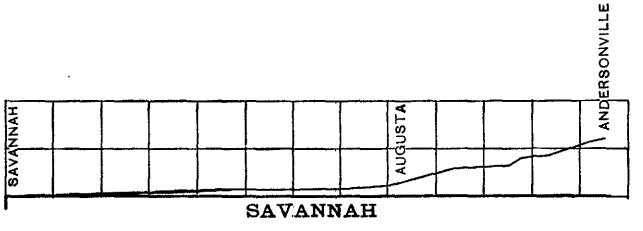

GREAT PEDEE AND YADKIN




CAPE FEAR




SANTEE WATEREE AND CATAWBA

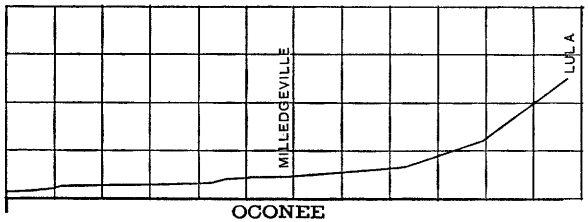



SAVANNAH

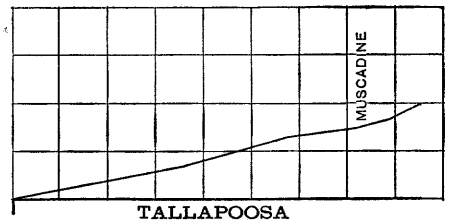
Scales
Horizontal, 100 miles to 1 inch
Vertical, 2000 feet to 1 inch

J. MANZ ENGRAVING CO., CHICAGO.

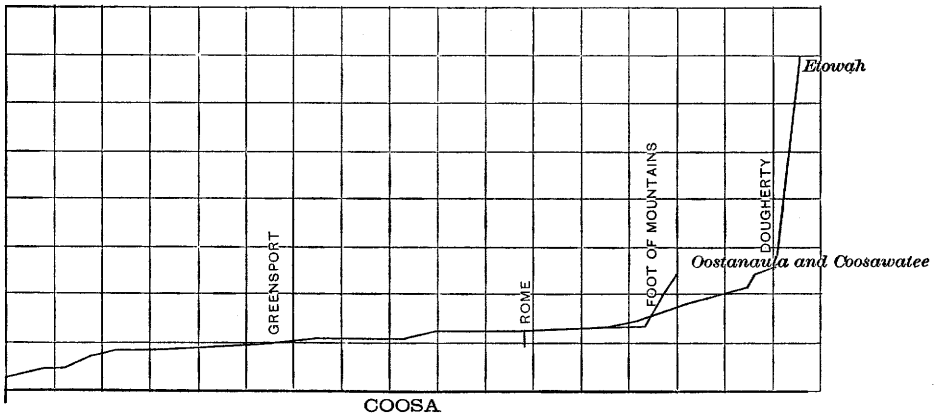
PROFILES OF RIVERS.



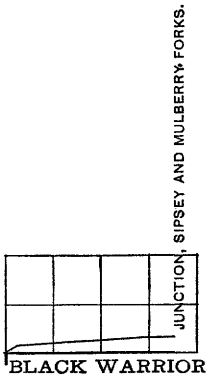

OCONEE



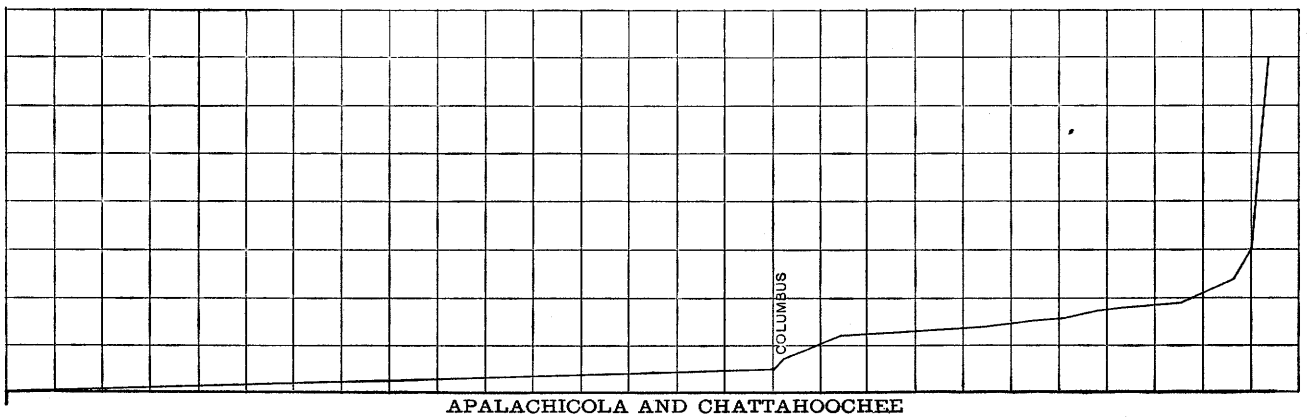

TALLAPOOSA




COOSA




BLACK WARRIOR

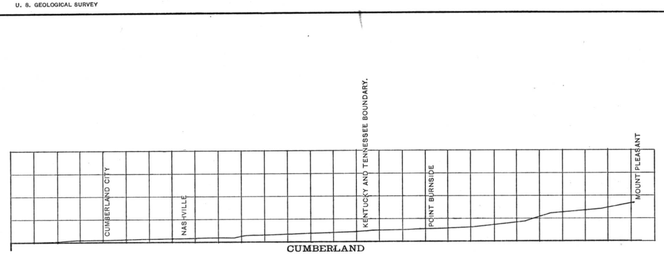



APALACHICOLA AND CHATTAHOOCHEE

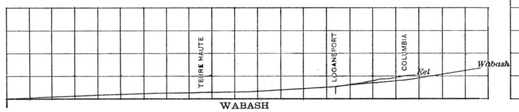
Scales
Horizontal, 100 miles to 1 inch.
Vertical, 2000 feet to 1 inch

J. MANZ ENGRAVING CO., CHICAGO.

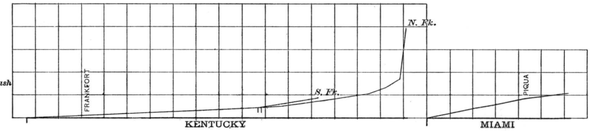
PROFILES OF RIVERS.




CUMBERLAND




WABASH




KENTUCKY

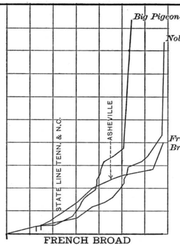



MIAMI

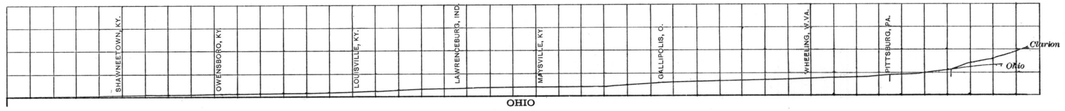

BIG SANDY


GUYANDOT

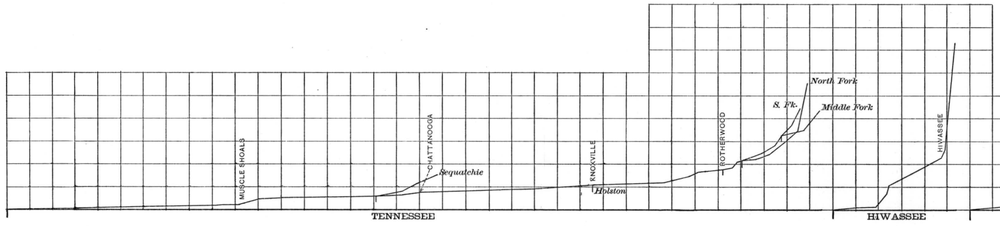

MUSKINGUM




FRENCH BROAD



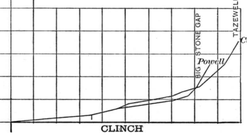

OHIO



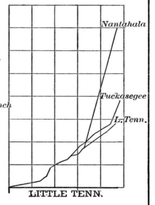

TENNESSEE



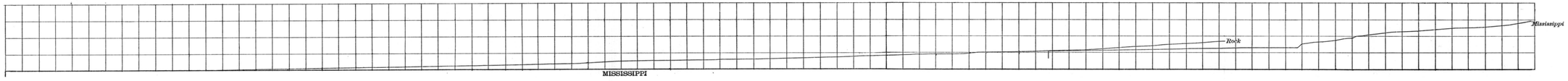

HIWASSEE




CLINCH




LITTLE TENN.



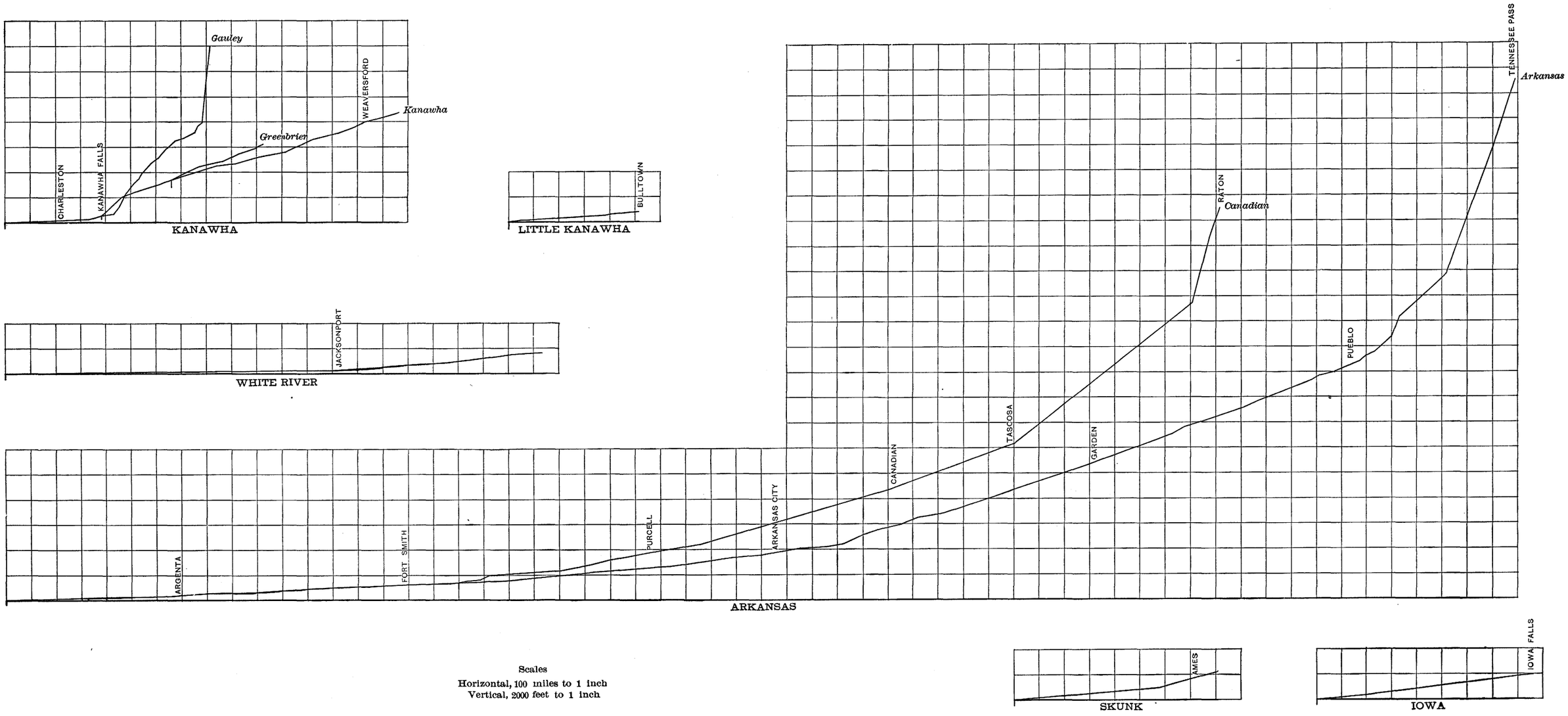

MISSISSIPPI

ILLINOIS

Scales
Horizontal, 100 miles to 1 inch
Vertical, 2000 feet to 1 inch

J. MANZ ENGRAVING CO., CHICAGO.

PROFILES OF RIVERS.



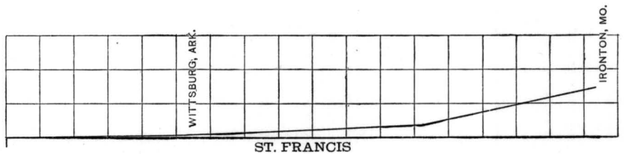

Scales

Horizontal, 100 miles to 1 inch
Vertical, 2000 feet to 1 inch

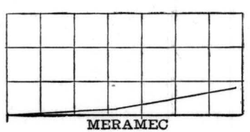
J. MANZ ENGRAVING CO., CHICAGO.

PROFILES OF RIVERS.

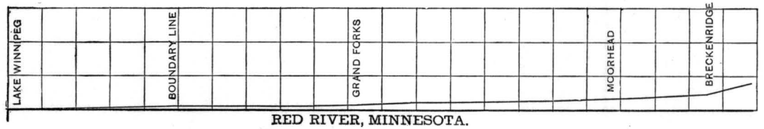

MINNESOTA



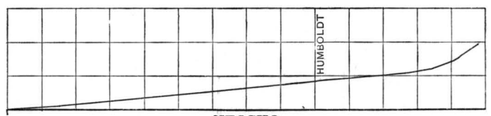

ST. FRANCIS



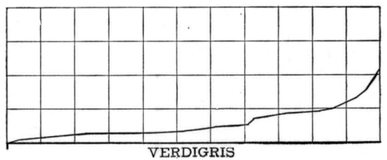
MERAMEC



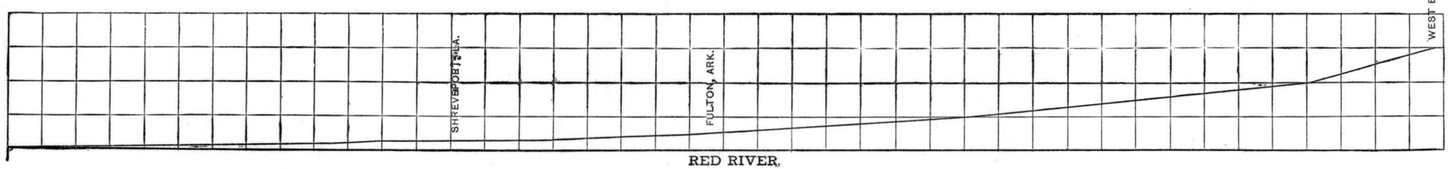

RED RIVER, MINNESOTA.



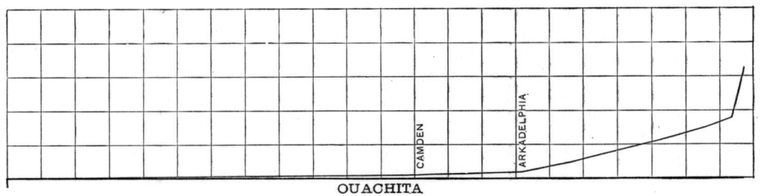

NEOSHO



VERDIGRIS



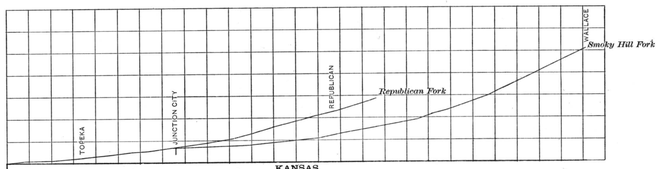

RED RIVER.




OUACHITA

Scales
Horizontal, 100 miles to 1 inch
Vertical, 2000 feet to 1 inch

PROFILES OF RIVERS.

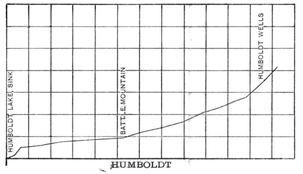



KANSAS

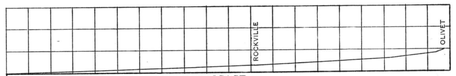

MILK



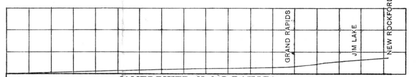

PLATTE



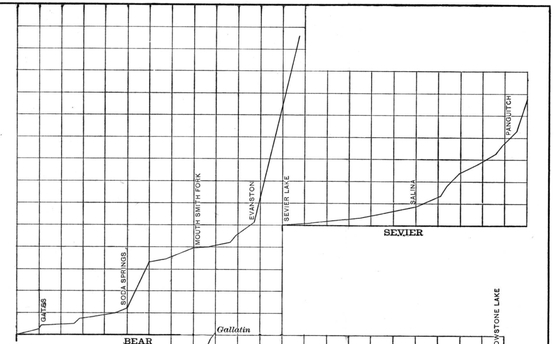

HUMBOLDT




OSAGE

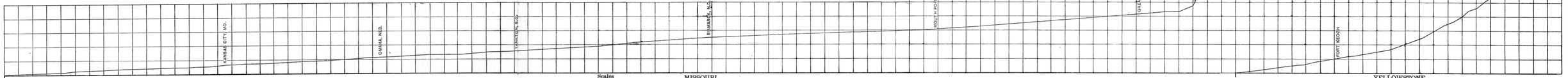



JAMES RIVER, N. & S. DAKOTA




SEVIER

BEAR



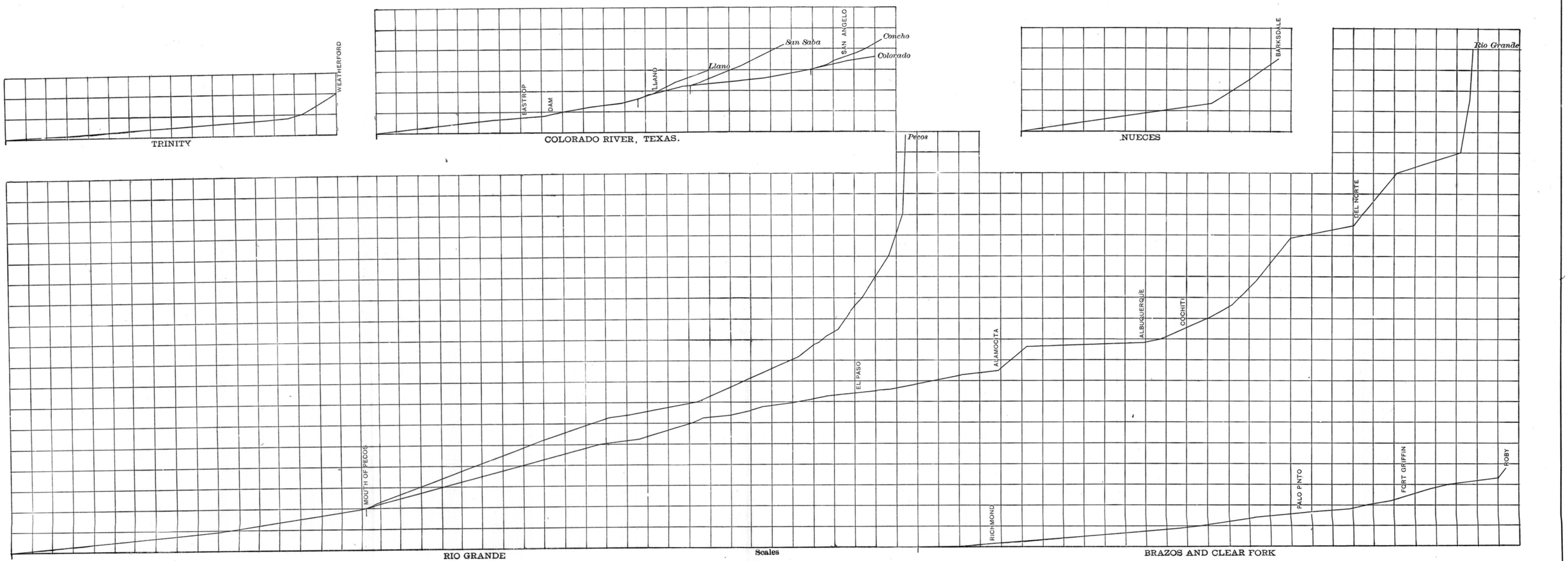

MISSOURI

YELLOWSTONE

Scales
Horizontal, 100 miles to 1 inch
Vertical, 2000 feet to 1 inch

J. MANZ ENGRAVING CO., CHICAGO.

PROFILES OF RIVERS.



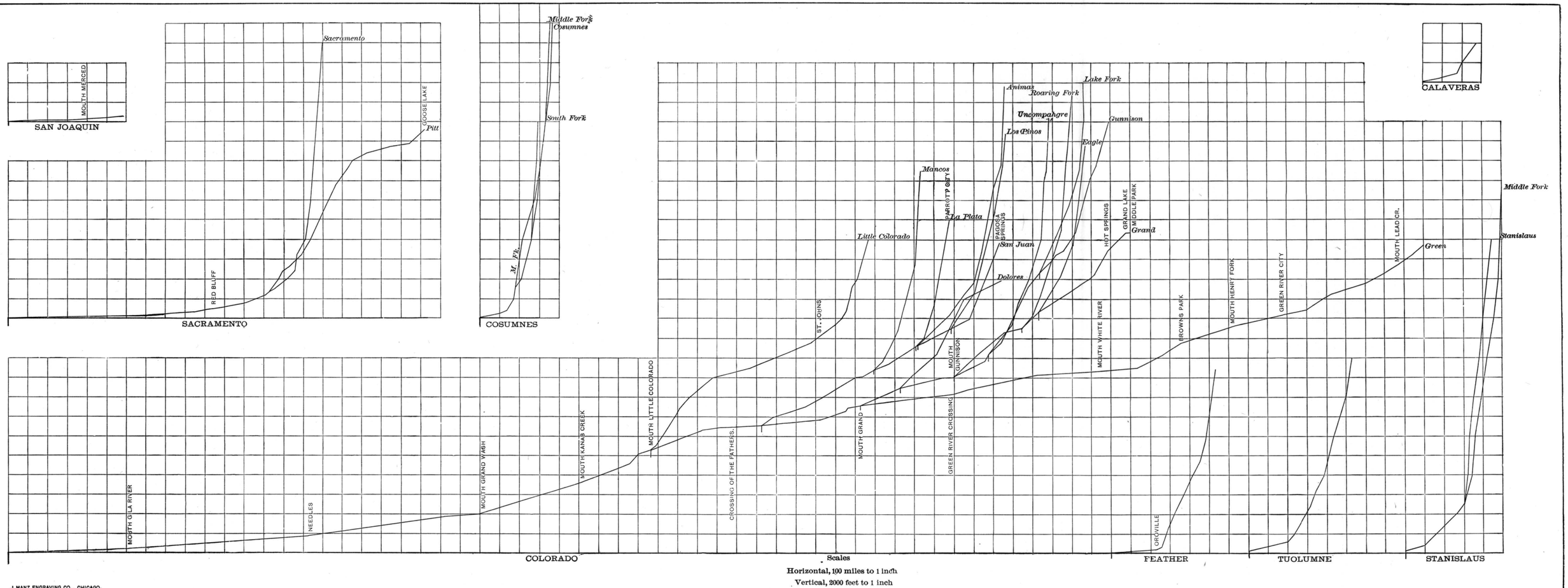

Scales

Horizontal, 100 miles to 1 inch

Vertical, 2000 feet to 1 inch

PROFILES OF RIVERS.

J. MANZ ENGRAVING CO., CHICAGO.



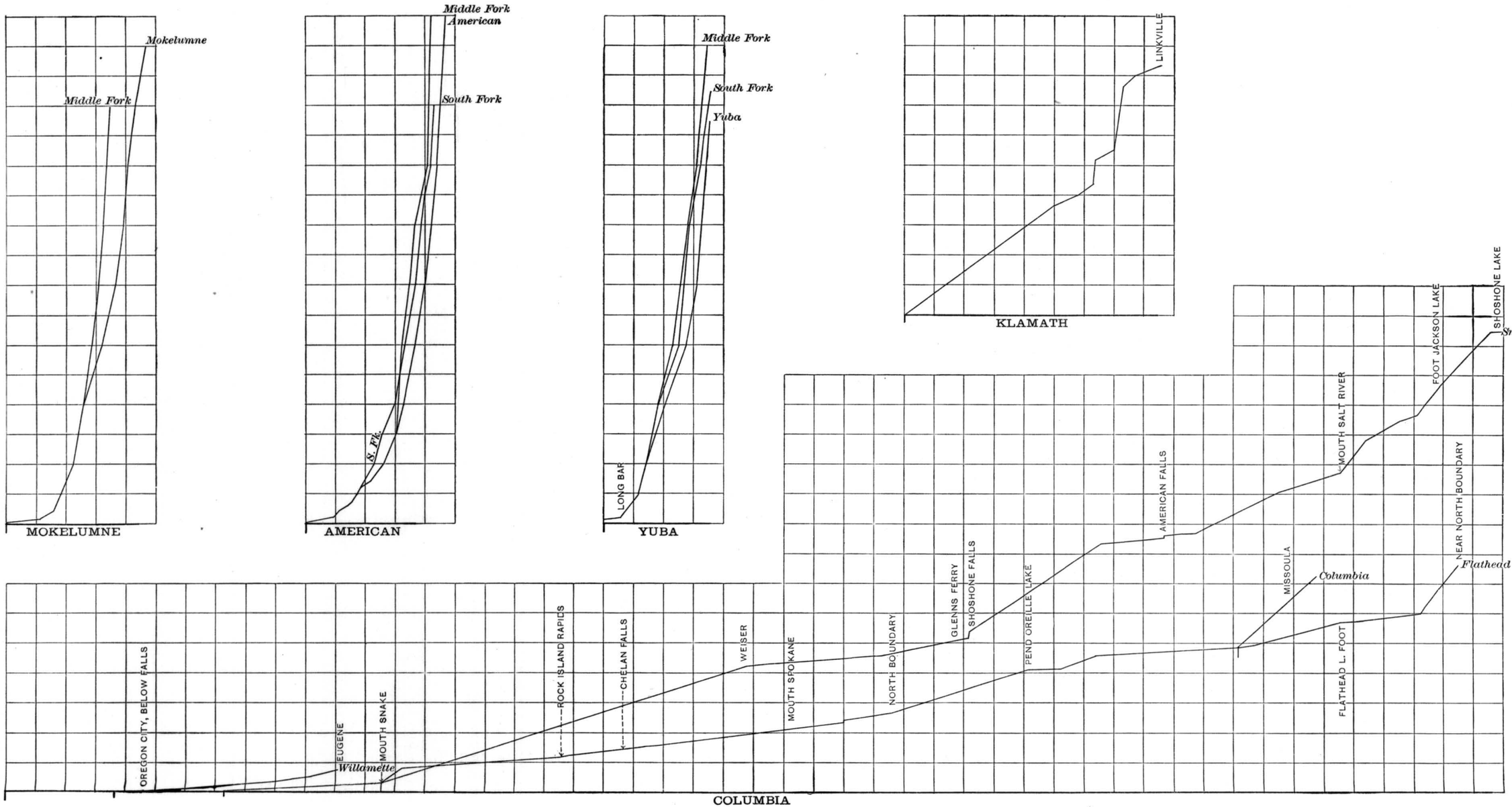

Scales

Horizontal, 100 miles to 1 inch

Vertical, 2000 feet to 1 inch

J. MANZ ENGRAVING CO., CHICAGO.

PROFILES OF RIVERS.




**Scales**

**Horizontal, 100 miles to 1 inch**

**Vertical, 2000 feet to 1 inch**

J. MANZ ENGRAVING CO., CHICAGO.

PROFILES OF RIVERS.

**1895.**

Sixteenth Annual Report of the United States Geological Survey, 1894–95, Part II, Papers of an economic character, 1895; octavo, 598 pp.

Contains a paper on the public lands and their water supply, by F. H. Newell, illustrated by a large map showing the relative extent and location of the vacant public lands also; a report on the water resources of a portion of the Great Plains, by Robert Hay.

A geological reconnoissance of northwestern Wyoming, by George H. Eldridge, 1894; octavo, 72 pp. Bulletin No. 119 of the United States Geological Survey; price, 10 cents.

Contains a description of the geologic structure of portions of the Big Horn Range and Big Horn Basin, especially with reference to the coal fields, and remarks upon the water-supply and agricultural possibilities.

Report of progress of the division of hydrography for the calendar years 1893 and 1894, by F. H. Newell, 1895; octavo, 176 pp. Bulletin No. 131 of the United States Geological Survey; price, 15 cents.

Contains results of stream measurements at various points, mainly within the arid region, and records of wells in a number of counties in western Nebraska, western Kansas, and eastern Colorado.

**1896.**

Seventeenth Annual Report of the United States Geological Survey, 1895–96, Part II, Economic geology and hydrography, 1896; octavo, 864 pp.

Contains papers on "The underground water of the Arkansas Valley in eastern Colorado," by G. K. Gilbert; "The water resources of Illinois," by Frank Leverett, and "Preliminary report on the artesian waters of a portion of the Dakotas," by N. H. Darton.

Artesian-well prospects in the Atlantic Coastal Plain region, by N. H. Darton, 1896; octavo, 230 pp., 19 plates. Bulletin No. 138 of the United States Geological Survey; price, 20 cents.

Gives a description of the geologic conditions of the coastal region from Long Island, New York, to Georgia, and contains data relating to many of the deep wells.

Report of progress of the division of hydrography for the calendar year 1895, by F. H. Newell, hydrographer in charge, 1896; octavo, 356 pp. Bulletin No. 140 of the United States Geological Survey; price, 25 cents.

Contains a description of the instruments and methods employed in measuring streams and the results of hydrographic investigations in various parts of the United States.

**1897.**

Eighteenth Annual Report of the United States Geological Survey, 1896–97, Part IV, Hydrography, 1897; octavo, 756 pp.

Contains a "Report of progress of stream measurements for the calendar year 1896," by Arthur P. Davis; "The water resources of Indiana and Ohio," by Frank Leverett; "New developments in well boring and irrigation in South Dakota," by N. H. Darton, and "Reservoirs for Irrigation," by J. D. Schuyler.

**1899.**

Nineteenth Annual Report of the United States Geological Survey, 1897–98, Part IV, Hydrography, 1899; octavo, 814 pp.

Contains a "Report of progress of stream measurements for the calendar year 1898," by F. H. Newell and others; "The rock waters of Ohio," by Edward Orton, and "A preliminary report on the geology and water resources of Nebraska west of the one hundred and third meridian," by N. H. Darton.

**1900.**

Twentieth Annual Report of the United States Geological Survey, 1898–99, Part IV, Hydrography, 1900; octavo, 660 pp.

Contains a "Report of progress of stream measurements for the calendar year 1898," by F. H. Newell, and "Hydrography of Nicaragua," by A. P. Davis.

WATER-SUPPLY AND IRRIGATION PAPERS, 1896–1900.

This series of papers is designed to present in pamphlet form the results of stream measurements and of special investigations. A list of these, with other information, is given on the outside (fourth) page of this cover.

Survey bulletins can be obtained only by prepayment of cost, as noted above. Money should be transmitted by postal money order or express order, made payable to the Director of the United States Geological Survey. Postage stamps, checks, and drafts can not be accepted. Correspondence relating to the publications of the Survey should be addressed to The Director, United States Geological Survey, Washington, D. C.

## WATER-SUPPLY AND IRRIGATION PAPERS.

1. Pumping water for irrigation, by Herbert M. Wilson, 1896.
2. Irrigation near Phœnix, Arizona, by Arthur P. Davis, 1897.
3. Sewage irrigation, by George W. Rafter, 1897.
4. A reconnoissance in southeastern Washington, by Israel C. Russell, 1897.
5. Irrigation practice on the Great Plains, by E. B. Cowgill, 1897.
6. Underground waters of southwestern Kansas, by Erasmus Haworth, 1897.
7. Seepage waters of northern Utah, by Samuel Fortier, 1897.
8. Windmills for irrigation, by E. C. Murphy, 1897.
9. Irrigation near Greeley, Colorado, by David Boyd, 1897.
10. Irrigation in Mesilla Valley, New Mexico, by F. C. Barker, 1898.
11. River heights for 1896, by Arthur P. Davis, 1897.
12. Water resources of southeastern Nebraska, by Nelson Horatio Darton, 1898.
13. Irrigation systems in Texas, by William Ferguson Hutson, 1898.
14. New tests of pumps and water lifts used in irrigation, by O. P. Hood, 1898.
15. Operations at river stations, 1897, Part I, 1898.
16. Operations at river stations, 1897, Part II, 1898.
17. Irrigation near Bakersfield, California, by C. E. Grunsky, 1898.
18. Irrigation near Fresno, California, by C. E. Grunsky, 1898.
19. Irrigation near Merced, California, by C. E. Grunsky, 1899.
20. Experiments with windmills, by Thomas O. Perry, 1899.
21. Wells of northern Indiana, by Frank Leverett, 1899.
22. Sewage irrigation, Part II, by George W. Rafter, 1899.
23. Water-right problems of the Bighorn Mountains, by Elwood Mead, 1899.
24. Water resources of the State of New York, Part I, by George W. Rafter, 1899.
25. Water resources of the State of New York, Part II, by George W. Rafter, 1899.
26. Wells of southern Indiana (continuation of No. 21), by Frank Leverett, 1899.
27. Operations at river stations, 1898, Part I, 1899.
28. Operations at river stations, 1898, Part II, 1899.
29. Wells and windmills in Nebraska, by Erwin Hinckley Barbour, 1899.
30. Water resources of the Lower Peninsula of Michigan, by Alfred C. Lane, 1899.
31. Lower Michigan mineral waters, by Alfred C. Lane, 1899.
32. Water resources of Puerto Rico, by H. M. Wilson, 1900.
33. Storage of water on Gila River, Arizona, by J. B. Lippincott, 1900.
34. Underground waters of a portion of southeastern S. Dakota, by J. E. Todd, 1900.
35. Operations at river stations, 1899, Part I, 1900.
36. Operations at river stations, 1899, Part II, 1900.
37. Operations at river stations, 1899, Part III, 1900.
38. Operations at river stations, 1899, Part IV, 1900.
39. Operations at river stations, 1899, Part V, 1900.
40. The Austin dam, by Thomas U. Taylor, 1900.
41. The windmill: its efficiency and economic use, by E. C. Murphy, Part I, 1901.
42. The windmill: its efficiency and economic use, by E. C. Murphy, Part II, 1901.
43. Conveyance of water in irrigation canals, etc., by Samuel Fortier.
44. Profiles of rivers in the United States, by Henry Gannett, 1901.

In addition to the above, there are in various stages of preparation other similar papers. Provision has been made for printing these by the following clause in the sundry civil act making appropriations for the year 1896–97:

*Provided*, That hereafter the reports of the Geological Survey in relation to the gaging of streams and to the methods of utilizing the water resources may be printed in octavo form, not to exceed 100 pages in length and 5,000 copies in number; 1,000 copies of which shall be for the official use of the Geological Survey, 1,500 copies shall be delivered to the Senate, and 2,500 copies shall be delivered to the House of Representatives, for distribution. [Approved June 11, 1896; Stat. L., vol. 29, p. 453.]

The endeavor is made to send these pamphlets to persons who have rendered assistance in their preparation through replies to schedules or who have furnished data. Requests specifying a certain paper and stating a reason for asking for it are granted whenever practicable, but it is impossible to comply with general demands, such as to have all of the series sent.

Application for these papers should be made either to Members of Congress or to