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AND

IRRIGATION PAPERS

OF THE

UNITED STATES GEOLOGICAL SURVEY

No. 46

RECONNAISSANCES OF KERN AND YUBA RIVERS, CALIFORNIA.—
OLMSTED AND MANSON

WASHINGTON
GOVERNMENT PRINTING OFFICE
1901

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UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

PHYSICAL CHARACTERISTICS OF KERN RIVER, CALIFORNIA

BY

FRANK H OLMSTED

AND

RECONNAISSANCE OF YUBA RIVER, CALIFORNIA

BY

MARSDEN MANSON

WASHINGTON

GOVERNMENT PRINTING OFFICE

1901

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LETTER OF TRANSMITTAL.

Department of the Interior,
United States Geological Survey,
Division of Hydrography,
Washington, D. C., March 6, 1901.

Sir: I have the honor to transmit herewith two manuscripts for publication together in the series of papers upon water supply and irrigation.

The first manuscript is by Mr. Frank H. Olmsted, a civil engineer of southern California, and relates to the physical characteristics of the catchment area of Kern River, California. In this paper the author describes the drainage basin and estimates the amount of water coming from it and the power available from a complete utilization of the various portions of the stream. He also discusses the utilization of this power in pumping for irrigation.

The ultimate development of a considerable portion of the arid region depends not only upon complete storage and control of the streams, but upon the largest possible use of the power which may be generated in the upper or steeper portions of the channel and transmitted electrically out upon the plains, to be used in bringing to the surface the moisture which has sunk below the reach of the roots of the plants. By this means the area of cultivation can be greatly extended; and, as shown by Mr. Olmsted, the cost of pumping this water and applying it to the soil may, under favorable conditions, be less than that of obtaining a supply by gravity.

In earlier pamphlets of this series of Water-Supply Papers the utilization of wind power for this purpose has been discussed, the efficiency of the windmill has been described, and the advantages due to the small cost and independent construction of each mill have been shown. Where, however, it is practicable to obtain electric power at small cost, pumping plants operated by electricity can be widely distributed and may have certain advantages over the windmill. It is therefore important, in any discussion of the method of utilizing the water resources, to bring to public attention the possible developments along this line.

The second manuscript presented herewith has been prepared by Dr. Marsden Manson, and relates to Yuba River, a tributary of the Sacramento. Dr. Manson discusses the physical conditions and storage possibilities of this stream, bringing out particularly the importance of preserving the forest cover on the upper catchment basin, and, if possible, increasing this by artificial means; and shows by estimates the possible increase of available water through complete afforestation of the area. The relation of forests to river flow is believed to be of great importance, and is a matter upon which precise data are needed. It is hoped that as the systematic river measurements continue it will be possible to state more and more definitely the precise relation which the forest cover bears to the behavior of the stream.

The protection of the forests by the creation of reservations and the conservation of the waters through reservoirs constructed within these various reservations are of such vital importance to the utilization of the arid lands of the West, both by direct irrigation and by the creation of power for pumping water, that all matters pertaining to these subjects have interest to the citizens of the country as the great landowners.

It is for these reasons that these manuscripts are presented as contributions to a larger knowledge of the subject.

Very respectfully,

F. H. NEWELL,
Hydrographer in Charge.

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

PHYSICAL CHARACTERISTICS OF KERN RIVER, CALIFORNIA, WITH SPECIAL REFERENCE TO ELECTRIC POWER DEVELOPMENT.

By Frank H. Olmsted.

INTRODUCTION.

The development of southern California has been retarded by three factors which are still operative: (1) Distance from the world's markets and commercial centers; (2) shortage of water; (3) lack of cheap fuel and power. Volumes might be written in regard to the relation which the development of water in southern California bears to the progress of the people, but broadly stated it may be said that the real development of this section will be defined and limited by the amount of water available for irrigation from San Diego to Santa Barbara and from San Pedro to the desert on the east. Regarding cheap fuel and power, neither Los Angeles, the commercial center of this section, nor any other place in southern California has had it, and even now, when it is reasonable to suppose that the local oil industry is at its best, the price of oil is approaching $1 a barrel of 42 gallons; or, expressed differently, the cost of oil as fuel is equal to bituminous coal at $4 a ton. During the last five years Los Angeles has had an industrial awakening corresponding to this decrease in the cost of fuel from $7 or $8 a ton to $4 a ton.

During the first year of its advent in the Los Angeles market the cost of oil ranged between $0.40 and $1 a barrel. Most of the users of coal at that time found it economical to change their grates to oil burners, but since 1896 the tendency of the oil market has been upward, until now the cost of oil is $0.75 to $1 a barrel. At $1.50 a barrel oil as fuel is no cheaper than Gallup coal at $7 a ton, except that usually the oil feeder is arranged so as not to require an attendant, thus saving the wages of a stoker. In carload lots, the cost of Wellington bituminous coals is about $1 a ton more than the Eastern lignites; and, limited as the output has been, at present it virtually controls the Los Angeles market. During at least half of the year the demand in Los Angeles is so near the greatest available supply that outside orders for coal are not sought. The oil supply has contributed to the industrial advancement of southern California, and there are many reasons for believing that with cheap electric power

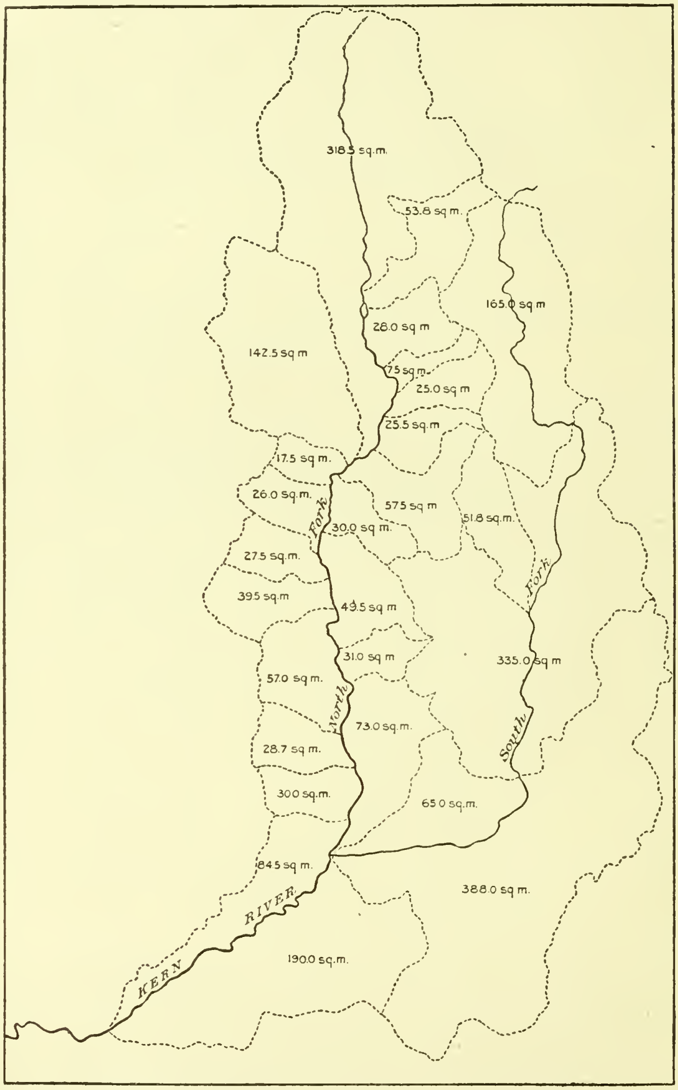


FIG. 1.—Map showing minor drainage basins of upper Kern River.

the manufactures and industries of southern California in general, and of the city of Los Angeles in particular, would quickly respond, and that their growth would be upon a safer foundation and a broader basis. The future outlook does not, however, warrant the hope for much better fuel rates, even with the construction of the

Salt Lake Railroad assured; but there is good reason to expect cheaper power, and if this expectation is realized, the greater part of the power must come from Kern River.

PHYSICAL FEATURES.

Kern River rises on the western slope of the Sierra Nevada, the greatest mountain range in the United States. For a distance of 100 miles the average elevation of this crest line is more than 11,000 feet above the sea, and so great is the run-off that within the first 15 miles of its course the river receives 80 per cent of its total summer flow at the mouth of its canyon 100 miles away. The drainage area of the stream above the latter point is 2,349.3 square miles. Fig. 1 is a map showing the distribution of this drainage area, the minor drainage basins being outlined and their respective areas given. The following tables give the names and the respective areas of these minor drainage basins:

Areas of minor drainage basins of North Fork of Kern River.

	Square miles.
Headwaters	318.5
Whitney Creek	53.8
Small Creek	28.0
Ninemile Creek	7.5
Menache Creek	25.0
Trout Meadow Creek	25.5
Harris Creek	57.5
Tibbetts Creek	30.0
Brush Creek	49.5
Salmon Creek	31.0
Corral and other creeks	75.0
Little Kern River	142.5
Needles Creek	17.5
Clark Creek	26.0
Jackson Creek	27.5
Wade Creek	39.5
Tobias and other creeks	57.0
Bull Run Creek	28.7
Tilly Creek	30.0
Total to junction of South Fork	1,070.0

Areas of minor drainage basins of South Fork of Kern River.

	Square miles.
Headwaters	165.0
Fish Creek	51.8
Middle tributaries	335.0
Lower tributaries from north	65.0
Lower tributaries from south	388.0
Total to junction with North Fork	1,004.8

Drainage areas of Kern River.

	Square miles.
North Fork	1,070.0
South Fork	1,004.8
Tributaries from north side after junction	84.5
Tributaries from south side after junction	190.0
Total	2,349.3

The length of Kern River from King River summit, on its main fork, to the mouth of the canyon above Bakersfield is 118 miles. The channel is in granite, and, with the exception of a few drops in the lower reaches of the stream, the grades are fairly uniform. In

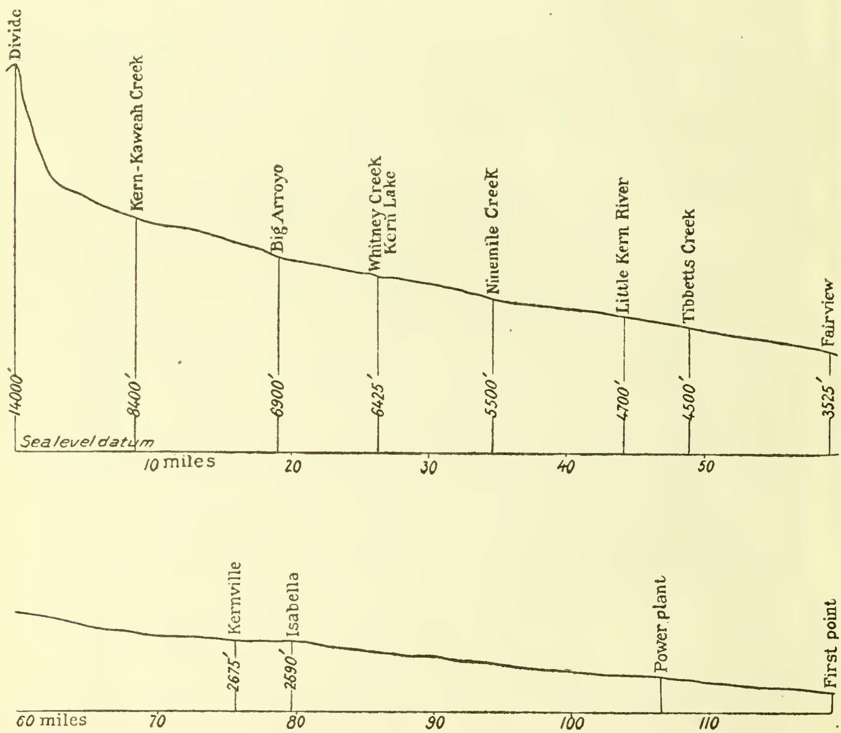


FIG. 2.—Profile of Kern River.

the 62 miles above Kernville the stream falls 5,600 feet, and in the 48 miles below Kernville it falls about 2,100 feet. A view of the river near Kernville is shown in Pl. I, and a profile of the stream in fig. 2. Fig. 3 is a view of a mountain valley in the basin of the river.

The South Fork of the stream, which rises just south of Cirque Peak, is 83 miles long to its junction with the North (or main) Fork at Isabella. The main range of the Sierra Nevada drops off rapidly just south of Cirque Peak, which may account in a large measure for the comparatively small flow of the South Fork. This branch of Kern River possesses one decided advantage over the other branch,

VIEW OF KERN RIVER NEAR KERNVILLE.

and over most California streams, in that it has a succession of particularly fine reservoir sites along a channel otherwise distinguished by reaches of rapid descent. A profile of the South Fork is shown in fig. 4.

The entire flow of Kern River is utilized for irrigation in the

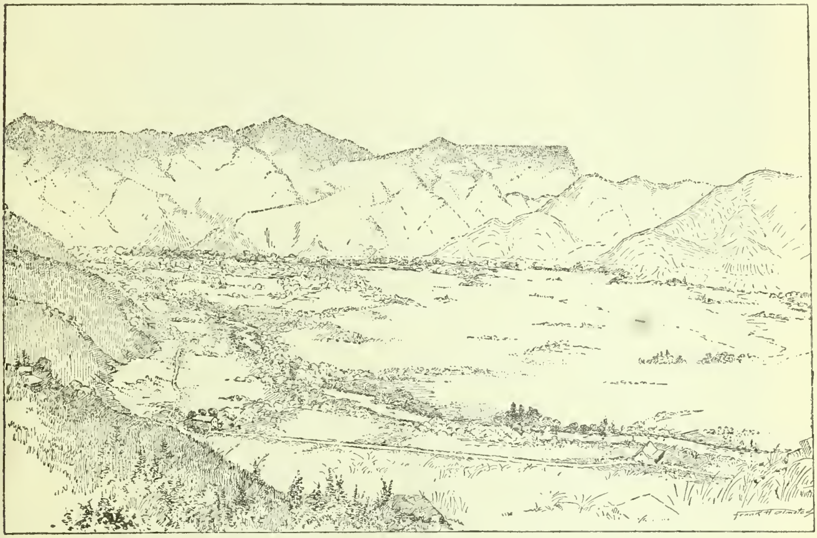


FIG. 3.—View of mountain valley in Kern River Basin.

southern end of San Joaquin Valley, and were it not for the great evaporation losses from the Buena Vista Lake reservoir the system could be called effective. The power of the stream, which, with one small exception, is available in large units, wastes itself upon the marbled bowlders and granite bed rock of the canyon, and suggests

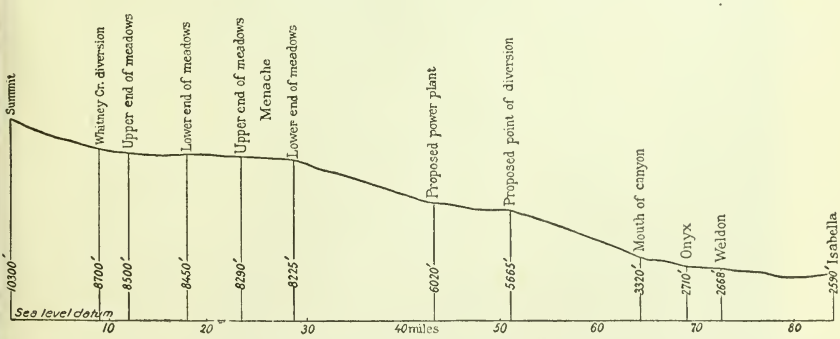


FIG. 4.—Profile of South Fork of Kern River.

an encouraging field for immediate investigation. The need of power in the agricultural valleys of California was never so apparent as now, after a series of dry years, when the ordinary flow of the streams has diminished to the extent of eliminating much hitherto valuable land, which of course precludes further development along gravity lines. Power applied to the pumping of water from the gravel beds which underlie most of the California streams where they debouch from their canyons at once solves the difficulty; and where the water plane is not far below the surface this method of irrigation

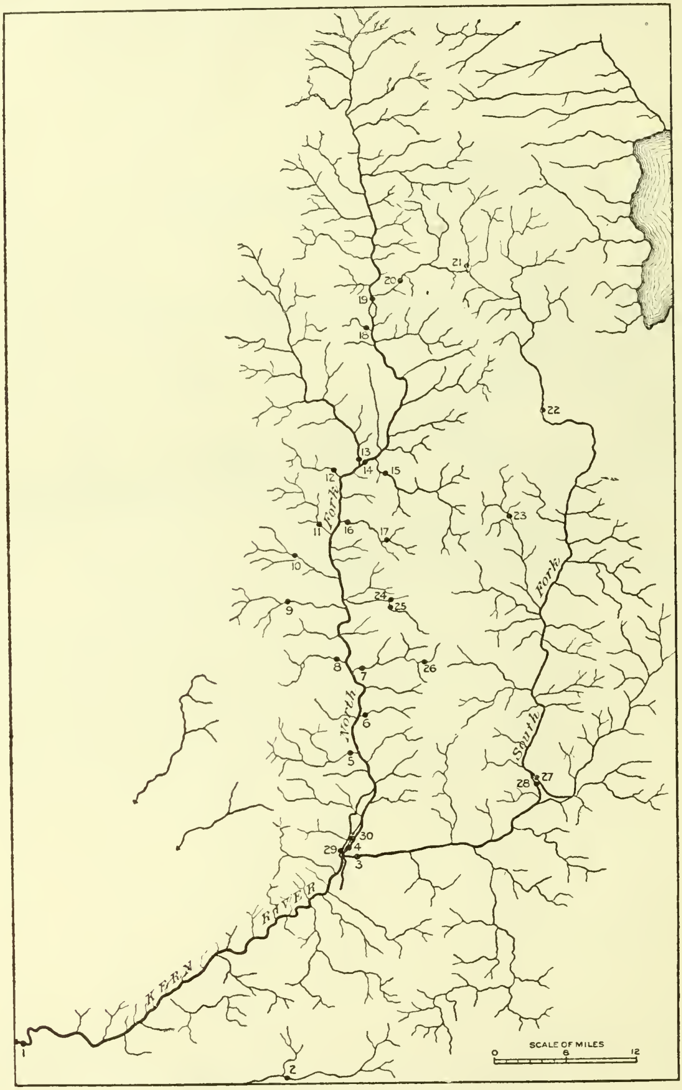


FIG. 5.—Map showing points of stream measurements.

is in many ways more convenient and perhaps not more expensive than the ordinary canal.

VOLUME.

From daily measurements continued through a series of years the run-off of Kern River Basin is well established, though the precipita

VIEW OF GAGING STATION ON NORTH FORK OF KERN RIVER

tion and the local discharges in the watershed are still in question. Mr. Henry Hawgood, Mem. Inst. of C. E., who has made a careful study of the physical conditions existing in the watershed of Kern River, more particularly in that of the North Fork, has estimated the annual precipitation for the North Fork above Isabella at 25.4 inches, with a run-off of 12.5 inches. This would give a mean annual flow of the North Fork of 982 second-feet. Mr. Hawgood estimates the rainfall of the entire basin at 23 inches, and the mean run-off at 7.8 inches. On this last assumption the mean discharge of Kern River at its mouth would be 1,350 second-feet. As a fact, however, for the last five years (1895–1899)—a period of exceptional drought in the basin—the stream has had a mean annual discharge at First Point of Measurement, near Bakersfield (see map, Pl. III), of 864 second-feet, or 64 per cent of the normal assumed by Mr. Hawgood.

In June, 1900, stream measurements made by the writer above Kern Lake, about 90 miles above First Point of Measurement, showed that, when considered with measurements made at the latter place and making a time allowance for the distance between, the discharge of the upper part of the stream was 99 per cent of that of the lower part. The loss in volume in the passage of 939 second-feet of water (the amount flowing in the river just above Kern Lake on June 27, 1900) from Kern Lake to Bakersfield can not be stated accurately, but in the lower reaches of the stream, from Isabella to Bakersfield, where the conditions are similar, the loss when the flow was 1,333 second-feet was determined by the writer to be 3.21 second-feet to the mile. On this basis, on June 27, 1900, the flow of the North Fork just above Kern Lake was equal to 83 per cent of the flow of Kern River at First Point of Measurement. Fig. 5 is a map showing the points where stream measurements were made, and the following table gives the dates of the measurements and the discharge in second-feet, the numbers in the table corresponding to the numbers on the map.

Discharge measurements of Kern River and tributaries at points shown on map (fig. 5).

Location.	Date.	Discharge.	Location.	Date.	Discharge.
	1900.	*Sec.-ft.*		1900.	*Sec.-ft.*
1	(First Point of Measurement.)		16	June 25	2.87
			17	June 29	1.80
2	June 19	1.31	18	June 25	4.87
3	June 20	14.18	19	June 27	939.60
4	do	1,333.17	20	do	39.11
5	June 21	2.30	21	do	4.72
6	June 22	0.32	22	June 28	3.67
7	do	3.45	23	June 29	Dry.
8	do	2.92	24	do	1.04
9	June 23	5.07	25	do	8.22
10	do	5.74	26	June 30	4.05
11	do	5.19	27	July 2	2.38
12	June 24	4.26	28	do	11.05
13	do	81.00	29	July 3	1.96
14	June 25	1,154.90	30	do	7.31
15	do	8.45			

Since September, 1893, the Kern County Land Company has made careful daily measurements of the flow of Kern River at First Point of Measurement. At Rio Bravo ranch, in sec. 11, T. 29 S., R. 29 E., M. D. M., 8¼ miles above First Point of Measurement, the flow of the river has been measured for many years by the State engineer of California. It is estimated by Mr. James, chief engineer of the Kern County Land Company, that there is a loss of 50 second-feet between these gaging stations. The accompanying tables give the monthly discharge of the river at Rio Bravo ranch for the years 1878–1884, inclusive, and at First Point of Measurement for the years 1893–1900, inclusive. On page 22 is a comparative table of the estimated daily discharge of the river during 1900 at First Point of Measurement and just below Tobias Creek, which is 17 miles above the mouth of the South Fork of Kern River and about 2 miles above the mouth of Salmon Creek, and enters the North Fork from the east.

On pages 22 and 23 is a table of miscellaneous discharge measurements of Kern River and its tributaries, and on the latter page are tables of rainfall at three places in Kern River Basin.

Estimated monthly discharge of Kern River at Rio Bravo ranch.

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Depth in inches.	Second-feet per square mile.
1878.						
November			400	23,802	0.19	0.17
December			350	21,521	.17	.15
1879.						
January	686	389	462	28,407	.23	.20
February	745	466	591	32,823	.26	.25
March	659	510	552	33,941	.28	.24
April	1,054	661	764	45,461	.37	.33
May	1,231	680	927	56,999	.46	.40
June	1,190	812	971	57,778	.47	.42
July	865	386	535	32,895	.26	.23
August	387	168	266	16,356	.13	.11
September	174	146	171	10,176	.08	.07
October	210	145	182	11,191	.09	.08
Season	1,231	145	514	371,350	2.99	.22
November	325	184	261	15,531	.12	.11
December	650	280	356	21,890	.17	.15
1880.						
January	410	315	354	21,767	.17	.15
February	380	315	370	21,282	.17	.16
March	385	349	389	23,919	.20	.17
April	3,320	395	1,557	92,648	.73	.66
May	3,560	1,615	2,659	163,496	1.31	1.14
June	4,070	2,740	3,317	197,376	1.58	1.42
July	3,140	1,550	2,196	135,027	1.08	.94
August	1,500	840	1,060	65,177	.52	.45
September	846	710	767	45,640	.37	.33
October	794	722	758	46,608	.37	.32
Season	4,070	184	1,169	850,361	6.79	.50


MAP OF
UPPER KERN RIVER
BY
FRANK H. OLMSTEAD
1900
Scale
3 2 1 0 3 6 MILES
KERN RIVER WATERSHED
TULARE COUNTY
KERN COUNTY
INYO COUNTY
SIERRA NEVADA
SEQUOIA NATIONAL PARK
Military Reservation
OWENS LAKE
EASTERN LIMITS OF SIERRA FOREST RESERVATION
SOUTHERN LIMITS OF SIERRA FOREST RESERVATION
CARSON & COLORADO R.R.
SOUTHERN PACIFIC R.R.
Harrisons Pass
Mt Geneva
Milestone Mt.
Mt Williamson
Mt. Whitney
Lone Pine Peak
Mt. Le Conte
Lone Pine Sta.
Lone Pine P.O.
Granite Peak
Kaweah Pk
Mt Guyot
Corcoran Mt.
Black Rock Pass
Cirque Peak
To Mineral King & E. Fk. of Kaweah
Funstons
Farewell Gap
Kern Lake
Trout Meadows
Menache Meadows
Needles
Smiths
Burnt Tract
Capitol Peak
Fairview
Rock House Meadows
Chimney Meadows
La Motte Meadows
Kernville
Hoopers Mill Bridge
Isabella
SOUTH FORK VALLEY
Weldon
Onyx
Walkers Pass
Greenhorn Mts.
Havilah
Piute Peak
Sageland
Mt Breckenridge
Power House
Walkers Basin
Caliente
N
36°
118°
A Hoen & Co Baltimore

Estimated monthly discharge of Kern River at Rio Bravo ranch—Continued.

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Depth in inches.	Second-feet per square mile.
1880.						
November	830	695	767	45,640	0.37	0.33
December	1,480	790	1,063	65,361	.52	.45
1881.						
January	1,640	950	1,078	66,284	.52	.46
February	2,970	1,430	1,073	98,471	.79	.76
March	2,100	1,400	1,570	96,535	.77	.67
April	2,612	2,100	2,288	136,145	1.09	.98
May	2,710	2,060	2,362	145,110	1.16	1.01
June	2,390	1,475	1,890	112,462	.90	.81
July	1,520	710	1,126	69,235	.55	.48
August	1,200	420	627	38,552	.31	.27
September	420	320	361	21,481	.17	.15
October	360	310	333	20,475	.16	.14
Season	2,970	310	1,263	915,751	7.31	.54
November	360	300	337	20,053	.16	.14
December	410	320	350	21,521	.17	.15
1882.						
January	380	310	335	20,598	.16	.14
February	510	360	395	21,937	.18	.17
March	1,260	440	600	36,893	.30	.26
April	1,670	920	1,174	69,858	.56	.50
May	2,000	1,420	1,670	102,684	.82	.71
June	1,990	900	1,306	77,712	.62	.56
July	1,110	450	726	44,640	.36	.31
August	----------	----------	330	*a*20,291	.16	.14
September	----------	----------	330	*a*19,636	.16	.14
October	----------	----------	330	*a*20,291	.16	.14
Season	2,000	300	655	476,114	3.81	.28
November	----------	----------	280	*a*16,661	.13	.12
December	----------	----------	280	*a*17,217	.14	.12
1883.						
January	----------	----------	280	*a*17,217	.14	.12
February	----------	----------	350	*a*19,438	.16	.15
March	----------	----------	700	*a*43,041	.35	.30
April	----------	----------	1,170	*a*69,620	.56	.50
May	----------	----------	1,410	*a*86,698	.69	.60
June	----------	----------	1,170	*a*69,620	.56	.50
July	----------	----------	940	*a*57,798	.46	.40
August	----------	----------	470	*a*28,899	.23	.20
September	----------	----------	350	*a*20,826	.17	.15
October	----------	----------	280	*a*17,217	.14	.12
Season	----------	----------	638	464,252	3.73	.27
November	----------	----------	200	*a*11,901	.10	.09
December	----------	----------	200	*a*12,298	.10	.09
1884.						
January	----------	----------	350	*a*21,521	.17	.15
February	----------	----------	470	*a*27,034	.22	.20
March	----------	----------	940	*a*57,798	.46	.40
April	----------	----------	1,980	*a*117,818	.89	.80
May	----------	----------	5,860	*a*360,317	2.90	2.50
June	----------	----------	9,380	*a*558,148	4.46	4.00
July	----------	----------	5,860	*a*360,317	2.90	2.50
August	----------	----------	2,350	*a*144,496	1.15	1.00
September	----------	----------	940	*a*55,934	.45	.40
October	----------	----------	470	*a*28,899	.23	.20
Season	----------	----------	2,422	*a*1,756,481	14.03	1.03

a Estimated from fragmentary records by State engineer.

Estimated monthly discharge of Kern River at First Point of Measurement.

[Drainage area used in previous reports, 2,345 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Depth in inches.	Second-feet per square mile.
1893.						
October	554	517	534	32,861	0.26	0.23
November	559	467	518	30,827	.24	.22
December	590	430	516	31,757	.25	.22
1894.						
January	741	562	661	40,644	.32	.28
February	1,114	604	717	39,817	.32	.30
March	1,443	762	1,001	61,541	.65	.43
April	1,892	1,209	1,495	88,952	.71	.64
May	2,208	1,228	1,607	98,798	.79	.69
June	1,719	871	1,085	64,557	.51	.46
July	1,051	400	700	43,036	.34	.30
August	549	256	335	20,565	.16	.14
September	382	172	248	14,756	.12	.11
October	363	224	279	17,178	.14	.12
November	268	230	244	14,500	.11	.10
December	805	234	470	28,908	.23	.20
The year	2,208	172	737	533,252	4.40	.31
1895.						
January	1,616	473	809	49,762	.40	.34
February	4,762	675	1,252	69,536	.55	.53
March	3,004	987	1,374	84,437	.67	.59
April	3,897	1,911	2,724	162,076	1.29	1.16
May	5,384	3,100	4,369	268,608	2.14	1.86
June	3,721	2,174	2,906	172,919	1.37	1.24
July	2,063	867	1,482	91,113	.73	.63
August	1,073	354	629	38,665	1.31	.27
September	676	290	344	20,469	.17	.15
October	612	276	327	20,106	.16	.14
November	436	308	346	20,588	.17	.15
December	447	368	403	24,779	.20	.17
The year	5,384	276	1,413	1,023,058	8.16	.60
1896.						
January	3,101	377	747	45,931	.37	.32
February	798	559	617	35,489	.28	.26
March	2,089	652	951	58,475	.47	.41
April	1,263	766	972	57,838	.46	.41
May	3,370	934	1,401	86,144	.69	.60
June	3,611	1,244	2,456	146,142	1.17	1.05
July	2,210	741	1,316	82,762	.66	.57
August	741	353	486	29,883	.24	.21
September	473	234	304	18,089	.14	.13
October	425	223	267	16,417	.13	.11
November	416	288	355	21,124	.17	.15
December	426	313	347	21,336	.17	.15
The year	3,611	223	854	619,630	4.95	.36
1897.						
January	832	305	373	22,935	.18	.16
February	2,306	516	809	44,930	.36	.35
March	2,044	688	923	56,753	.45	.39
April	4,410	1,094	2,914	173,395	1.38	1.24
May	5,342	4,054	4,580	281,613	2.25	1.95
June	4,352	1,289	2,309	137,395	1.09	.98
July	1,536	644	1,006	61,857	.49	.43
August	671	338	469	28,838	.23	.20
September	363	260	295	17,554	.14	.13
October	441	278	340	20,906	.17	.15
November	477	289	355	21,124	.17	.15
December	1,023	327	422	25,948	.21	.18
The year	5,342	260	1,234	893,248	7.12	.53

Estimated monthly discharge of Kern River at First Point of Measurement—Cont'd.

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Depth in inches.	Second-feet per square mile.
1898.						
January	400	311	363	22,320	0.17	0.15
February	923	316	434	24,103	.20	.19
March	485	304	388	23,857	.20	.17
April	1,342	371	710	42,247	.33	.30
May	980	560	735	45,193	.36	.31
June	686	394	551	32,786	.26	.23
July	416	127	244	15,003	.12	.10
August	142	86	120	7,378	.06	.05
September	294	80	116	6,902	.06	.05
October	232	127	160	9,838	.08	.07
November	188	136	166	9,877	.08	.07
December	314	147	199	12,236	.09	.08
The year	1,342	80	348	251,743	2.01	.15
1899.						
January	361	182	263	16,172	.13	.11
February	365	258	302	16,772	.14	.13
March	4,932	247	590	36,278	.29	.25
April	1,167	593	893	53,138	.43	.38
May	1,302	576	835	51,342	.41	.36
June	2,230	809	1,331	79,200	.63	.57
July	894	229	489	30,057	.24	.21
August	240	99	156	9,592	.08	.07
September	117	89	105	6,257	.05	.04
October	229	86	160	9,838	.08	.07
November	385	183	221	13,151	.10	.09
December	781	182	277	17,032	1.36	1.18
The year	4,932	86	468	338,829	3.94	.29
1900.						
January	1,048	266	362	22,259	.17	.15
February	329	238	280	15,550	.12	.12
March	502	307	413	25,394	.21	.18
April	592	387	472	28,086	.22	.20
May	1,969	449	1,111	68,312	.54	.47
June	1,878	841	1,283	76,344	.61	.55
July	850	202	392	24,103	.20	.17
August	217	101	144	8,854	.07	.06
September	270	106	166	9,878	.08	.07
October	186	137	160	9,838	.08	.07
November	1,339	161	349	20,767	.17	.15
December	445	288	373	22,934	.18	.16
The year	1,969	101	459	332,319	2.65	.20

Thirteen-year mean of the discharge of Kern River, as compiled from the foregoing records of the State engineering department and the United States Geological Survey.

Season and year.	Discharge.	
	Sec.-ft.	*Acre-feet.*
1878–1879	514	371,350
1879–1880	1,169	850,361
1880–1881	1,263	915,751
1881–1882	655	476,114
1882–1883	638	464,252
1883–1884	2,422	1,756,481
1894	737	533,252
1895	1,413	1,023,058
1896	854	619,630
1897	1,234	893,248
1898	348	251,743
1899	468	338,829
1900	459	332,319
Thirteen-year mean	936	678,953

Estimated daily discharge of Kern River for 1900.

Day.	July.		August.		September.		October.	
	First Point of Measurement.	Just below Tobias Creek.	First Point of Measurement.	Just below Tobias Creek.	First Point of Measurement.	Just below Tobias Creek.	First Point of Measurement.	Just below Tobias Creek.
	Sec.-ft.	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*	*Sec.-ft.*
1			209.08	334.00	108.31	212.80	144.95	204.32
2			190.64	338.00	115.71	310.40	142.44	205.20
3			188.25	306.20	131.89	308.00	141.92	208.16
4			193.78	252.90	147.24	274.28	147.92	204.12
5			195.49	244.38	190.01	256.00	146.64	202.80
6			188.78	234.82	159.17	253.20	154.68	202.80
7			178.86	230.62	156.86	246.40	164.04	202.40
8			169.11	230.00	241.22	244.00	164.77	200.80
9			178.32	228.66	221.09	244.00	157.39	201.20
10			171.89	228.66	212.66	234.82	153.45	202.14
11			159.38	226.14	188.13	232.06	153.30	201.80
12			161.24	226.50	175.33	232.58	151.08	201.66
13			157.67	226.00	174.77	230.44	152.02	202.00
14			149.18	224.34	170.70	222.60	156.04	201.20
15			140.79	222.34	170.66	220.30	158.50	201.20
16			130.41	222.34	165.97	220.00	156.19	200.40
17			122.57	213.30	157.06	213.76		
18			116.84	205.80	155.60	214.90		
19			116.75	201.50	151.98	211.14		
20			120.21	198.44	146.16	210.84		
21	274.25	352.58	120.16	195.36	138.63	211.00		
22	269.00	344.80	120.38	194.30	139.29	206.58		
23	274.43	340.30	121.81	192.90	142.05	206.60		
24	282.59	336.20	114.32	195.64	144.14	207.32		
25	250.55	327.72	110.85	195.00	139.79	208.90		
26	229.73	318.50	109.43	193.40	141.31	208.40		
27	224.64	308.18	110.70	194.08	153.44	207.54		
28	216.80	208.20	107.63	186.00	155.78	205.86		
29	212.69	291.34	102.99	187.20	151.31	205.32		
30	219.59	285.40	106.31	181.00	147.22	207.10		
31	222.49	282.06	103.18	178.40				
Mean			144.10	222.00	166.45	228.91		

Miscellaneous discharge measurements of Kern River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Elevation.	Discharge.
				Feet.	*Sec.-ft.*
1898.					
July 10	North Fork of Kern River.	"A" channel, above junction with South Fork.	F. H. Olmsted		17.00
Do	do	"B" channel	do		199.00
Do	do	"C" channel	do		107.00
Do	do	"D" channel	do		8.00
Do	South Fork of Kern River.	700 feet above junction with North Fork.	do		13.00
July	North Fork of Kern River.	At mouth	do		330.00
Do	South Fork of Kern River.	At engineers' old camp.	do		18.00
Do	do	Sec. 6, T. 22 S., R. 36 E	do		10.00
Do	do	Menache Meadows	do		5.30
Aug. 29	Kern River	First Point of Measurement.	do		115.60
1899.					
Sept. 2	do	do	do		99.22
1900.					
June 19	Basin Creek	Rankin's ranch, Walkers Basin.	do		1.32
June 20	South Fork of Kern River.	700 feet above junction.	do		14.18
Do	North Fork of Kern River.	Hooper's mill bridge	do		1,333.17
June 21	Bull Run Creek	Near mouth	do		2.30
June 22	Tobias Creek	do	do		2.92
Do	Ant Creek	At mouth	do	3,200	.18
Do	Salmon Creek	do	do		3.45
Do	Corral Creek	Near mouth	do		.32
June 23	South Needles Creek	At Needles Peak	do	4,550	5.82

Miscellaneous discharge measurements of Kern River and its tributaries—Cont'd.

Date.	Stream.	Locality.	Hydrographer.	Elevation.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
June 23	Clark Creek	Dry Meadows	F. H. Olmsted		5.19
Do	Jackson Creek	do	do		5.74
Do	Wade Creek	do	do		5.07
June 24	North Needles Creek	At Needles Peak	do		4.26
Do	Little Kern River	At junction with Kern River.	do		81.00
June 25	Tibbetts Creek	1 mile above mouth	do		2.87
Do	Harris Creek	At mouth	do		8.45
Do	Onemile Creek	1 mile below Kern Lake.	do		4.87
Do	North Fork of Kern River.	3,000 feet above junction with Little Kern River.	do		1,154.90
Do	Whitney Creek	At tunnel in divide	do		4.72
June 27	do	At lava bridge	do		39.11
Do	Creek south of Bald Mountain.		do	6,560	17.64
Do	North Fork of Kern River.	800 feet above Kern Lake.	do		939.60
June 28	South Fork of Kern River.	Menache Meadows	do		3.67
June 29	Tibbetts Creek	At 8,300 feet elevation	do		1.80
Do	North Fork of Brush Creek.	At 5,800 feet elevation	do		1.04
Do	Brush Creek	Above North Fork	do	5,600	8.22
June 30	North Fork of Kern River.	At new gaging station 4,000 feet above junction with South Fork.	do		825.25
Do	Salmon Creek	At Horse Meadows	do	7,700	4.05
July 2	South Fork of Kern River.	T. 25 S., R. 35 E.	do	2,920	11.05
Do	Powers ditch	Near head	do		2.38
July 3	Neils ditch	Isabella	do		1.96
Do	Hooper's mill ditch	At gaging station on Kern River.	do		7.31

Precipitation in Kern River Basin.

DAUNT.

[Observer, Mountain Home sawmill.]

Year.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1895–96					11.91	0.83	5.13	11.01	1.30	2.70	0.65	0.50
1896–97	0.00	0.60	0.40	1.95								

KERNVILLE.

[Observer, Stephen Barton, Isabella.]

Season.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Total.
1895–96					3.52	0.00	1.54	0.86	0.00	0.20	2.25	0.05	
1896–97	0.00	1.15	0.41	0.85	3.40	3.60	2.57	0.10	0.00	0.00	0.00	0.00	12.08
1897–98	0.15	0.38	0.00	1.28	0.58	0.99	0.58	T.	0.54	0.00	0.00	0.00	4.50
1898–99	0.04	0.00	0.00	0.33	1.95	0.19	1.89	0.28	0.25	0.45	0.00	0.00	5.38
1899–00	0.00	0.78	0.85	0.73	0.80	0.53	0.58	0.52	0.90	0.00	0.00	0.00	5.69
1900–01	0.79	0.10	5.09	0.00									

MOUNT BRECKENRIDGE.

[Observer, G. Otterman.]

Season.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1896–97			2.20	4.30	2.00	4.67	7.72	0.00	0.40	0.10	0.00	0.00
1897–98	0.00	0.00										
1898–99					1.67	0.94						

The rain gage at Daunt is at the Mountain Home sawmill, near the divide between Kern and Kaweah rivers, and at an elevation of 6,600 feet. Kernville is at an elevation of 2,600 feet, and Mount Breckenridge at an elevation of 6,750 feet.

From the diagram (fig. 6) showing synchronous discharge and temperature observations at First Point of Measurement for the months of April, May, and June, 1897—the particular season of the year when the factor of snow enters prominently into the regimen of the river—we gather, by connecting the peak points of flow and temperature, that ordinarily it requires about forty-seven hours for the stream waters to pass from the snow line, about 100 miles up the river, to

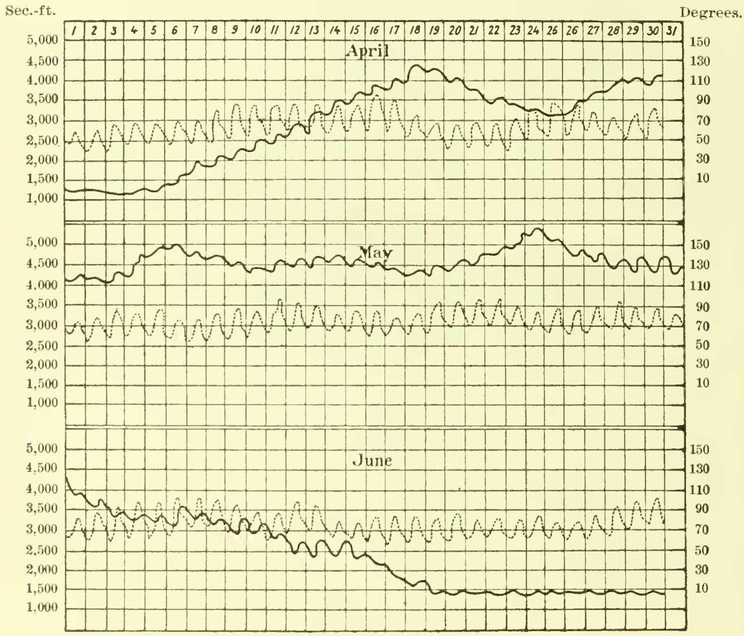


Fig. 6.—Diagram showing synchronous discharge and temperature observations at First Point of Measurement. Dotted lines are temperature curves; heavy lines are discharge curves.

First Point of Measurement. Under ordinary circumstances the melting of snow below the 7,000-foot contour would accompany a low gage, and the mean velocity would of course be relatively slow compared with a larger stream. The run-off of the heavy snows would start certainly not lower than the 8,500-foot contour, and invariably would be accompanied by a general breaking up of winter in the higher mountains, resulting in a high gage throughout the entire stream; from which we may infer that there is no marked difference in the time required for the passage of snow water between points as much as 30 miles apart to the canyon mouth. When the spring rise begins the mean velocity of the stream waters from the snow line, 60 miles up, to First Point of Measurement must be about 1.90 feet per second. When the snow line reaches the 8,500-foot contour, 100 miles upstream, the flood velocity is approximately 3.1 feet per second. This 1.2-foot-per-second play in velocity between high and low snow water gage in the stream represents the only data available for estimating, even crudely, the velocity-slope relations during the remainder of the year.

POWER POSSIBILITIES.

Elevations and distances have been and still are to a certain extent assumptions, and were it not that the data in some form is in demand, it certainly would be desirable to possess more basic information of Kern River Basin before undertaking to even outline the power possibilities of the stream. The flood period of the year is May and June; the minimum flow occurs in September and October. During extremely dry years the flow at First Point of Measurement drops to 80 second-feet, with a probable mean for the month in which this occurs of, say, 100 second-feet.

In the reach between First Point of Measurement and Isabella the stream has been affected by losses from evaporation and seepage and by increment in flow due to the South Fork, Clear Creek, and other small tributaries. The net result of these plus and minus factors is estimated to be a loss between these points of 122 second-feet. Calling this loss 120 second-feet, and taking the minimum flow at First Point of Measurement (80 second-feet), we have, as the least flow of the river at the latter place, 200 second-feet. Between Isabella and First Point of Measurement the fall is about 1,900 feet, giving more than 42,000 theoretical horsepower. At Isabella the mean flow for the full year 1899 was 588 second-feet, for 1898 it was 469 second-feet, and for 1897 it was 1,353 second-feet. Below Isabella the topography on the right bank is not unfavorable for the construction of a large canal, but the immense bowlders which cover the southern and western sides of the Greenhorn Mountains, and which are constantly in transit down the slopes, are not an economical factor in canal construction.

Of the total flow of Kern River at First Point of Measurement 80 per cent passes Funstons on the North Fork, or a point of equal elevation (7,050 feet) on the South Fork, which would be about midway between the lower end of Menache Meadows and the mouth of Fish Creek. The theoretical power possibilities of the stream below these places would be, then, about 500,000 horsepower, which, for a watershed of 2,349.3 square miles in an arid region, evidences the remarkable advantages of the stream, so far as grades and discharge are concerned, for electrical-power development.

The Kern River Company, which has been engaged for the last four years in securing rights of way (now approved by the Department of the Interior), and in arranging preliminaries incident to the construction of so large a plant, has as yet accomplished nothing in the way of actual building. A plan of the reservoir site of the company is shown in fig. 7. The diversion works of their power canal will be in

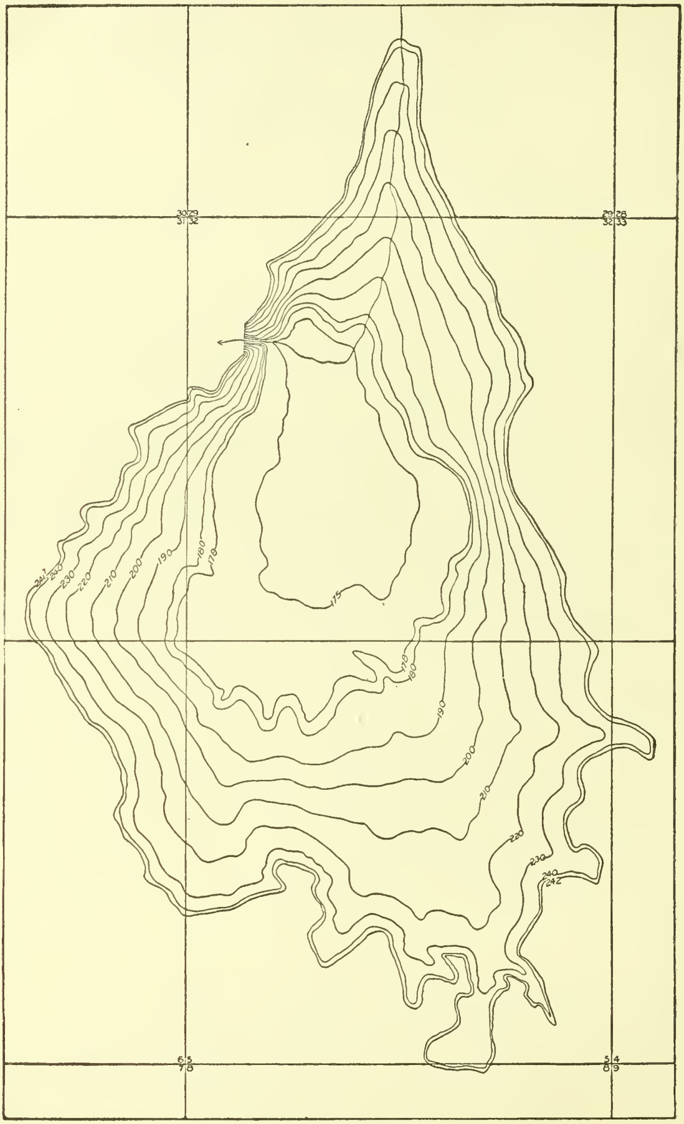


FIG. 7.—Plan of reservoir site of Kern River Company. Area, 1,121 acres; storage capacity, 42,000 acre-feet; height of dam, 72 feet.

the lower end of the town of Kernville, where the river forks. The West Fork is to be deepened so that during low stages this branch will gather all of the water of the river, and a low training wall, over which floods of the river will pass, will be built. The head gate will be 3,600 feet distant, on bed rock, and of solid masonry. The standard cross section of the canal for the first 10 miles is 25 feet wide at bottom, 7.5 feet depth of water, and on a grade of 1.058 feet to the mile. At a distance of 4½ miles from the head gate the only considerable structure on the line is encountered—the bridge over Kern River. After passing that point the cross section of the canal is reduced and the grades are increased accordingly.

The plans of the company are based upon a minimum flow of Kern River past their diversion works of 400 second-feet. This, considering the storage proposed on Salmon Creek, which is described further on, is a conservative estimate for any ordinary series of years, but could not have been maintained in 1899–1900, although in nine out of ten years it easily could be increased to 500 second-feet. The plans are based on an available head at the wheels of 230 feet during extreme high water, with an additional head of 40 feet when the river is at its minimum stage. Mr. H. Hawgood, the chief engineer of the Kern River Company, has designed, as a generating unit, a water wheel of 1,500 horsepower, with an alternator of 1,030 kilowatts capacity. There are to be nine of these units—eight for daily service and one to be held in reserve. For the additional 40-foot head possible during low water, there will be a 750-horsepower wheel and one 550-kilowatt alternator. On this basis, at no time would there be supplied to the wheels less than 11,200 horsepower. The impulse type of wheel would give an efficiency of 80 per cent, the alternators an efficiency of 95 per cent, and the step-up transformers an efficiency of 98 per cent, thus delivering to the line 8,342 horsepower. Assuming 5 per cent average loss in transmission (a larger allowance than the 80-mile carriage of the Southern California Power Company's current indicates is necessary), there would be delivered at the Los Angeles power house 7,825 horsepower, and with 98 per cent efficiency in the step-down transformers there would be 5,720 kilowatts for daily distribution in the city. This delivery could be increased 50 per cent for an hour to take care of the maximum load, which occurs between the hours of 5 and 6 p. m. Speaking conservatively, and having in mind the ruling rates elsewhere on the Coast, this 7,668 horsepower should command 1⅓ cents per horsepower per hour. During the irrigating season of 1900 the municipality of Los Angeles paid 2.2 cents per horsepower per hour for power registered between the hours of 11 p. m. and 5 p. m., and 4.4 cents per horsepower per hour for power registered between the hours of 5 p. m. and 11 p. m. In large plants working eighteen hours a day, and with good bituminous coal at $4 a ton, the cost of 1 horsepower per year would be $85, and in small plants, where the attendance factor is relatively greater, the cost would be $150. At the rate of 1⅓ cents the cost of a horsepower per year of three hundred and thirteen working days is $75. At this rate the gross annual revenue of the plant would be $768,000.

The company's estimate of the cost of construction of the plant and lines for the transmission of the current to Los Angeles is, approximately, \$1,333,000. Using direct-connected motor and centrifugal pumps, with 30 feet depth of wheel pit and 20 feet additional lift, and assuming the duty of water to be 8 acres per miners' inch, 1.42 horsepower would irrigate 100 acres at the rate of, say, \$2.50 per acre per annum. This would be on the basis of a 50-foot lift and a rate of 2 cents per horsepower per hour for the current. The efficiency of pumping plants ranges from 20 to 68 per cent—frequently plants are condemned solely because of a lack of skillful assembling of the units.

Electric motive power possesses many advantages over either steam or gasoline plants for pumping water, and in actual cost of service it may be questioned whether it is not to be compared with many well-managed canal systems of the State. The Kern Land Company has twenty-five pumping plants in operation near Bakersfield, each delivering from 1,400 to 2,000 gallons a minute. These plants each consist of four wells in a line, sunk to a depth of 80 to 130 feet through strata of alluvial loam, clay, and water-bearing sand. The wells are cased with galvanized iron, 13 inches in diameter, No. 16 gage, perforated with vertical slits opened one-sixteenth of an inch. It was the practice of Mr. Lewis A. Hicks, the engineer in charge of this work, to land the casing in clay, and to perforate for all sand below a depth of 30 feet. Surface water was generally encountered at about 15 feet. In each plant the four wells are 6 feet apart on centers, and by experiment it was found that the flow from the four was generally a little more than double that from one. The total lift for most of these plants was about 35 feet.

After many experiments to determine the pump best suited to these conditions, a centrifugal pump, connected directly to the motor and working on a vertical rod, all thoroughly bolted to steel framework, was found to give the greatest efficiency and the least trouble in operation—one attendant looks after ten plants, and there have been months when the plants were in operation 98 per cent of the time. The farmers under the Kern Land Company's water supply are taxed 75 cents per acre-foot for irrigating water from these electrically driven pumping plants, and as the land requires 2 acre-feet annual irrigation the expense is \$1.50 per acre per year. It is not probable that the rate of 1½ cents per horsepower per hour could be maintained in Antelope Valley or farther south in San Fernando Valley for irregular demand, but there is no good reason why a 2-cent rate could not be maintained by any of the Kern River companies.

The 68 per cent efficiency obtained in many of the Kern Land Company's plants deserves more than passing notice. In electrically driven pumping plants 55 per cent efficiency (reckoned from the meter consumption to the foot-pounds raised) is very good, but when this is raised to 68 per cent, the method employed to obtain this result merits a detailed description. The following is quoted from one of Mr. Hicks's reports:

The pumps are of the Pit type, provided with 10-inch outlet, automatic balance, heavy shaft, and runners of special curvature adapted to the speed and height of lift, and a delivery of 5 to 6 cubic feet per second. The bearings are provided with sight-feed oil cups, and the feed on the upper bearing is upward against the water with which the stuffing-gland chamber is filled. The chamber is provided with a gage glass to enable the attendant to note any leak through the packing. The pump is bolted to cast-iron pedestal set on a wooden base, and the steel angles which support the motor are attached to the same pedestal. The assembling of the pumps and frame was accomplished in the shops, and the completed unit was hauled to its destination and lowered into place on the floor of the pit, only requiring to be guyed to a perpendicular position in the anchor frame to be ready to receive the motor. The adjustment of the thrust of the pump can be altered so as to carry the entire weight of the motor and shafting or such portion of it as may be desirable. It has been found preferable to separate them with 100 to 200 pounds down thrust, as there is a tendency to bow out the shaft between bearings if it is thrown into compression with resulting vibration. The motor is provided with adjusting screws, so that its position in vertical or horizontal planes can be easily changed with a hand wrench. The pump, motor, and frame constitute a self-contained unit, so that any settlement of foundation does not

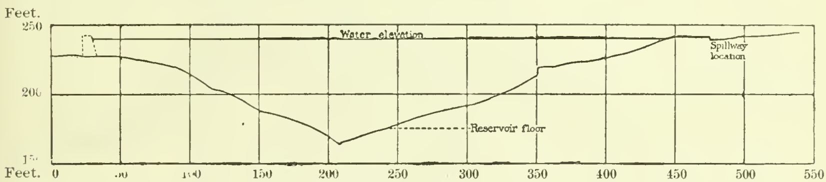


FIG. 8.—Cross section of proposed dam site of Kern River Company on Salmon Creek.

alter the relative position of either machine, and can be quickly rectified, should it occur, by guying the frame back to a vertical position. The motors used for this installation are the ordinary type of 30-horsepower inductive motor, equipped with special end shields to adapt them for vertical use. The oiling is accomplished by means of centrifugal force, which is utilized to lift the oil from the inside periphery of a revolving cup to the top of the bearings, whence it returns to the oil cups through oil grooves along the shaft. The motors are wound for a potential of 550 volts, and as the transformers at these points can be connected up to 605 volts, the effective heating overload is greatly reduced.

The Kern River Company's transmission line from the power station at the mouth of Clear Creek to Los Angeles would be 105 miles long, map measurement, and 108 miles when the vertical departures are considered. The line begins at an elevation of 2,450 feet, and its southern terminal at Los Angeles is 350 feet above the sea. A number of mountain ranges would be crossed, but a large proportion of the line would be over good ground, and it is believed that the highest elevation reached (6,500 feet, at Tehachapi) will offer no serious obstacles to a daily inspection of the pole line.

A reservoir on Salmon Creek, a tributary of Kern River, is planned by the Kern River Company for the storage of 47,000 acre-feet of water. About 20,000 acres can be made tributary to this intake, and it is hoped that with this catchment basin and the precipitation from an elevation of 7,700 feet on this divide the reservoir will supplement the flow of Kern River to 400 second-feet during the particular season of any year when the normal flow is below that figure. Fig. 8 is a cross section of the dam site on Salmon Creek. It is in a

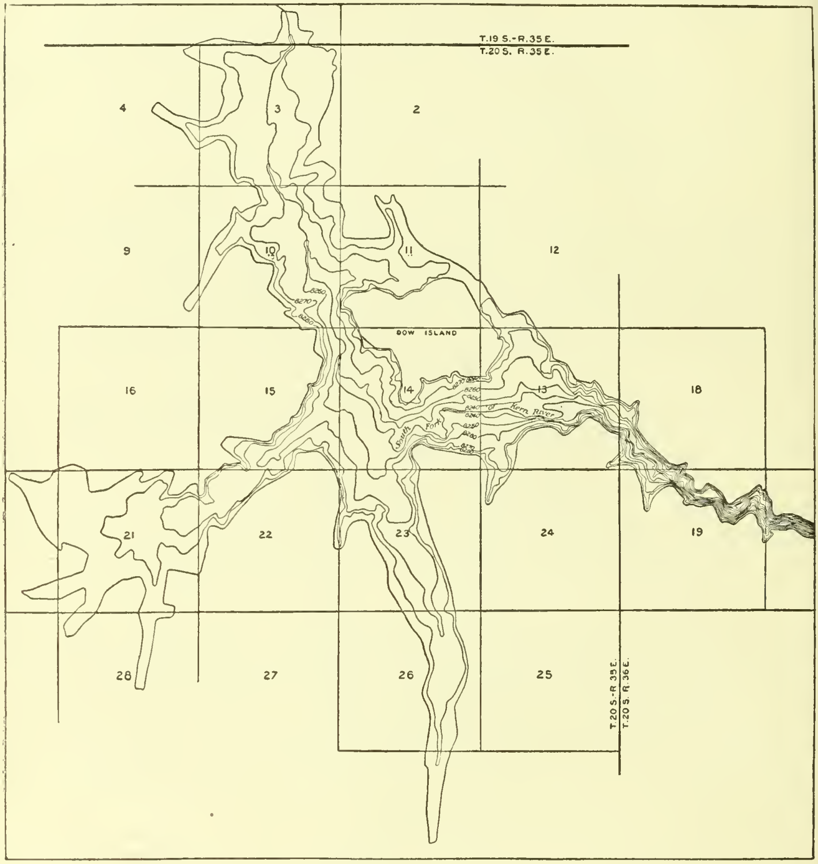


FIG. 9.—Plan of reservoir site of Kern-Rand Electric Power Company. Area, 3,562 acres; storage capacity, 63,722 acre-feet; height of dam, 65 feet above stream bed.

granite canyon, with clean bed rock on bottom and sides. The width at the bottom is 125 feet between walls; the top width at the 75-foot level would be 390 feet. A rock-fill dam is estimated to require 26,000 cubic yards of material and to cost $80,000.[1]

The utilization of the higher reaches of Kern River for power purposes will certainly be accomplished in time, but for the present,

[1] Reservoirs for Irrigation, Water Power, and Domestic Water Supply, by J. D. Schuyler.

and with the disinclination of electrical engineers to recommend the transmission of power to distances greater than 100 miles, it is doubtful whether the market outside of Los Angeles will warrant the outlay; and the latter city is so far away from the upper river as

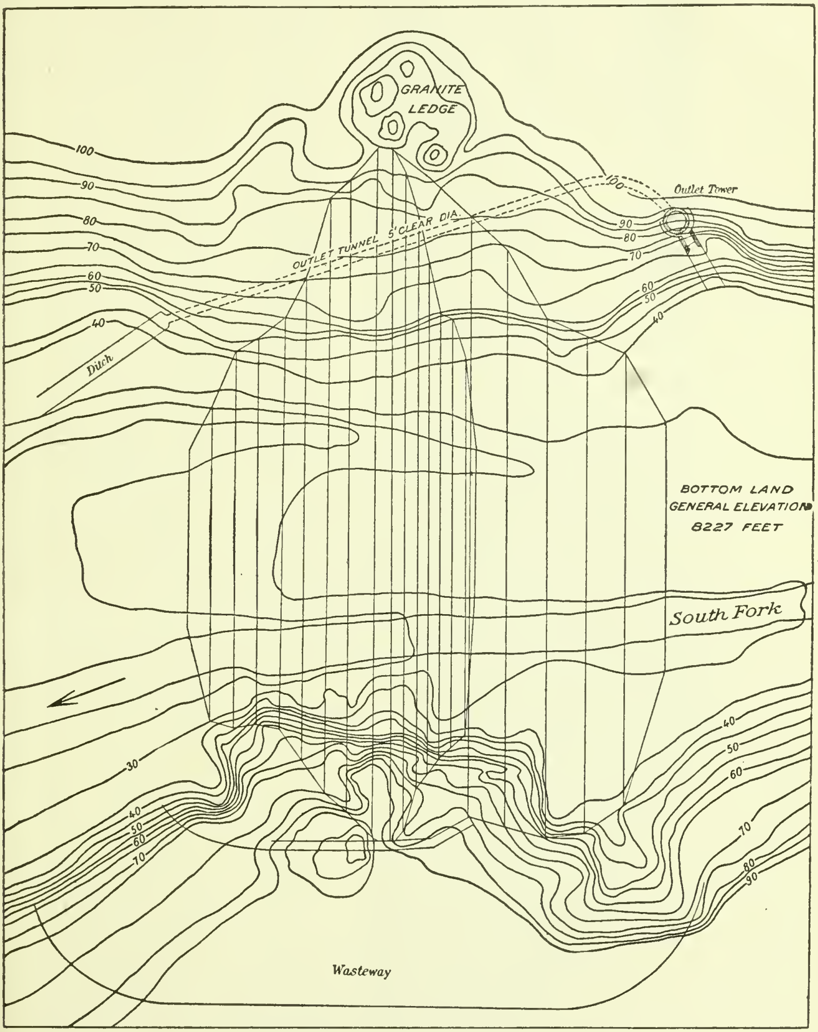


FIG. 10.—Plan of dam site of Kern-Rand Electric Power Company.

to preclude, for the present at least, supplying it with power from that source.

The Kern-Rand Electric Power Company, of Los Angeles, purposes to construct a rock-fill dam on the South Fork of Kern River, at Menache Meadows, and an initial power station near the upper end of South Fork Valley, about 35 miles farther down the stream. At some recent geological time Menache Meadows must have been an immense mountain lake. A dam 65 feet high would throw the water back 6 miles from the canyon mouth, in two arms 6 miles apart. A dam of that height would store 63,700 acre-feet of water at a mean depth of 18 feet. There is no question that in an ordinary year the drainage area tributary to the South Fork and above the Meadows (165 square miles) would furnish ample storage water for this reservoir, although it is probable that in a season like that of 1899–1900 there would be a shortage. There is no reliable data for determining the minimum precipitation in Menache Meadows, for generally the snows lie so deep over the mountains surrounding the basin as to make it impenetrable during at least the colder half of the year.

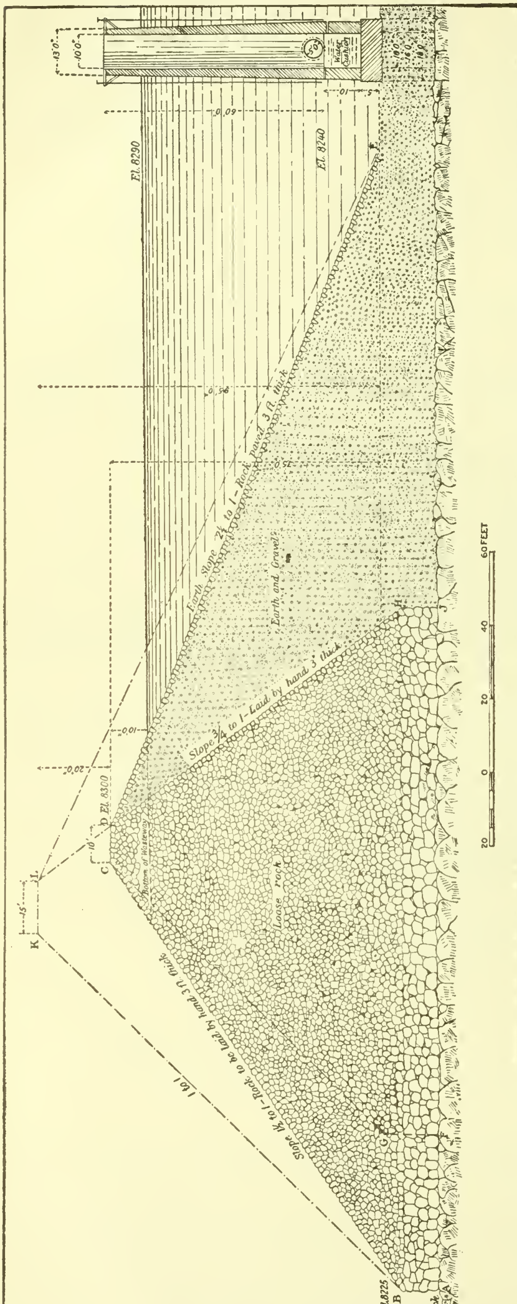


FIG. 11.—Sectional elevation of dam proposed by the Kern-Rand Electric Power Company. For dam 75 feet high above bed rock, build on lines *F*, *G*, *C*, *D*, and *E*. If it is desired to increase capacity of reservoir in future, build on lines *A*, *B*, *C*, *D*, and *E*. Dam built on lines *B*, *K*, *L*, and *E* would nearly treble the capacity of the reservoir.

Capacity of Menache Meadows reservoir site.

Height above base of dam.	Surface area.	Capacity.
Feet.	*Acres.*	*Acre-feet.*
10	22	110
20	146	954
30	812	4,563
40	1,865	18,827
50	2,599	40,732
60	3,254	69,885
70	3,814	105,236
80	4,420	146,419
100	5,830	248,852

Fig. 9 is a plan of the reservoir site of the Kern-Rand Electric Power Company in Menache Meadows, fig. 10 is a plan of the dam site, and figs. 11, 12, and 13 are details of the dam proposed. The material at the dam site is apparently hard granite, overlain with earth, sand, and gravel. The dam site is at an elevation of 8,200 feet above the sea, and consequently snow and frost prevail there during the winter months. There is no wagon road to the dam site, and the cost of making one would add very materially to the cost of the dam. The drainage area tributary to this reservoir being all above an elevation of 8,200 feet, naturally has the greater part of its precipitation in the form of snow. This makes the run-off an uncertain quantity, and leaves the proper height for the dam a difficult question to decide.

Taking all of these considerations into account, the engineers of the company were led to select a loose rock-fill dam faced with earth as the most economical and serviceable for the locality. On account of the possible action of frost, flatter slopes were given the rock faces than are absolutely necessary to make the dam heavy enough to resist the water pressure. So far as possible, the material found in the immediate vicinity of the dam will be used in its construction, and the outlet, gates, and connections have been designed so that all of their parts can easily be transported on mules over a steep mountain trail. The crest of the dam was fixed at 65 feet above the natural surface of the ground at the dam site. This height can, however, be increased to 95 feet, if it is found that a larger reservoir capacity could be supplied, at a proportionate increase in cost. It is proposed to excavate all of the rock required in the construction of the dam on the north side, forming a suitable wasteway in the solid rock, capable of discharging a stream of water 100 feet wide and 9 feet deep at a velocity of 6 feet per second—a volume of 5,400 cubic feet per second. As each foot rise of water over the bottom of the wasteway represents about 5,000 acre-feet, 9 feet rise of water in the wasteway would increase the volume in the reservoir to 45,000 acre-feet. This, in addition to the water running through the wasteway and outlet, would make more than 50,000 acre-feet, which, if it all came in twenty-four hours, would represent a run-off of about 5½ inches. It is believed that a wasteway of this size would make the dam absolutely safe against any possibility of the water ever flowing over the top. The capacity of the reservoir with a dam 65 feet high, as now

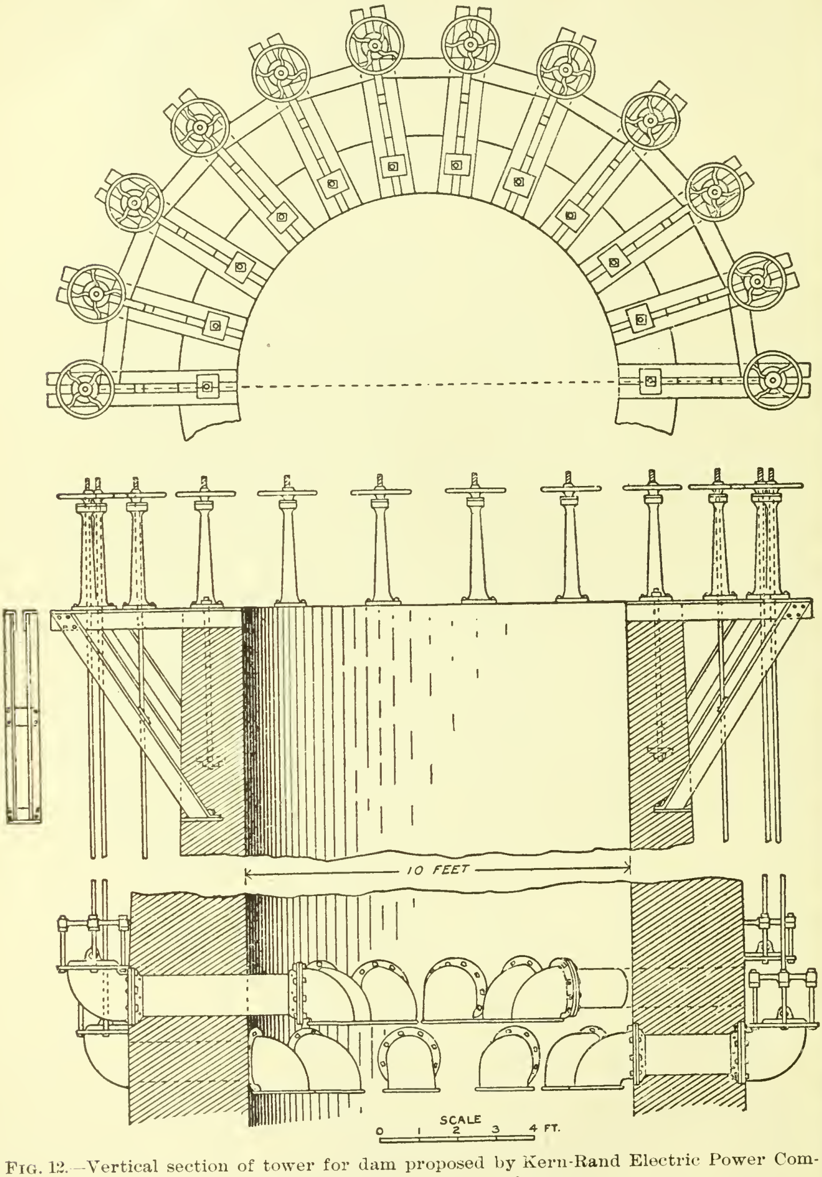


FIG. 12.—Vertical section of tower for dam proposed by Kern-Rand Electric Power Company, showing arrangement of gates.

proposed, would be 63,700 acre-feet; and if the dam were raised hereafter to a height of 85 feet the capacity of the reservoir would be nearly trebled.

It is proposed to take the water from the reservoir by means of a tunnel through the solid rock on the south side of the dam. The masonry or concrete tower (see figs. 11, 12, and 13) is designed as an inlet to this tunnel and to accommodate the placing of the gates in

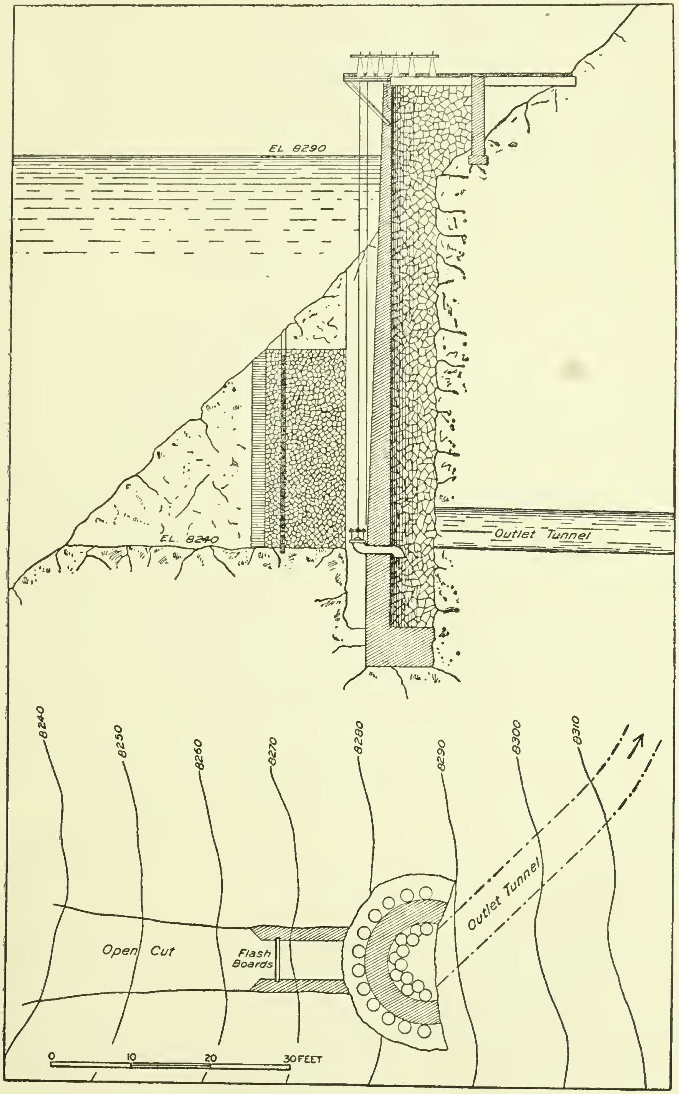


FIG. 13.—Sectional elevation and plan of gate tower for dam proposed by Kern-Rand Electric Power Company.

the most simple and economical manner. The gates are so simple and so easily opened and closed that it has not been considered necessary to provide for their repair under a full head of water in the reservoir. Fig. 12, however, shows a simple and economical way of shutting off the water after it has fallen to an elevation of 8,260 feet, or 35 feet above the base of the dam. This would prevent the necessity of emptying the reservoir for the purpose of making repairs to the gates.

Following are the estimates for three sizes of the dam proposed:

Estimate of cost of a 75-foot dam with slopes 1 to 1 and ¾ to 1.

Loose rock, 73,000 cubic yards; or 43,800 cubic yards solid at $1.50	$65,700.00
Earth, 55,870 cubic yards at $0.25	13,967.50
Extra labor on 5,000 cubic yards laid by hand, at $1	5,000.00
Tunnel, 350 feet at $12	4,200.00
Tower, gates, and connections	15,000.00
Guide walls, etc., at wasteway	15,000.00
	118,867.50
Engineering and contingencies, 10 per cent	11,886.75
Total	130,754.25

Estimate of cost of 75-foot dam with slopes 1½ to 1 and ¾ to 1.

Loose rock, 91,000 cubic yards; or 54,600 cubic yards solid at $1.50	$81,900.00
Earth, 55,870 cubic yards at $0.25	13,967.50
Extra labor on 6,000 cubic yards laid by hand, at $1	6,000.00
Tunnel, 350 feet at $12	4,200.00
Tower, gates, and connections	15,000.00
Guide walls, etc., at wasteway	15,000.00
	136,067.50
Engineering and contingencies, 10 per cent	13,606.75
Total	149,674.25

Estimate of cost of 95-foot dam with slopes 1 to 1 and ¾ to 1.

Loose rock, 110,000 cubic yards; or 66,000 cubic yards solid at $1.50	$99,000
Earth, 70,000 cubic yards at $0.25	17,500
Extra labor on 7,000 cubic yards, at $1	7,000
Tunnel, 350 feet at $12	4,200
Tower, gates, and connections, with bridge to tower	17,000
Guide walls, etc., at wasteway	20,000
	164,700
Engineering and contingencies, 10 per cent	16,470
Total	181,170

The foregoing estimates are based on the supposition that the rock will be hard enough to stand vertically around the tower and that the tunnel will not need lining.

The transmission line from the power plant in sec. 14, T. 25 S., R.

35 E., M. D. M., to Randsburg, 43 miles distant, would be over as fine a country for a pole line as can well be found—easy slopes, virtually unimproved and without tree growth. With very few exceptions a wagon could be driven, without road work, along the transmission line from the power plant to Randsburg. The highest elevation reached on the pole line would be at Walkers Pass, 5,320 feet above sea level, and at that point the snow lasts only a few days and would never interfere with the regular patrol of the line.

The following is an approximate estimate of the cost of generating and transmitting electric current from the South Fork power house, for a delivery in Randsburg of 900 horsepower, with conduit and pole-line capacity for 450 additional horsepower:

Estimate of cost of generating and transmitting electric current from South Fork power house to Randsburg.

Diversion in bed rock and 100 feet of rock channel	$4,000
Regulating gate	1,000
Riveted-steel pipe, 8,000 feet of 30-inch, gage No. 12, at $2.70	21,600
Pipe work in canyon, 8,000 feet	10,000
Flume, 3,500 feet at $3	10,500
Tunnel, 1,300 feet at $10	13,000
Canal in earth, 3,000 feet, with concrete lining	6,750
Canal in rock, 1,594 feet at $1.50 per foot run	2,391
Siphon, 1,000 feet at $3	3,000
Penstock, 4,000 feet at $4	16,000
Water wheels	6,000
Power houses, two, fireproof	6,000
Wire for transmitting current, 900 horsepower, delivered 43 miles	13,000
Telephone	2,000
Line poles (43 miles, 40 to the mile), and placing same	20,000
Electric machinery	30,000
Distribution of current at Randsburg	5,000
	170,241
Contingencies, 15 per cent	24,536
Total	195,777

A landslide has blocked the canyon and created a lake of about 40 acres area on the North Fork of Kern River just below the mouth of Whitney Creek and above the mouth of the Little Kern. This lake, known as Kern Lake, the California State engineering department, in its investigations of the Kern River drainage basin, has considered as a possible reservoir site. At the lower end of the lake the cliffs tower almost vertically above it to heights ranging from 2,000 to 3,000 feet, and estimates have been made for the blasting of large fragments into the dam site, forming a loose rock-fill dam. The capacity of the reservoir at the 220-foot level would be 46,000 acre-feet. The State engineering department considered the possibility of paving the mass of rock thus thrown down to a uniform surface and covering it with asphalt. The width of the canyon at the site is only 100 feet at the bottom and 400 feet at a height of 230 feet above the stream bed. There would be no question about the ability of the drainage basin to fill the reservoir annually, and if it is possible to construct such a dam at this place the site probably would be of value for replenishing the late summer flow for power and irrigation.

RECONNAISSANCE OF YUBA RIVER, CALIFORNIA.

By Marsden Manson.

WATERSHED.

Yuba River is a tributary of Feather River, which it enters at Marysville, 30 miles above its mouth. It drains about 1,357 square miles of the western slope of the Sierra Nevada, comprising portions of Sierra, Nevada, Plumas, and Yuba counties. The extreme length of the watershed is about 60 miles, the extreme width 36 miles. In addition to the length given there are about 11 miles of channel in the valley between the foothills and Feather River. In size Yuba River is fourth in the Sacramento Valley. Its extreme low-water discharge is about 360 cubic feet per second,[1] its mean winter discharge 1,500 cubic feet per second, and its flood discharge 26,000 cubic feet per second.[2] For the lower 10 miles of its course in the foothills the river is greatly clogged with débris from hydraulic-mining camps (estimated at many million cubic yards), and is between levees which have been raised from year to year to meet the overflow caused by the filling up of the area between them. The channel of the river in the lower foothills has been filled with cobbles and gravel to a depth of more than 100 feet. (See Pl. IV, *B*.) From the foothills to the mouth of the river at Marysville the channel is over a surface of gravel, sand, and clay, recently built up from the mines above. The channels are irregular and change from winter to winter and sometimes during the summer. It is therefore impracticable to establish low-water gaging stations which would serve for more than one summer and fall and which would be suitable for winter or flood-stage gagings.

[1] This is not as small as the natural discharge would be. The large mining companies—the South Yuba Canal Company, the North Bloomfield Gravel and Mining Company, the Milton Excelsior Water and Mining Company, the Eureka Lake and Yuba Canal Company, and others—store large volumes of water during the winter and spring months for use during periods of low water in the late summer and the early autumn.

[2] Extreme flood discharge estimated by Mr. Hubert Vischer, Asst. Engr., U. S. Engrs., at 125,000 cubic feet per second. H. R. Doc. No. 431, Fifty-sixth Congress, second session, p. 12.

The changes in the bottom and in the position of the channel are so great that the gagings at the flood stages of the river would be unsatisfactory, and if undertaken from boats would be highly dangerous, if not impossible.

The drainage basin is subdivided into five small basins, namely, North Fork, with a drainage area of 491.6 square miles; Middle Fork, with a drainage area of 218 square miles; South Fork, with a drainage area of 360 square miles; Deer Creek, with a drainage area of 89.6 square miles; and Dry Creek, with a drainage area of 105.5 square miles. In addition to these an area of 92.5 square miles drains into the main stream above the 100-foot contour. Dry Creek joins Yuba River from the north just as it leaves the foothills. The other streams unite in the mountains. The forks are perennial in flow, but the

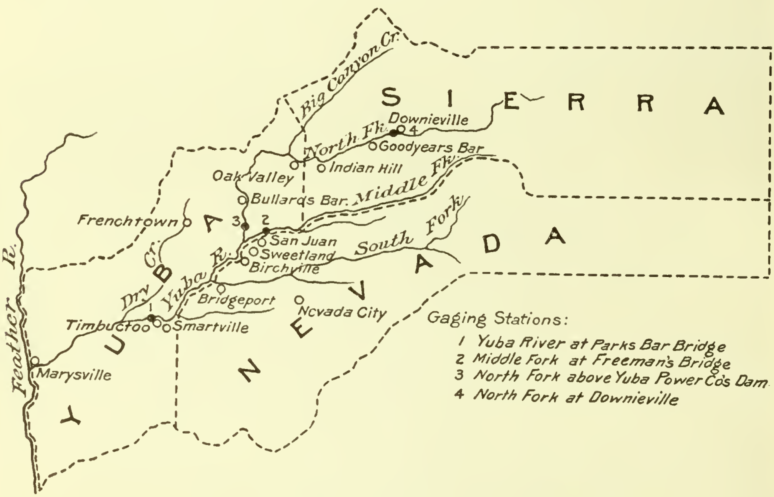
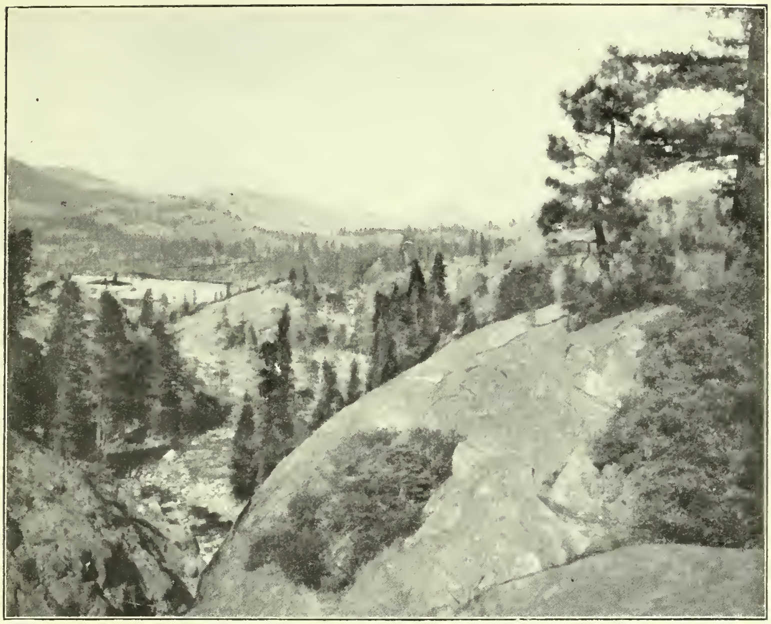


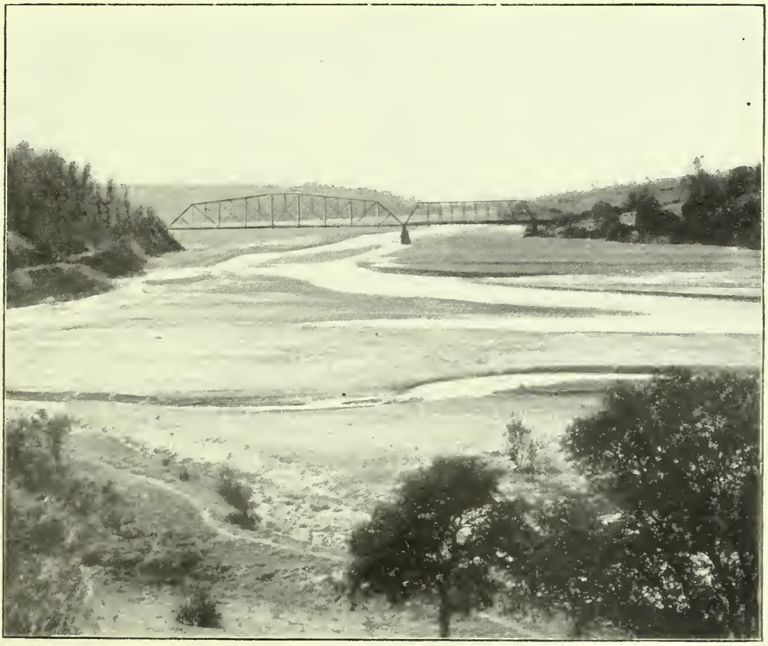
FIG. 14.—Map of Yuba River, showing location of gaging stations.

discharge of the two creeks mentioned (Deer and Dry) becomes insignificant in the late summer and early autumn.

As they merge into the valley the Sierra foothills have an elevation of about 100 feet above tide. The watershed rises gently, in rounded and broken mountains, to the crest of the Sierra, which at the headwaters of the Yuba is at a mean elevation of about 8,200 feet, with peaks rising to a height of 9,100 feet. From Mount Lincoln—a peak common to the watersheds of Yuba, American, and Truckee rivers—to a point about 2½ miles northeast of Mount Webber, the summit of the Sierra divides the watershed of Yuba River from that of Truckee River, which discharges into Humboldt Basin. Farther north from Mount Webber there is a secondary crest which divides the watersheds of Yuba and Feather rivers, the watershed of the latter stream reaching farther east, to a less elevated divide in which the passes are lower than those of the easterly crest.



A. HEAD OF SOUTH FORK OF YUBA RIVER AND LAKE SPAULDING.



B. YUBA RIVER IN THE FOOTHILLS.

TOPOGRAPHY.

The western and lower portions of the drainage area are composed of slates and kindred rock, very much eroded and merging into the gravel and alluvial deposits of the great valley of California. The upper portions of the basin are composed principally of lavas and granites, all deeply eroded, particularly the lavas. Some idea of the magnitude of the erosion may be obtained when it is considered that it has required at least 4,000 (possibly 6,000) cubic miles of denuded materials to fill the great valley of California to its present level, and that most of this has come from the Sierra Nevada.

A stratum of serpentine traverses the watershed of Yuba River in a direction generally parallel with the crest of the Sierra. It is intersected by the North Fork at Goodyears Bar, by the Middle Fork near Moores Flat, and by the South Fork just east of Washington, and leaves the drainage basin of the Yuba, passing near Towle Station on the Central Pacific Railroad. This stratum is generally softer and more easily eroded than adjoining strata, and through it the canyons of the various forks are upon lighter grades than immediately above and below, and they generally are wider. This softer material also controls the loci of longer and more deeply eroded tributaries, which afford approaches to the main canyons for roads and trails. This stratum is of further interest because it is the dividing line between the auriferous strata in the watershed. To the west of it the mines are more extensive, the occurrences of gold-bearing rock to the east being irregular and difficult to trace.

The middle and upper portions of the watersheds of the three forks differ materially. The North Fork rises in lavas which vary much in composition and hardness, but which generally afford a deep soil for timber and shrub growth. The Middle Fork rises in similar lavas and in granite. The mean elevation of the crest of the Sierra at the head of these forks is about 8,200 feet. The main and tributary streams fall rapidly, and their canyons head well up in the mountains. The sides of these canyons are covered with timber and brush, which, with the deep soil, retain the moisture and feed numerous perennial springs. (See Pl. V, *A*.) In the case of the North Fork this is particularly noticeable. The forests of its watershed make it a reliable and constant stream. The mean annual precipitation upon the watersheds of the North and Middle forks is about 54 inches. Warm rains on soft snow sometimes give a high flood run-off, but snow remains on the higher peaks until midsummer. Reservoir sites are not numerous; they will be mentioned later. The headwaters of the South Fork lie upon a broad granite surface, into which the streams have not cut deeply until the main stream reaches a point 16 miles from the summit, where it drops rapidly into a deeply eroded canyon. The eastern or upper edge of the drainage area has a mean elevation about the same as the other forks, but the 5,000-foot contour is about

20 miles to the westward. This broad surface has been denuded by glacial action, and the harder nature of the granite has not permitted a deep soil to form. The area is therefore less heavily timbered than the drainage areas of the other two forks, and its accessibility has caused it to suffer more severely from the ax of the lumberman. This topography gives a broader and more gently sloping surface than characterizes the headwaters of other Sierra Nevada streams. The surface is marked by nearly 100 glacial lakelets and valleys, affording many excellent reservoir sites which have been or are being utilized. This elevated watershed receives a mean annual precipitation of 60 inches, most of which is in the form of snow. The slow melting of the snow maintains the discharge of tributaries until June or July, which, with the natural and artificial reservoirs, makes the South Fork of the Yuba a highly valuable and reliable source of water supply.

NATURAL STORAGE OF WATER IN YUBA RIVER BASIN.

Precipitation upon the drainage basin of Yuba River is dependent upon the southerly or winter extension of the north temperate rain belt. During the summer months the more northerly position of this belt leaves California in the comparatively rainless region between the north temperate and equatorial rain belts. The rains and snows, therefore, fall from October to April, with little or no rainfall of moment from May to September, so that during the latter months the streams depend upon either natural or artificial storage. Natural storage is by snow and the slow run-off of water retained in afforested and brush-covered soils. On the South Fork artificial storage has reached a very effective stage. The precipitation ranges from 20 inches at Marysville, in the valley, to 70 inches at the summit of the Sierra.[1]

Snow storage of water is depended on during the latter part of April and into July, the run-off until June being superabundant for all purposes, but in July it begins to fall below the necessities of dependent industries, and it remains below until the autumnal rains occur. Snow storage has been made a subject of extended observation by Mr. W. F. Englebright, chief engineer of the South Yuba Canal Company, through whose courtesy the writer has been enabled to prepare a most instructive diagram of the accumulation, depth, and rate of melting of snow at Lake Fordyce (fig. 15). This lake has an elevation of 6,500 feet above tide level, and is in a region over which the annual precipitation in rain and melted snow is 70 inches. Snow begins to accumulate late in November, and reaches its maximum depth in packed snow in March. During the winter months the lower readings on the gage rod following higher readings generally indicate a packing of the snow.

[1] These figures are taken from a map prepared, under the writer's direction, for the California Water and Forest Association, showing the drainage areas, the mean annual rainfall, and the distribution of forests throughout the State.

A. CANYON OF MIDDLE FORK OF YUBA RIVER.

B. MIDDLE FORK OF YUBA RIVER NEAR FREEMAN'S CROSSING.

Melting begins in March and continues quite regularly until the middle of June or early July. Short storms during April and May cause offsets in the curve, which resumes a parallel line. A series of cold and heavy storms in April, 1896, caused the snow to last until July 5, while the clear, warm spring of 1897 caused it to disappear on June 7.

During the latter half of April, by means of daily reports by telephone, Mr. Englebright is enabled, through diagrams upon a larger scale, to approximate to within a few days the duration of the snow supply and the beginning of the draft on the reservoirs. Data and studies of this kind are very valuable, and suggest the importance of stations above the snow line as a means of determining the volume of snow storage available at different seasons and the ratio between the volume stored by snow and that stored by reservoirs. The discharge of the streams is maintained by snow during the spring and for half of

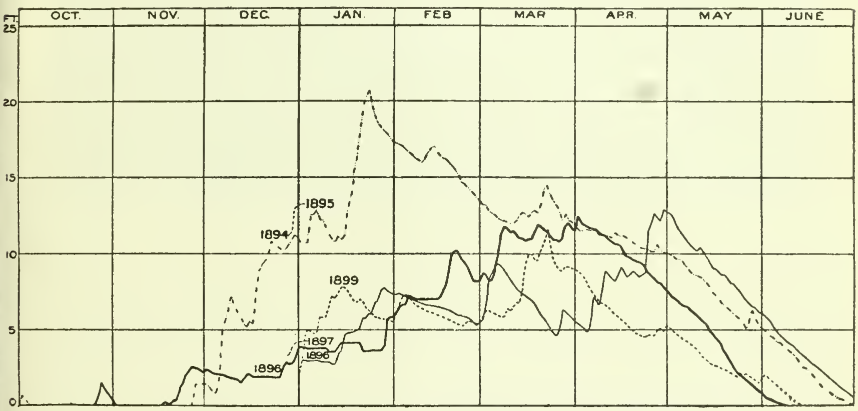


FIG. 15.—Diagram showing depth of snow at Lake Fordyce.

the summer months, and the volume and rate of the discharge can be foretold with reasonable accuracy by daily readings of gages properly located.

ARTIFICIAL STORAGE POSSIBILITIES.

The natural facilities for the storage of storm waters are particularly favorable in the upper third of the drainage basin of the South Fork. The demands for large volumes of water under high pressure to operate the mines in the middle and lower portions of that drainage basin and those on Bear and American rivers were met by the construction of large and expensive canals and storage reservoirs. Just above the great bend north of the head of Bear River and at the head of the steep canyon of the South Fork is a broad, flat, glacial valley which has been converted into a lake by the construction of a stone dam. This lake, known as Lake Spaulding and shown in Pl. IV, *A*, has a capacity of 270,000,000 cubic feet, and is the lower and controlling reservoir of a series embracing the available storage and supply above. This supply is derived from about 120 square miles, upon which the mean annual precipitation in rain and melted snow is about 5 feet. The following is a list of the storage reservoirs:

Storage reservoirs in Yuba River Basin.

Name of reservoir.	Elevation.	Area.	Capacity.	Cost of dam.
	Feet.	*Acres.*	*Gallons.*	
Meadow	7,515	300	1,275,000,000	$75.000
Stirling	7,200	100	340,000,000	20,000
White Rock	7,000	80	225,000,000	5,000
Peak Lakes (three)	6,900	150	1,275,000,000	(*a*)
Fordyce	6,500	474	5,950,000,000	300,000
Lost River	7,000	(*a*)	85,000,000	(*a*)
Fallcreek Lakes (six)	7,000	171	1,020,000,000	(*a*)
Spaulding	4,846	215	2,125,000,000	50,000
Summit Lake	6,800	400	1,938,816,000	30,000
Bear Valley	4,400	60	145,411,200	8,000
Total		1,950	*b* 14,409,227,200	478,000

a Records lost. *b* 1,921,230,293 cubic feet.

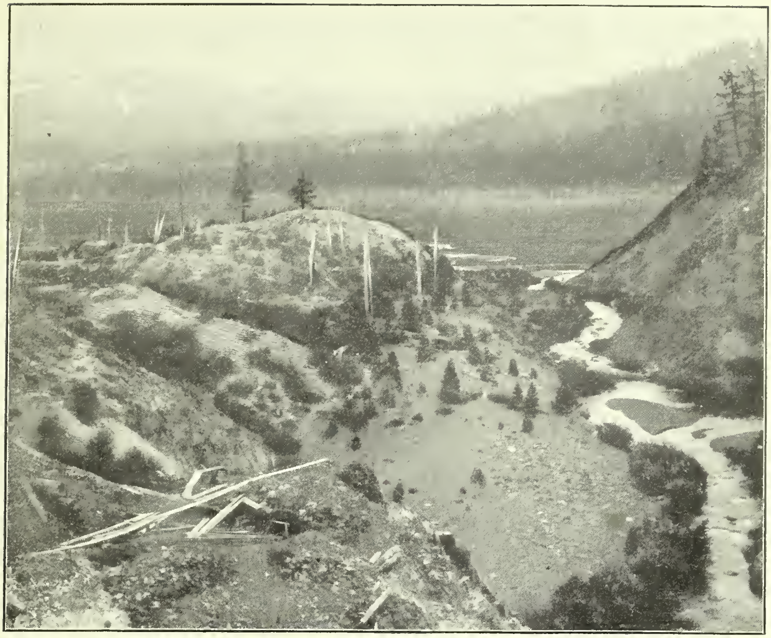
The aggregate area of these reservoirs is 3.05 square miles, and they are filled to an average depth of 22.5 feet, thus giving storage for about 12 per cent of the mean annual precipitation upon the tributary area, the remainder going to waste and to swell the floods which devastate the valley. It is possible, by raising the dams and enlarging the canals, to utilize a considerable additional portion of the precipitation. The conditions favorable to the conservation of water on the upper third of the drainage basin of the South Fork are far greater than in the lower two-thirds of that basin or in the basin of the other forks.

On the upper portion of Canyon Creek, a tributary of the South Fork, the Eureka Lake and Yuba Canal Company and the North Bloomfield Gravel and Mining Company have the following storage reservoirs:

Storage reservoirs on upper portion of Canyon Creek.

Name of reservoir.	Area.	Height.	Top length.	Barometric elevation.	Catchment area.	Capacity.	Cost.
	Acres.	*Feet.*	*Feet.*	*Feet.*	*Acres.*	*Cubic feet.*	
Bowman	500.0	100.0	425	5,450	12,093	930,000,000	$151,521
Sawmill Flat	80.6	39.2		5,780		2,000,000	Total amount expended on these dams and reservoirs, $246,000.
Shot Gun Lake	26.2	10.0		6,410		3,423,816	
Island Lake	48.8	12.8		6,690		23,027,558	
Middle Lake	11.2	12.0		6,460		2,395,800	
Crooked Lake	10.3	3.0		6,510		1,600,000	
Round Lake	8.1	11.0		6,590		2,906,630	
Fall Creek				6,690			
Jackson Lake	20.0	5.0		5,410		15,000,000	
Faucherie Lake	90.0	21.0	550	6,060	3,262	58,000,000	8,000
Weaver Lake	83.5	21.8				150,000,000	
Eureka Lake	337.3	68.2	250	6,480	3,170	661,000,000	35,000
Total						1,849,354,804	

The drainage area tributary to these reservoirs is 28.4 square miles, and it receives a total precipitation during an average year of



A ENGLISH RESERVOIR ON MIDDLE FORK OF YUBA RIVER.

B SMALL DAM OF ENGLISH RESERVOIR.

4,589,481,600 cubic feet, 1,849,354,804 cubic feet of which is stored, or between one-third and one-half of the mean annual precipitation.

On the Middle Fork there are no reservoirs storing water at the present time. The only site of any importance is that of the Ruyard or English reservoir (see Pl. VI), which has not been in use since the failure of the dam in June, 1883. This site has a capacity of 650,000,000 cubic feet. Weaver Lake is on the watershed of the Middle Yuba, but its catchment area is not large enough to fill it, so it is supplied from the Eureka Lake and Yuba Canal Company's ditch from Canyon Creek, a tributary of the South Yuba, and is included in the foregoing list. At Milton there is a reservoir site with an estimated capacity of 28,000,000 cubic feet. The total storage capacity on the Middle Yuba may be considered to be 678,000,000 cubic feet.

On the North Fork are the dam and headworks of the Browns Valley Irrigation District. (See Pl. VII.) The dam is a well-built crib structure, about 167 feet long on the crest, with a maximum height of 37 feet. The head gates are in concrete. For several miles above the dam the river bed is covered with gravel, sand, and cobbles on a grade slightly less than that of the original stream. This is a feature common to dams upon streams carrying mining débris. The dam thus acts as a retaining wall as well as an overflow weir. Leakage through the débris and dam is slight. The head gates open into a flume 5 feet by 7 feet, on a grade of 13 feet to the mile, and built to carry 300 second-feet of water. The greater portion of the water diverted is used to develop power at the Colgate and Browns Valley power stations of the Bay Counties Power Company, lessees of the Browns Valley Irrigation District rights. This power is transmitted to Marysville, Oroville, Wheatland, Nevada City, Grass Valley, and Sacramento. These plants are synchronized with one on the South Yuba, about 7 miles distant.

On the North Fork there are the following small lakes, which might be developed to an aggregate storage capacity of 500,000,000 cubic feet:

Reservoir sites on the North Fork.

Name of lake.	Area.
	Acres.
Upper Sardine	38.0
Lower Sardine	40.0
Young American	9.0
Volcano	2.5
Packer	7.0
Saxonia	2.5
Deer	5.0
Upper Salmon	30.0
Lower Salmon	50.0
Hawley	11.0
Spencer Lakes (two)	16.0
Sundry small lakes (five, not named)	27.0
Deadmans	3.0
Total	241.0

Assuming that artificial storage on the North Fork and the Middle Fork could be developed to a capacity equal to that above the Lake Spaulding dam, there would then be in service an area of 6.8 square miles with water at an average depth of 26.4 feet, or 5,692,000,000 cubic feet. The mean annual precipitation in the drainage basin of Yuba River is 170,829,000,000 cubic feet. The total ultimate artificial storage is less than 3.3 per cent of this precipitation, and could hardly be recognized in a gaging of the total run-off. Moreover, in the storage of water for industrial purposes the uncertainty of the character of the seasonal rainfall makes it prudent and desirable to permit the reservoirs to fill during the earlier rains, and not leave the husbanding of a supply to possible succeeding rains. Hence it generally happens that when the heavy storms of the late winter and spring months occur the reservoirs are full and the flood wave passes down without being diminished by the reservoirs. This is also true to a limited extent of regions above the snow line, where the unmelted snow constitutes a reservoir of far greater capacity than ordinarily is obtained by building dams. It happens that when late warm rains or rapid melting of the snows occurs the reservoirs are already full, and consequently do not diminish the flood volume.

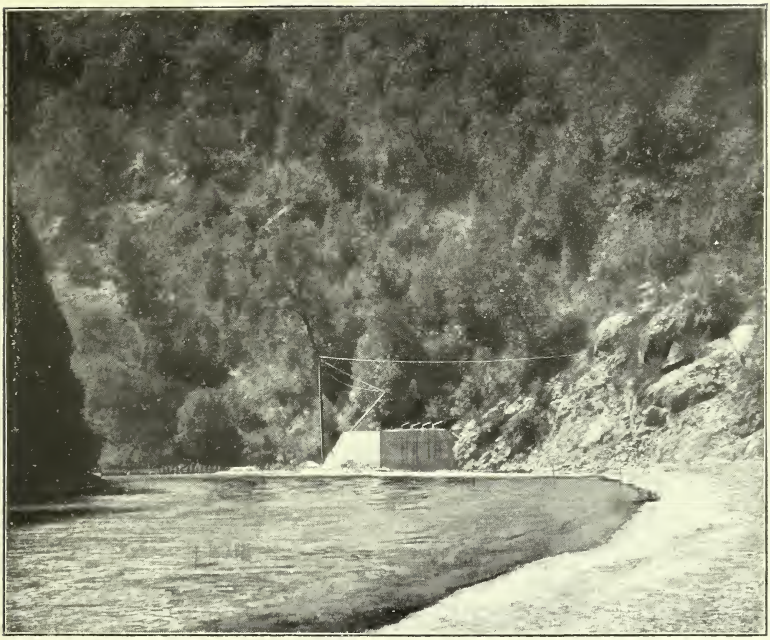
It would appear, therefore, that however useful artificial reservoirs are for domestic and industrial purposes they can not be relied upon, except under unusual conditions, to decrease the heights of late winter and spring floods, and we must look elsewhere for a solution of that problem.

COMPARISON OF LOW-WATER DISCHARGE FROM A TIMBERED AREA WITH THAT FROM A COMPARATIVELY TREELESS AREA.

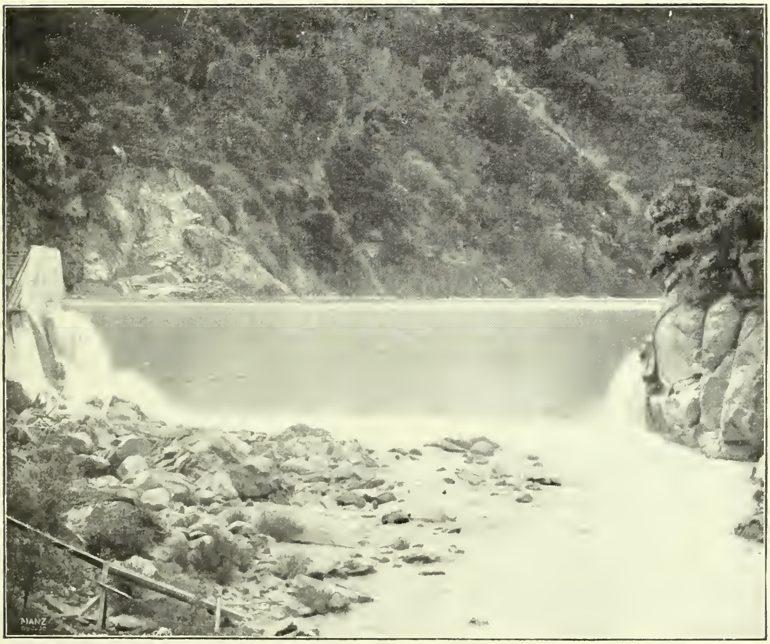
On the south fork of the North Fork is a watershed area of 139 square miles, which was gaged on September 19, 1900, after three successive seasons of deficient rainfall, and gave a minimum run-off of 113 second-feet, or 0.8 second-foot per square mile. This area is well covered with timber and brush, and in 120 days it gives a minimum run-off of 1,441,152,000 cubic feet.

The drainage basin of the North Fork is more heavily timbered than the basins of the other forks, and consequently it has a deeper soil, and, although only one-tenth of the total drainage area, it furnishes 75 per cent of the low-water flow of the entire drainage basin above Parks Bar.

On the south fork above Lake Spaulding there is a watershed of 120 square miles, which has heretofore been described as comparatively barren of timber, the timbered areas which once existed having been denuded. (See Pl. VIII, *A*.) The run-off of this area is practically nothing for 120 days of the year, due to the absence of forests and



A. BROWNS VALLEY IRRIGATION DISTRICT DAM FROM ABOVE



B. BROWNS VALLEY IRRIGATION DISTRICT DAM FROM BELOW

brush. If this area were afforested and gave a minimum run-off of 0.8 second-foot per square mile, the discharge would be 100 second-feet, equivalent to an effective storage capacity of 1,036,800,000 cubic feet. This minimum low-water discharge of 100 second-feet for 120 days is equivalent to more than half the storage capacity of all the reservoirs above Lake Spaulding dam, which aggregate 1,375,000,000 cubic feet. As the basis of this estimate is extreme low-water discharge, it may be assumed that by afforesting the watershed this costly and extensive system of reservoirs could safely be drawn upon for double their present capacity. As what is true of portions of the watershed is true of the watershed as a whole, aggregating as it does 1,357 square miles, the value of afforesting the area becomes apparent.

It appears to the writer that the solution of the problem of storage of flood waters is not the retention of a small percentage of the storm waters behind dams, but the application of storage over the entire watershed by the systematic protection and extension of forest-covered and brush-covered areas.

DISCHARGE MEASUREMENTS OF YUBA RIVER AND ITS TRIBUTARIES.

The accompanying tables of low-water discharge measurements of Yuba River and its forks are based upon observations and gagings

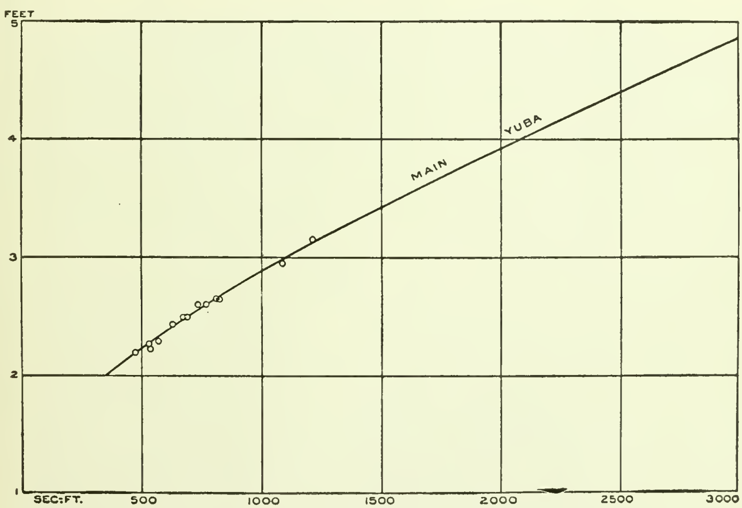


FIG. 16.—Curve showing relation of gage height to discharge of Yuba River.

made by Mr. H. D. H. Connick, under the direction of the writer, during the months of June, July, August, September, and October, 1900. The precipitation during the wet season preceding these gagings was about two-thirds to three-fourths of the mean annual rainfall. The precipitation during the two preceding wet seasons was still further below the normal.

The location of the gaging stations is shown on the map, fig. 14, page 40. The gagings were made with a large Price meter furnished by the United States Geological Survey. The usual method was pursued, namely, the cross section was divided into subsections of 5 feet each, and the velocities were observed for three minutes for each foot of depth. The integral of the discharges thus ascertained divided by the total cross-sectional area determined the mean velocity. The volumes thus determined for various stages were platted as a curve of discharge, using gage heights and discharges as ordinates, from which curve intermediate discharges were estimated to fill out the tables. For discharge curves, see figs. 16, 17, and 18.

Daily discharge of Yuba River at Parks Bar Bridge during the month of July, 1900.

Day.	Gage height. 6 a.m.	Gage height. 6 p.m.	Mean gage height.	Area of section.	Mean velocity.	Discharge.	
	Feet.	*Feet.*	*Feet.*	*Square feet.*	*Feet per second.*	*Second-feet.*	*Cubic feet per 24 hours.*
1	2.90	2.80	2.85			970.0	83,808,000
2	2.90	2.90	2.90			1,020.0	88,128,000
3	3.10	2.90	3.00			1,100.0	95,040,000
4	2.80	2.70	2.75			890.0	76,896,000
5	2.70	2.80	2.75			890.0	76,896,000
6	2.60	2.70	2.65			810.0	69,984,000
7	2.60	2.80	2.70			850.0	73,440,000
8	2.70	2.70	2.70			850.0	73,440,000
9	2.60	2.60	2.60			775.0	66,960,000
10	2.60	2.60	2.60			775.0	66,960,000
11	2.70	2.60	2.65	181.5	4.52	820.8	70,917,120
12	2.70	2.50	2.60	180.0	4.50	810.5	70,027,200
13	2.70	2.50	2.60	171.1	4.39	773.8	66,856,320
14	2.60	2.50	2.55			730.0	63,072,000
15	2.60	2.50	2.55			730.0	63,072,000
16	2.50	2.40	2.45			660.0	57,024,000
17	2.50	2.40	2.45			660.0	57,024,000
18	2.50	2.40	2.45			660.0	57,024,000
19	2.40	2.40	2.40			620.0	53,568,000
20	2.40	2.30	2.35			580.0	50,112,000
21	2.40	2.30	2.35			580.0	50,112,000
22	2.40	2.40	2.40	163.6	3.80	622.2	53,758,080
23	2.40	2.50	2.45	173.3	3.91	685.8	59,253,120
24	2.50	2.40	2.45	169.3	3.97	672.7	57,025,280
25	2.50	2.40	2.45			660.0	57,024,000
26	2.40	2.30	2.35			580.0	50,112,000
27	2.40	2.30	2.35			580.0	50,112,000
28	2.40	2.30	2.35			580.0	50,112,000
29	2.40	2.30	2.35			580.0	50,112,000
30	2.30	2.40	2.35			580.0	50,112,000
31	2.30	2.30	2.30			545.0	47,088,000
Total							1,955,059,000

A. SECOND-GROWTH FOREST DESTROYED BY FIRE.

B. HEAD OF SOUTH YUBA CANAL COMPANY'S DITCH.

Daily discharge of Yuba River at Parks Bar Bridge during the month of August, 1900.

Day.	Gage height.		Mean gage height.	Area of section.	Mean velocity.	Discharge.	
	6 a. m.	6 p. m.					
	Feet.	*Feet.*	*Feet.*	*Sq. ft.*	*Ft. per sec.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1	2.30	2.30	2.30			545.0	47,088,000
2	2.20	2.30	2.25			510.0	44,064,000
3	2.20	2.20	2.20			480.0	41,472,000
4	2.20	2.20	2.20			480.0	41,472,000
5	2.20	2.20	2.20			480.0	41,472,000
6	2.20	2.20	2.20			480.0	41,472,000
7	2.30	2.20	2.25	151.8	3.54	536.8	46,379,520
8	2.30	2.20	2.25	158.7	3.59	571.2	49,251,680
9	2.30	2.20	2.25			510.0	44,064,000
10	2.20	2.10	2.15			440.0	38,016,000
11	2.20	2.20	2.20			480.0	41,472,000
12	2.10	2.20	2.15			440.0	38,016,000
13	2.20	2.30	2.25			510.0	44,064,000
14	2.20	2.30	2.25	153.0	3.49	535.0	46,094,400
15	2.10	2.20	2.15			440.0	38,016,000
16	2.20	2.20	2.20			480.0	41,472,000
17	2.10	2.10	2.10			400.0	34,560,000
18	2.10	2.20	2.15			440.0	38,016,000
19	2.10	2.20	2.15			440.0	38,016,000
20	2.30	2.20	2.25			510.0	44,064,000
21	2.30	2.30	2.30			545.0	47,088,000
22	2.40	2.30	2.35			580.0	50,112,000
23	2.30	2.20	2.25			510.0	44,064,000
24	2.30	2.20	2.25			510.0	44,064,000
25	2.20	2.10	2.15			440.0	38,016,000
26	2.10	2.10	2.10			400.0	34,560,000
27	2.20	2.10	2.10			400.0	34,560,000
28	2.10	2.10	2.10			474.2	40,970,880
29	2.10	2.10	2.10			400.0	34,560,000
30	2.20	2.20	2.20			480.0	41,472,000
31	2.20	2.10	2.15			440.0	38,016,000
Total							1,286,151,520

Daily discharge of Yuba River at Parks Bar Bridge during the month of September, 1900.

Day.	Gage height.		Mean gage height.	Area of section.	Mean velocity.	Discharge.	
	6 a. m.	6 p. m.					
	Feet.	*Feet.*	*Feet.*	*Sq. ft.*	*Ft. per sec.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1	2.10	2.10	2.10			400.0	34,560,000
2	2.10	2.10	2.10			400.0	34,560,000
3	2.10	2.10	2.10			400.0	34,560,000
4	2.10	2.20	2.15			440.0	38,016,000
5	2.40	2.40	2.40			620.0	53,568,000
6	2.30	2.30	2.30			545.0	47,088,000
7	2.20	2.20	2.20			470.0	40,608,000
8	2.20	2.20	2.20			470.0	40,608,000
9	2.20	2.10	2.15			440.0	38,016,000
10	2.10	2.10	2.10			400.0	34,560,000
11	2.30	2.20	2.25			510.0	44,064,000
12	2.20	2.30	2.25			510.0	44,064,000
13	2.30	2.50	2.40			620.0	53,568,000
14	2.60	2.60	2.60	178.5	4.12	735.6	63,555,840
15	2.40	2.40	2.40			620.0	53,568,000
16	2.40	2.30	2.35			580.0	50,112,000
17	2.20	2.20	2.20			470.0	40,618,000
18	2.20	2.20	2.20			470.0	40,618,000
19	2.20	2.20	2.20			470.0	40,618,000
20	2.20	2.10	2.15			440.0	38,016,000
21	2.10	2.10	2.10			400.0	34,560,000
22	2.10	2.10	2.10			400.0	34,560,000
23	2.00	2.00	2.00			360.0	31,104,000
24	2.00	2.00	2.00			360.0	31,104,000
25	2.00	2.00	2.00			360.0	31,104,000
26	2.10	2.10	2.10			400.0	34,560,000
27	2.00	2.00	2.00			360.0	31,104,000
28	2.00	2.00	2.00			360.0	31,104,000
29	2.00	2.00	2.00			360.0	31,104,000
30	2.00	2.00	2.00			360.0	31,104,000
Total							1,158,249,840

Daily discharge of Yuba River at Parks Bar Bridge during the month of October, 1900.

Day.	Gage height.		Mean gage height.	Discharge.	
	6 a. m.	6 p. m.			
	Feet.	*Feet.*	*Feet.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1	2.00	2.00	2.00	360	31,104,000
2	2.00	2.00	2.00	360	31,104,000
3	2.80	3.40	3.10	1,200	103,680,000
4	3.20	4.90	4.05	2,140	184,896,000
5	4.60	4.60	4.60	2,720	235,008,000
6	4.20	4.00	4 10	2,200	190,080,000
7	3.70	3.60	3.65	1,730	149,472,000
8	3.50	3.50	3.50	1,595	137,808,000
9	3.50	3.50	3.50	1,595	137,808,000
10	3.50	3.40	3.45	1,540	133,056,000
11	3.40	3.40	3.40	1,480	127,872,000
12	3.60	3.40	3.50	1,595	137,808,000
13	3.40	3.40	3.40	1,480	127,872,000
Total					1,727,568,000

NOTE.—On the evening of October 4 gage No. 1 was washed out. All subsequent readings were made on gage No. 2. Equation: Gage No. 2+2.2=gage No. 1. Thus: 2.7+2.2=4.9, gage height.

Daily discharge of North Fork of Yuba River at Yuba Power Company's dam during the month of July, 1900.

Day.	Gage height.		Mean gage height.	Area of section.	Mean velocity.	Discharge.	
	6 a. m.	6 p. m.					
	Feet.	*Feet.*	*Feet.*	*Sq. ft.*	*Ft. per sec.*	*Sec.-ft.*	*Cu. ft. per 24 hrs*
1	2.07	2.07	2.07			630.0	54,432,000
2	2.06	2.06	2.06			625.0	54,000,000
3	2.05	2.05	2.05	203.1	2.98	606.0	52,358,400
4	2.05	2.00	2.03			610.0	52,704,000
5	2.00	2.00	2.00			595.0	51,408,000
6	1.95	2.00	1.98	196.4	2.88	566.8	48,971,520
7	2.00	2.00	2.00			595.0	51,408,000
8	1.95	1.95	1.95			560.0	48,384,000
9	1.90	1.85	1.88			520.0	44,928,000
10	1.85	1.80	1.83			490.0	42,336,000
11	1.80	1.80	1.80			470.0	40,608,000
12	1.75	1.75	1.75			440.0	38,016,000
13	1.75	1.75	1.75			440.0	38,016,000
14	1.75	1.75	1.75			440.0	38,016,000
15	1.75	1.75	1.75			440.0	38,016,000
16	1.75	1.75	1.75			440.0	38,016,000
17	1.70	1.70	1.70	160.3	2.73	437.7	37,817,280
18	1.70	1.70	1.70	157.0	2.66	418.7	36,175,680
19	1.70	1.70	1.70			410.0	35.424,000
20	1.65	1.65	1.65			380.0	32,832,000
21	1.65	1.65	1.65			380.0	32,832,000
22	1.65	1.70	1.68			400.0	34,560,000
23	1.70	1.70	1.70			410.0	35,424,000
24	1.70	1.65	1.68			400.0	34,560,000
25	1.65	1.65	1.65			380.0	32,832,000
26	1.65	1.65	1.65			380.0	32,832,000
27	1.65	1.65	1.65	158.5	2.31	366.1	31,631,040
28	1.60	1.60	1.60			350.0	30,240,000
29	1.60	1.60	1.60	159.2	2.33	371.4	32,088,960
30	1.60	1.60	1.60			350.0	30,240,000
31	1.60	1.60	1.60	159.1	2.28	363.9	31,440,960
Total							1,232,548,840

Daily discharge of North Fork of Yuba River at Yuba Power Company's dam during the month of August, 1900.

Day.	Gage height.		Mean gage height.	Area of section.	Mean velocity.	Discharge.	
	6 a.m.	6 p.m.					
	Feet.	*Feet.*	*Feet.*	*Sq. ft.*	*Ft. per sec.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1	1.60	1.60	1.60			350.0	30,240,000
2	1.55	1.55	1.55			320.0	27,648,000
3	1.55	1.55	1.55			320.0	27,648,000
4	1.55	1.55	1.55			320.0	27,648,000
5	1.55	1.55	1.55			320.0	27,648,000
6	1.55	1.55	1.55			320.0	27,648,000
7	1.55	1.55	1.55			320.0	27,648,000
8	1.55	1.55	1.55			320.0	27,648,000
9	1.55	1.55	1.55	155.4	2.11	328.4	28,373,760
10	1.55	1.55	1.55	153.0	2.10	321.7	27,794,880
11	1.55	1.55	1.55			320.0	27,648,000
12	1.55	1.55	1.55			320.0	27,648,000
13	1.55	1.55	1.55			320.0	27,648,000
14	1.55	1.55	1.55			320.0	27,648,000
15	1.55	1.55	1.55			320.0	27,648,000
16	1.55	1.55	1.55			320.0	27,648,000
17	1.55	1.55	1.55			320.0	27,648,000
18	1.55	1.55	1.55			320.0	27,648,000
19	1.50	1.50	1.50			300.0	25,920,000
20	1.50	1.50	1.50			300.0	25,920,000
21	1.50	1.50	1.50			300.0	25,920,000
22	1.50	1.50	1.50			300.0	25,920,000
23	1.50	1.50	1.50			300.0	25,920,000
24	1.50	1.50	1.50			300.0	25,920,000
25	1.50	1.50	1.50			300.0	25,920,000
26	1.50	1.50	1.50			300.0	25,920,000
27	1.49	1.49	1.49			295.0	25,488,000
28	1.49	1.48	1.49			295.0	25,488,000
29	1.48	1.48	1.48	145.8	1.93	282.1	24,373,440
30	1.47	1.47	1.47	142.7	1.99	284.6	24,589,440
31	1.47	1.47	1.47			280.0	24,192,000
Total							814,971,520

Daily discharge of North Fork of Yuba River at Yuba Power Company's dam during the month of September, 1900.

Day.	Gage height.		Mean gage height.	Discharge.	
	6 a.m.	6 p.m.			
	Feet.	*Feet.*	*Feet.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1	1.46	1.46	1.46	270	23,328,000
2	1.46	1.46	1.46	270	23,328,000
3	1.46	1.45	1.46	270	23,328,000
4	1.46	1.47	1.47	280	24,192,000
5	1.48	1.49	1.49	295	25,448,000
6	1.49	1.50	1.50	300	25,920,000
7	1.50	1.50	1.50	300	25,920,000
8	1.49	1.49	1.49	295	25,488,000
9	1.49	1.48	1.49	295	25,488,000
10	1.47	1.47	1.47	280	24,192,000
11	1.47	1.48	1.48	280	24,192,000
12	1.49	1.49	1.49	295	25,488,000
13	1.50	1.56	1.53	310	26,784,000
14	1.61	1.60	1.61	355	30,672,000
15	1.55	1.50	1.53	310	26,784,000
16	1.50	1.50	1.50	300	25,920,000
17	1.49	1.49	1.49	295	25,488,000
18	1.48	1.48	1.48	280	24,192,000
19	1.47	1.47	1.47	280	24,192,000
20	1.47	1.46	1.47	280	24,192,000
21	1.46	1.46	1.46	270	23,328,000
22	1.45	1.45	1.45	266	22,982,400
23	1.44	1.43	1.44	265	22,896,000
24	1.44	1.45	1.45	266	22,982,400
25	1.45	1.46	1.46	270	23,328,000
26	1.47	1.48	1.48	280	24,192,000
27	1.47	1.48	1.48	280	24,192,000
28	1.48	1.47	1.48	280	24,192,000
29	1.47	1.47	1.47	280	24,192,000
30	1.46	1.46			
Total					710,830,800

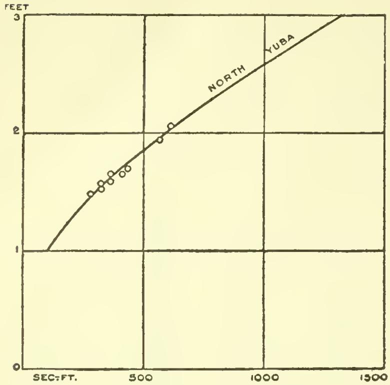


FIG. 17.—Curve showing relation of gage height to discharge of North Fork of Yuba River.

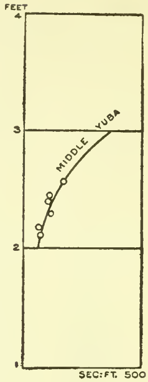


FIG. 18.—Curve showing relation of gage height to discharge of Middle Fork of Yuba River.

Daily discharge of North Fork of Yuba River at Yuba Power Company's dam during the month of October, 1900.

Day.	Gage height.		Mean gage height.	Discharge.	
	6 a. m.	6 p. m.			
	Feet.	*Feet.*	*Feet.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1	1.46	1.47	1.47	280	24,192,000
2	1.48	1.50	1.49	295	25,488,000
3	1.99	2.40	2.19	720	62,208,000
4	1.93	2.15	2.04	610	52,704,000
5	2.68	2.70	2.69	1,080	93,312,000
6	2.12	1.95	2.03	610	52,704,000
7	1.81	1.80	1.80	470	40,608,000
8	1.70	1.68	1.69	405	34,992,000
9	1.67	1.75	1.71	410	35,424,000
10	1.64	1.71	1.68	400	34,560,000
11	1.60	1.70	1.65	350	32,832,000
12	1.64	1.70	1.67	390	33,696,000
13	1.65	1.68	1.67	390	33,696,000
Total					556,416,000

Daily discharge of Middle Fork of Yuba River at Freeman's bridge during the month of July, 1900.

Day.	Gage height.		Mean gage height.	Area of section.	Mean velocity.	Discharge.	
	6 a. m.	6 p. m.					
	Feet.	*Feet.*	*Feet.*	*Sq. ft.*	*Ft. per sec.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1			2.40	63.0	3.03	190.8	16,485,120
2			2.38			189.0	15,329,600
3			2.35	59.9	3.00	179.9	15,543,360
4			2.33	58.1	3.18	184.9	15,975,360
5			2.40			190.0	16,416,000
6	2.45	2.60	2.53			150.0	12,960,000
7	2.60	2.60	2.60	62.6	2.58	161.7	13,970,880
8	2.60	2.45	2.53			150.0	12,960,000
9	2.45	2.45	2.45			130.0	11,232,000
10	2.45	2.40	2.43			125.0	10,810,000
11	2.40	2.40	2.40			120.0	10,368,000
12	2.40	2.40	2.40			120.0	10,368,000
13	2.30	2.30	2.30			100.0	8,640,000
14	2.30	2.30	2.30			100.0	8,640,000
15	2.30	2.30	2.30			100.0	8,640,000
16	2.30	2.40	2.35			110.0	9,504,000
17	2.30	2.40	2.35			110.0	9,504,000
18	2.30	2.35	2.33			108.0	9,331,200
19	2.45	2.40	2.43			125.0	10,810,000
20	2.35	2.35	2.35			110.0	9,504,000
21	2.35	2.40	2.38			119.0	10,281,600
22	2.35	2.40	2.38			119.0	10,281,600
23	2.35	2.45	2.40			120.0	10,368,000
24	2.40	2.35	2.38			119.0	10,281,600
25	2.35	2.40	2.38			119.0	10,281,600
26	2.35	2.35	2.35			110.0	9,504,000
27	2.35	2.40	2.38			119.0	10,281,600
28	2.35	2.34	2.35			110.0	9,504,000
29	2.30	2.35	2.33	49.6	2.20	109.2	9,434,880
30	2.25	2.30	2.28			90.0	7,776,000
31	2.20	2.20	2.20			80.0	6,912,000
Total							341,898,400

Daily discharge of Middle Fork of Yuba River at Freeman's bridge during the month of August, 1900.

Day.	Gage height.		Mean gage height.	Area of section.	Mean velocity.	Discharge.	
	6 a. m.	6 p. m.					
	Feet.	*Feet.*	*Feet.*	*Sq. ft.*	*Ft. per sec.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1	2.20	2.20	2.20			80.0	6,912,000
2	2.15	2.20	2.18			79.0	6,825,600
3	2.15	2.15	2.15			75.0	6,480,000
4	2.15	2.15	2.15			75.0	6,480,000
5	2.15	2.15	2.15			75.0	6,480,000
6	2.15	2.15	2.15			75.0	6,480,000
7	2.15	2.15	2.15			75.0	6,480,000
8	2.15	2.15	2.15			75.0	6,480,000
9	2.15	2.15	2.15			75.0	6,480,000
10	2.15	2.15	2.15			75.0	6,480,000
11	2.15	2.15	2.15	36.5	2.17	79.3	6,851,520
12	2.15	2.15	2.15	36.7	2.13	78.1	6,747,840
13	2.15	2.15	2.15			75.0	6,480,000
14	2.15	2.15	2.15			75.0	6,480,000
15	2.15	2.15	2.15			75.0	6,480,000
16	2.15	2.15	2.15			75.0	6,480,000
17	2.15	2.15	2.15			75.0	6,480,000
18	2.15	2.15	2.15			75.0	6,480,000
19	2.15	2.15	2.15			75.0	6,480,000
20	2.15	2.15	2.15			75.0	6,480,000
21	2.15	2.15	2.15			75.0	6,480,000
22	2.15	2.15	2.15			75.0	6,480,000
23	2.15	2.15	2.15			75.0	6,480,000
24	2.15	2.15	2.15			70.0	6,048,000
25	2.10	2.10	2.10			70.0	6,048,000
26	2.10	2.10	2.10			70.0	6,048,000
27	2.10	2.10	2.10			70.0	6,048,000
28	2.10	2.10	2.10			70.0	6,048,000
29	2.10	2.10	2.10	31.2	2.22	69.26	5,984,064
30	2.10	2.10	2.10	30.5	2.22	67.7	5,849,280
31	2.10	2.10	2.10				
Total							192,530,304

Daily discharge of Middle Fork of Yuba River at Freeman's bridge during the month of September, 1900.

Day.	Gage height.		Mean gage height.	Area of section.	Mean velocity.	Discharge.	
	6 a. m.	6 p. m.					
	Feet.	*Feet.*	*Feet.*	*Sq. ft.*	*Ft. per sec.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1	2.10	2.10	2.10			70.0	6,048,000
2	2.10	2.05	2.08			68.0	5,875,000
3	2.00	2.00	2.00			60.0	5,184,000
4	2.00	2.00	2.00			60.0	5,184,000
5	2.05	2.05	2.05			65.0	5,616,000
6	2.05	2.05	2.05				5,616,000
7	2.05	2.10	2.08			68.0	5,875,000
8	2.05	2.05	2.05			65.0	5,616,000
9	2.05	2.05	2.05			65.0	5,616,000
10	2.00	2.00	2.00			60.0	5,184,000
11	2.00	2.05	2.03			62.0	5,356,800
12	2.05	2.05	2.05			65.0	5,616,000
13	2.15	2.35	2.25			90.0	7,776,000
14	2.30	2.30	2.30			100.0	8,640,000
15	2.20	2.20	2.20			80.0	6,912,000
16	2.20	2.20	2.20			80.0	6,912,000
17	2.15	2.15	2.15			75.0	6,480,000
18	2.15	2.15	2.15	27.4	2.34	64.2	5,546,880
19	2.15	2.15	2.15			75.0	6,480,000
20	2.10	2.10	2.10			70.0	6,048,000
21	2.00	2.00	2.00			60.0	5,184,000
22	2.00	2.00	2.00			60.0	5,184,000
23	2.00	2.00	2.00			60.0	5,184,000
24	2.00	2.00	2.00			60.0	5,184,000
25	2.00	2.00	2.00			60.0	5,184,000
26	2.00	2.00	2.00			60.0	5,184,000
27	2.00	2.00	2.00			60.0	5,184,000
28	2.00	2.00	2.00			60.0	5,184,000
29	2.00	2.00	2.00			60.0	5,184,000
30	2.00	2.00	2.00			60.0	5,184,000
Total							173,421,680

Discharge of Middle Fork of Yuba River at Freeman's bridge during the month of October, 1900.

Day.	Gage height.		Mean gage height.	Discharge.	
	6 a. m.	6 p. m.			
	Feet.	*Feet.*	*Feet.*	*Sec.-ft.*	*Cu. ft. per 24 hrs.*
1	2.00	2.00	2.00	60	5,184,000
2	2.00	2.00	2.00	00	5,184,000
3	2.45	2.45	2.45	130	11,232,000
4	2.40	2.50	2.45	130	11,232,000
5	3.00	3.00	3.00	360	21,104,000
6	2.00	2.50	2.25	90	7,776,000
7	2.45	2.35	2.40	120	10,368,000
8	2.30	2.20	2.25	90	7,776,000
9	2.20	2.20	2.20	80	6,912,000
10	2.15	2.20	2.17	78	6,739,200
11	2.00	2.15	2.08	68	5,875,000
12	2.00	2.15	2.08	68	5,875,000
13	2.00	2.00	2.00	60	5,184,000
Total					110,441,200

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DEPARTMENT OF THE INTERIOR

WATER-SUPPLY

AND

IRRIGATION PAPERS

OF THE

UNITED STATES GEOLOGICAL SURVEY

No. 47

OPERATIONS AT RIVER STATIONS, 1900.—Part I

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 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; also 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; and "Results of stream measurements," by F. H. Newell. Illustrated by maps and diagrams.

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DEPARTMENT OF THE INTERIOR

WATER-SUPPLY

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UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

OPERATIONS AT RIVER STATIONS, 1900

A REPORT OF THE

DIVISION OF HYDROGRAPHY

OF THE

UNITED STATES GEOLOGICAL SURVEY

PART I

WASHINGTON
GOVERNMENT PRINTING OFFICE
1901

CONTENTS.

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
DIVISION OF HYDROGRAPHY,
Washington, D. C., March 1, 1901.

SIR: I have the honor to transmit herewith a manuscript giving the results of operations at various river stations in 1900, and request that it be published in the series of Water-Supply and Irrigation Papers. In order to comply with the law limiting these papers to 100 pages, it is necessary to divide the material. This has been done n a general geographic basis, following the precedent of Water-Supply Papers Nos. 35 to 39, relating to similar operations for the year 1899. In the first paper are introductory remarks and the data relating to New England and Eastern streams. The succeeding papers take up in order the rivers flowing into the Atlantic Ocean, then those tributary to the Ohio and Mississippi rivers, the Great Lakes, Missouri River and the Rio Grande, the interior basin, and finally those flowing into the Pacific Ocean, from north to south, ending with the data relating to the streams of southern California.

The general conclusions drawn from the operations at the river stations, together with diagrams, maps, and illustrations, are being prepared for publication in Part IV of the Twenty-second Annual Report, this being designed to be in form and substance similar to preceding volumes known as Part IV of the Eighteenth to the Twenty-first Annual Reports.

Very respectfully,

F. H. NEWELL,
Hydrographer in Charge.

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

OPERATIONS AT RIVER STATIONS, 1900.

PART I.

INTRODUCTION.

The following pages contain descriptions of the river stations maintained during 1900 by the United States Geological Survey, together with details of the average daily height of the water and results of measurements of discharge. The rating tables constructed from the latter and applicable in general for the calendar year will be given at the end of the publication. Similar facts have been printed for the year 1899 in Water-Supply Papers Nos. 35 to 39, inclusive, and a general description of the method of publication has been given on page 9 of Paper No. 35.

ACKNOWLEDGMENTS.

Most of the measurements herewith presented have been obtained through local hydrographers, a comparatively small part of the work having been conducted directly from the office of the Geological Survey at Washington. Acknowledgment is therefore due to these persons individually. Thanks should also be extended to individuals and corporations who have cooperated in various ways—by furnishing readings of the heights of water, by assisting in transportation, etc. The following list gives the names of the resident hydrographers or persons cooperating, arranged alphabetically by States:

California: J. B. Lippincott, civil engineer, Los Angeles.

Colorado: A. L. Fellows, civil engineer, Denver.

Georgia and Alabama: Prof. B. M. Hall, civil engineer, Atlanta; Prof. W. S. Yeates, State geologist, Atlanta; and Prof. Eugene A. Smith, State geologist, Tuscaloosa.

Idaho: N. S. Dils, civil engineer, Caldwell.

Kansas: W. G. Russell, Russell.

Maryland: Prof. W. B. Clark, State geologist, Baltimore.

Montana: Prof. Samuel Fortier, Bozeman; Prof. Fred D. Smith, Missoula.

Nebraska: Prof. O. V. P. Stout, State University, Lincoln, assisted by Adna Dobson and Glenn E. Smith.

Nevada: L. H. Taylor, civil engineer, Golconda.

New Mexico: P. E. Harroun, civil engineer, Albuquerque.

North and South Carolina: Prof. J. A. Holmes, State geologist, Chapel Hill, North Carolina, assisted by E. W. Myers.

Texas: Prof. Thomas U. Taylor, State University

Utah: Prof. George L. Swendsen, Logan.

Virginia and West Virginia: Prof. D. C. Humphreys, Washington and Lee University, Lexington, Virginia.

Washington: Sydney Arnold, civil engineer, North Yakima; William J. Ware, civil engineer, Port Angeles.

Wyoming: A. J. Parshall, civil engineer, Cheyenne.

In a number of instances related data have been inserted, such as results of computation of daily flow at milldams made by local engineers and data of river heights obtained from the United States Weather Bureau or the Corps of Engineers, United States Army. Reference to these facts, mainly unpublished, has been or will be made in other publications of this Survey, and they are therefore placed in consecutive order for convenience of reference.

The methods of measuring the discharge of various streams and of preparing the computations have been described on pages 18 to 30 of the Nineteenth Annual Report, Part IV, and on pages 20 to 22 of the Twentieth Annual Report, Part IV.

METHOD OF USING STREAM GAGINGS FOR THE COMPUTATION OF WATER POWER.[1]

One of the objects of the gagings which are made by the United States Geological Survey is to assist engineers in the estimation of available power on the larger streams of the United States. In an article by John W. Hays in the Manufacturers Record of January 10, 1901, there is given a description of the use which he has made of the daily records published by the Survey. The suggestions made by Mr. Hays are of such general interest that they are given herewith.

Speaking generally, to determine the power available on any stream it is necessary to know the fall and the flow. The fall can easily be determined by an engineer, but the flow of many of our streams is still very uncertain. Usually, an engineer, after obtaining all available data of the stream being studied and also of the neighboring streams, must rely largely upon his judgment to determine maximum and minimum flows and the power that can economically be developed. Often the only basis of estimate is the knowledge of what some other stream has been doing within a limited period, or a comparison with some power on the same stream. When it is remembered that during extreme low water a variation in level of only a few inches may affect the quantity of water passing as much as 100 per cent, it will be seen how misleading may be a single gage or float measurement, even when reinforced by the assurance of casual observers that "the river is as low as it ever gets." Yet it is upon such data that many estimates of prospective power have been made, mills built, and machinery installed, only to have the first dry season show conclusively that the estimates were greatly in error. Then has followed the raising of the dam for storage, which has rarely met expectations, and, after many

[1] Report of H. A. Pressey.

shut-downs, the inevitable steam auxiliary comes, and with it regret, on the part of the owners, that hydraulic development was attempted.

The method described by Mr. Hays in the article referred to has been used in computations made from time to time of the available power of the Potomac and other streams, and found to be reliable and convenient. Mr. Hays illustrates the method by quoting the record of Deep River, in North Carolina, as published by the Geological Survey. The various stages of that river for 1899, as read on the gage of the Survey, are given in the following table:

Daily gage height, in feet, of Deep River at Moncure, North Carolina, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.03	4.58	6.91	7.12	2.99	2.84	1.52	4.54	0.85	0.83	12.74	2.77
2	3.21	5.00	6.25	4.70	2.85	2.61	1.36	4.36	.79	.78	5.86	1.85
3	3.41	6.78	6.39	4.52	2.56	3.45	1.34	3.46	.75	.88	4.23	1.83
4	3.27	7.06	13.25	5.16	2.51	3.13	1.18	3.08	.91	.79	3.48	2.19
5	2.79	16.40	14.43	8.64	2.29	2.49	4.20	1.46	.73	.87	3.04	2.15
6	2.47	20.48	15.77	6.18	2.25	1.95	2.42	1.20	.71	7.20	2.74	1.49
7	10.27	23.21	15.67	6.40	2.47	1.65	2.72	4.54	.89	6.49	2.24	1.27
8	9.13	25.92	13.62	17.76	8.85	1.49	2.11	4.11	1.19	6.70	1.91	1.19
9	7.71	20.90	10.61	15.04	6.09	1.58	2.19	4.15	1.10	7.11	1.86	1.11
10	5.59	18.70	7.39	8.28	4.43	2.55	2.10	3.37	1.82	3.96	.84	1.19
11	4.99	12.26	5.05	6.16	3.85	3.23	1.79	1.39	2.10	3.19	.89	4.03
12	5.83	7.19	4.41	5.40	5.89	4.72	1.67	1.41	2.55	1.97	1.09	5.95
13	6.07	6.98	4.67	4.86	7.99	3.78	1.34	1.25	2.04	1.72	1.02	4.69
14	9.79	6.06	3.91	4.48	9.23	3.40	1.19	1.21	4.86	1.59	1.09	3.39
15	13.07	5.10	21.19	3.76	5.99	2.56	1.09	1.29	1.96	1.31	.96	2.35
16	8.61	6.76	22.51	3.98	4.46	2.42	1.28	1.31	1.04	1.17	.98	1.39
17	7.91	16.20	16.21	4.10	3.97	2.40	.90	1.17	.93	1.27	1.08	1.34
18	6.93	21.26	9.99	4.04	3.75	1.68	1.14	1.09	.84	1.04	1.26	1.47
19	5.99	19.34	14.69	3.54	3.69	1.58	1.11	1.25	.87	1.06	1.14	1.39
20	4.73	15.30	15.31	3.32	3.05	1.49	1.02	.88	1.71	1.12	1.02	.63
21	3.15	9.92	9.02	3.46	2.89	1.50	1.02	.74	1.99	.97	.98	1.27
22	3.36	9.05	7.15	2.97	2.67	1.47	1.02	.78	1.49	.90	1.10	1.13
23	3.08	8.22	5.87	3.10	3.25	1.77	1.19	.90	1.17	.87	1.05	1.07
24	3.17	7.92	5.43	2.96	2.85	1.37	1.11	.95	.87	.85	1.04	1.19
25	3.25	6.24	4.91	2.97	2.75	1.55	1.52	1.06	2.34	.91	1.00	1.13
26	3.27	6.92	4.41	5.60	2.51	1.57	1.67	.84	1.53	.92	1.32	1.11
27	3.54	12.94	4.14	5.54	2.25	1.71	5.19	1.00	1.35	1.01	1.92	1.07
28	3.19	18.22	7.07	4.46	2.02	2.15	4.35	.96	1.09	.98	1.83	.95
29	2.55	......	11.65	3.50	1.91	1.68	3.77	1.20	1.17	.94	3.78	1.03
30	2.21	......	10.31	3.04	2.54	1.60	2.11	1.22	1.04	.89	2.84	.97
31	3.23	......	8.44	......	2.96	.....	6.28	.89	......	1.13	......	1.03

As will be seen from an inspection of the foregoing table, the records kept by the Geological Survey show the stage of water of each stream measured on each day of the year, and the rating table, which is computed from numerous measurements, shows the quantity of water passing at each reading of the gage. These data may most conveniently be applied by developing a table as follows:

In the first column arrange in order all graduations of the gage rod from the lowest to the highest. In the succeeding columns write opposite each gage height the following: (*a*) The number of days during the year on which the gage read that particular height; (*b*) the equivalent volume in second-feet; (*c*) the effective head; (*d*) the equivalent gross horsepower; (*e*) the number of days during the year on which power would have been lessened by low water and by high water, respectively. By way of illustration: The gage read 1.6 feet on 17 days, equivalent to a volume of 380 second-feet, an effective head of 46.4 feet, and a gross horsepower of 2,004, which would be lessened on 121 days by deficient water and on 227 days by high water in the tailrace. If the gage readings at Moncure station from the records of the year 1899 be thus assembled and the variation of the effective head be noted, there results the following table:

Table showing method of determining the daily available horsepower of a stream from records kept by the United States Geological Survey, using the gage heights of Deep River at Moncure, North Carolina, for the year 1899 as a basis.

Gage height.	Number of days during year 1899 that gage stood at respective heights.	Equivalent volume.	Equivalent effective head.	Equivalent gross horsepower.	Number of days on which power indicated would have been diminished.			Ratio of diminution to total annual power.		
					By low water.	By high water.	Total.	Low water.	High water.	Total.
Feet.		*Sec.-ft.*	*Feet.*					*Per ct.*	*Per ct.*	*Per ct.*
0.6	1	210	47.4	1,128	0	364	364	0.000	0.077	0.07
0.8	27	230	47.2	1,232	1	337	338	.010	.075	.08
1.0	48	250	47.0	1,335	28	289	317	.022	.072	.09
1.2	27	290	46.8	1,544	76	262	338	.045	.067	.11
1.4	18	330	46.6	1,747	103	244	347	.065	.065	.13
1.6	17	380	46.4	2,004	121	227	348	.095	.058	.15
1.8	9	440	46.2	2,260	138	218	356	.125	.055	.18
2.0	13	500	46.0	2,530	147	205	352	.155	.055	.21
2.2	8	560	45.8	2,839	160	197	357	.189	.055	.24
2.4	9	630	45.6	3,192	168	188	356	.217	.052	.27
2.6	9	715	45.4	3,600	177	179	356	.250	.050	.30
2.8	10	805	45.2	4,050	186	169	355	.270	.050	.32
3.0	10	900	45.0	4,500	196	159	355	.300	.045	.34
3.2	11	1,070	44.8	5,379	206	148	354	.350	.040	.39
3.4	13	1,240	44.6	6,154	217	135	352	.390	.036	.43
3.6	3	1,410	44.4	6,926	230	132	361	.415	.035	.45
3.8	7	1,580	44.2	7,735	233	125	358	.430	.035	.46
4.0	8	1,750	44.0	8,536	240	117	357	.450	.035	.48
4.2	3	1,940	43.8	9,417	248	114	361	.470	.035	.50
4.4	7	2,130	43.6	10,289	251	107	358	.490	.033	.52
4.6	8	2,320	43.4	11,094	258	99	357	.510	.030	.54
4.8	3	2,510	43.2	11,197	266	96				
5.0	9	2,700	43.0	12,900	269	87				
5.5	6	3,175	42.5	14,960	278	81				
6.0	12	3,650	42.0	16,800	284	69				
6.5	6	4,125	41.5	19,000	296	63				
7.0	13	4,600	41.0	20,500	302	50				
7.5	1	5,100	40.5	22,923	315	49				
8.0	5	5,600	40.0	24,880	316	44				
8.5	3	6,100	39.5	26,741	321	41				
9.0	4	6,600	39.0	28,587	324	37				
9.5	2	9,100	38.5	30,338	328	35				
10.0	5	7,600	38.0	32,072	330	30				
11.0	1	8,600	37.0	35,335	335	29				
12.0	2	9,600	36.0	38,386	336	27				
13.0	4	10,600	35.0	41,195	338	23				
14.0	3	11,600	34.0	43,792	342	20				
15.0	11	12,600	33.0	46,200	345	9				
20.0	7	18,080	28.0	56,000	356	2				
25.0	2	23,580	23.0	61,640	363	0				
	365									

An inspection of the foregoing table will show to what extent any power plant which might have been installed at this place would have been affected by variations in the flow of the river during the year 1899, the number of days on which the power would have been diminished by high and low water, respectively, and the exact amount of such diminution. For instance, the power would have varied from 1,128 horsepower gross at extreme low water to 61,640 horsepower gross at extreme high water. There would have been but one day on which 1,232 horsepower gross could not have been realized, about two hundred days on which 5,000 horsepower gross could not have been realized, and two hundred and fifty days on which 10,000 horsepower gross could not have been realized. All of these figures are for continuous power, night and day. Should it be desired to concentrate flow into day service by night storage, which is practicable at Moncure, the installation for horsepower should be doubled. For instance, 10,000 horsepower gross would have been realized on one hundred days, and the power would have fallen below that amount on two hundred days.

It should be noted that the foregoing figures are based on a head of 47 feet normal, with which head little inconvenience would be experienced from high water, the maximum flood for the year being about 25 feet, and on only nine days did the water in the tailrace rise above 15 feet and on thirty days above 10 feet. But the physical conditions indicate a development of the power under two separate heads, which would be affected by flood water to a somewhat greater degree, as will be seen from an inspection of the table. Having accurate knowledge of the periods of decreased head and partial gate, it is possible to determine the capacity of the wheels for any required installation.

Should steam auxiliary be required, the table affords the data necessary to determine the exact proportion of steam power. For example, suppose it is desired to install a plant of 3,600 horsepower for night and day service, during what proportion of the year will steam power be required, and what proportion of the total power desired should be steam power? The following table shows the way of arriving at the answer. From the table on page 12 it will be seen that during one day of the year the available water power is 1,128 horsepower; so that to insure 3,600 horsepower every day in the year it will be necessary to install a steam plant of 2,472 horsepower. During twenty-seven days of the year the available water power is 1,232 horsepower, and on those days 2,268 horsepower of steam will be required, and so on, as shown in the table.

Table showing number of days and amount of steam power required during the year 1899 to develop daily 3,600 horsepower on Deep River at Moncure, North Carolina.

Number of days on which water power of the various amounts was available.	Water power available.	Steam power required.
	Horsepower.	*Horsepower.*
1	1,128	2,472
27	1,232	2,268
48	1,335	2,265
27	1,544	2,056
18	1,724	1,876
17	1,995	1,665
9	2,260	1,340
13	2,530	1,070
8	2,839	761
9	3,192	408
9	3,600	0

Summarizing, the total horsepower days (3,600 × 365) are 1,314,000; the total steam horsepower days are 325,743, or nearly 25 per cent, and steam power would have been required on 177 days of the year 1899.

For conciseness, the factors of wheel efficiency and partial gate are not considered in this estimate. A fair rating of the power of Deep River at this place would be 1,500 horsepower continuous, or 3,000 horsepower for day flow only, on a basis of thirty days' deficiency by reason of the dry season and thirty days' deficiency when the head would be decreased 10 per cent or more by flood water in the tailrace.

In the article referred to Mr. Hays also shows, basing his computations upon the Geological Survey records, that while in ordinary seasons, from the run-off of a drainage area of 12 square miles on Broad River we may expect 1 horsepower per foot of fall of the stream, it will require the run-off from a drainage area of 60 square miles to furnish 1 horsepower per foot of fall on Neuse River, 45 square miles on Cape Fear, Tar, Deep, and Haw rivers, 30 square miles on Roanoke River, 20 square miles on Yadkin River, 15 square miles on lower Catawba River, and 12 square miles on upper Catawba and French Broad rivers.

As the number of stations on any one stream is necessarily limited, it becomes desirable to apply the data obtained at one point to other points on the same stream. This may be done by determining the relative drainage areas. It should be noted, however, that the efficiency of a stream increases as the headwaters are approached. During the dry season of 1897 Yadkin River had nearly 33⅓ per cent greater efficiency at Salisbury than at Norwood, and the Catawba had nearly 20 per cent greater efficiency at the Catawba station, near Hickory, North Carolina, than it had at Rockhill, South Carolina. Neuse River has the lowest efficiency of any stream in North Carolina, its drainage area lying wholly in the eastern section of the State, where the geological formation is not conducive to perennial springs, and during the dry season of 1897 the run-off for that river at Selma, North Carolina, was only 15 per cent of that of Broad River at Gaffney, South Carolina, for the same drainage area. The drainage area of the latter stream lies wholly in the mountains; that of the former stream lies in the lowlands. In the year 1897 the maximum flood of the Neuse was 105 times its minimum flow, while the maximum flood of the Broad was only 24 times its minimum flow. These two streams are excellent illustrations of the effect of physical conditions on the efficiency of flow, and the physical conditions are almost invariably such as to give greater efficiency as the headwaters are approached.

A knowledge of the greatest flood volume of a stream is most essential in the construction of hydraulic works. Experience has shown that the failure of dams may in nearly every case be attributed to lack of sufficient knowledge of the floods which they will be required to withstand. In this respect also streams are very dissimilar. For instance: The maximum flood of the Roanoke in 1897 (gage height of 28 feet at Neal, North Carolina) was about 7 second-feet per square mile. In the same year Tar River gave a flood discharge of 6 second-feet, Neuse River a flood discharge of 7 second-feet, Cape Fear River 8 second-feet, Yadkin River 10 second-feet, and Broad River 13 second-feet, while the Catawba developed a flood of 26 second-feet to the square mile. The greatest flood ever recorded on the Cape Fear at Fayetteville, North Carolina, was a gage height of 58 feet above low water and a discharge of only 13 second-feet per square mile, or half that of the Catawba in 1897.

MEASUREMENT OF SEDIMENT.[1]

The following method has been employed for measuring the amount of sediment held in suspension by streams in Arizona: By means of a small bottle attached to a hollow rod, samples were taken from various parts of the stream and collected in a bucket. After thorough mixing, the water in the bucket represented as nearly as possible the average condition of the water flowing in the stream. A measured quantity of this water, usually 100 cubic centimeters, was placed in a tubular graduate of glass divided into cubic centimeters. Ordinarily this was allowed twenty-four hours to settle, but if longer time was required for thorough settlement, it was allowed. The clear liquid was then decanted and rejected, leaving a small quantity of water with the sediment in the bottom. If the amount of sediment was inconsiderable, another sample was added, taken on the day following that on which the first sample was procured, and after settlement it was decanted in like manner, the process being repeated from day to day until a sufficient quantity of sediment had accumulated to make a reading on the scale of the glass graduate. Under ordinary conditions, when the stream was not in flood, it sometimes required thirty days to accumulate samples which would show 2 or 3 cubic centimeters of sediment, but at times of flood a large quantity of sediment was sometimes obtained from a single sample of 100 cubic centimeters, in which case the quantity of sediment was ascertained by reading, and a new determination was started on the following day. The total quantity of sediment obtained from the samples or series of samples was divided by the quantity of water used in the accumulation, and a ratio was thus established which was applied to the total volume flowing in the river.

It was found that the mud obtained from these samples was of a very thin consistency and contracted greatly upon being dried. To determine the amount of this contraction for Gila River water a number of laboratory tests were made. The residue was dried at 100° C., and the dried material was weighed, its specific gravity also being determined. As might be expected, the results of these tests were by

[1] Report of A. P. Davis.

no means uniform, but the mean of the tests made indicated about one part of dry matter to five parts of mud, which factor has been used in reducing observations of this kind. In other words, it is assumed that after complete settlement the mud in the bottom of the water sample consists of one part of solid matter and four parts of water.

The foregoing method requires very little skill and time, and the apparatus used is extremely simple. The error of the determinations lies mainly in the assumption of the factor used in reducing the mud to solid matter, and it is probably considerable.

Another method which is now undergoing test is as follows: Samples of water are obtained in the manner already described, and a measured quantity is poured upon an ordinary filter paper in a funnel and is filtered as in the chemical laboratory. If the residue is inconsiderable the process is repeated until a measurable quantity of sediment is obtained, which is dried and afterwards is weighed. The reduction is made in the same way as in the first method, that is, the quantity of water used is to the sediment obtained as the quantity of water flowing in the stream is to the quantity of silt carried in suspension.

This method, to be used with any considerable degree of accuracy, requires the use of a pair of delicate scales. The error of the determination consists partly in the errors of observations, which would be greater than by the first method, unless great skill is employed in the filtering and weighing of the sediment, but chiefly in determining or assuming the specific gravity of the silt obtained, as it is volume and not weight that ordinarily is required. It is believed, however, that where the necessary instruments and skill are available it is much more accurate than the first method.

The method of estimating the turbidity by measurement of opacity is inaccurate in any country where the water is stained to any considerable degree by leaves and roots with which it comes in contact. This is clearly shown by the writer's experience on sluggish rivers in Nicaragua, notably the San Francisco and Deseado rivers. On the latter stream it was sometimes desired to gage the river in the absence of the electric recording apparatus, but attempts to do this showed that it was impossible to observe the revolutions of the meter more than 6 inches beneath the surface of the stream, owing to the opacity of the water. At the same time sediment samples were settled and accumulated for sixty days without yielding any measurable quantity of solid matter, showing that the water was free from sediment, the dense opacity being caused entirely by vegetable stains produced by the leaves, roots, and bark of the dense tropical vegetation with which it came in contact. However, vegetable stains and sediment are seldom found in considerable degree in the same water, for only sluggish waters remain long enough in contact with vegetation to become colored, and these carry but little sediment, so that in most cases opacity observations can profitably be used by carefully noting the true cause of the opacity.

Mr. Allen Hazen, member American Society of Civil Engineers, after reading the foregoing description, made the following comments:

Of course the aggregate amount of sediment carried by a stream, considered with reference to its tendency to fill a reservoir, is very different from the average amount of sediment carried by the water from a waterworks standpoint. In the first case. the maximum amount of sediment occurs, generally speaking, at times of maximum discharge, and, for most streams with which I am familiar, so large a percentage of the sediment as to be practically the whole of it would be carried by the water in floods occupying but a few days in each year. The average amount of sediment in the water taken for waterworks purposes, on the other hand, represents the average of the amounts in substantially equal volumes of water taken from the stream each day in the year. In comparing different streams with one another, I think it would make a great difference which method was used.

The statements regarding the colors of the waters in Nicaragua are of great interest. Of course color is an element of disturbance in any optical method of measuring turbidity. Computations and experiments conducted by Mr. Whipple and myself show, however, that water with a color which will be tolerated as a municipal supply, or which is capable of being decolorized at a reasonable cost, is not so highly colored as to affect the turbidity reading to a notable extent. The most deeply colored waters with which I have had experience have not much exceeded 2.00 on the platinum scale. The waters from Nicaragua referred to must have had colors many times deeper than this, and it would be very interesting to have accurate determinations of their colors made.

Mr. George W. Fuller, associate member of the American Society of Civil Engineers, made the following comments upon the methods described:

The determination of turbidity is a very important matter in connection with various water problems. Various methods are practiced for its determination, and thus far no standard method obtains. Apparently the "standard silica solution" is going to accomplish a great deal in this direction. Careful studies of this method are now being made at New Orleans, and the results are very promising. Messrs. Whipple and Jackson first described the standard silica solution method in the "Technology Quarterly," Vol. XII, No. 4.

The method used by Mr. Davis in Arizona was tried by myself at Louisville for several months, side by side with gravimetric determinations. It was found that the individual results were quite variable, although for the purpose for which he used them the method is probably much more satisfactory than under the conditions to which it was put in getting an accurate record of the rapidly changing Ohio River water.

The second method mentioned by Mr. Davis strikes me as a more satisfactory one, when reasonable facilities are available for carrying it out. It does not appear to me that it is so much the specific gravity of the sediment as the percentage of voids as actually found in the bottom of the reservoirs, that would materially affect the correctness of the estimates as to volume. This method has been used for a great many years on the Missouri and Mississippi rivers, and is described in the European text-books on water analysis. With coarse-grained turbidity it seems to work very well, and, all things considered, I presume that as a laboratory method it is entitled to high rating.

With the Ohio River water, which contains a considerable percentage of very fine clay, this method was not found to be practicable, as the clay would pass through a dozen or more thicknesses of the finest filter paper, to say nothing of the length of time necessary for filtering the clay. On that work it was the practice to determine the total residue on evaporation of the water as collected, and then of the filtrate after passing the water through a Pasteur filter. The suspended matter could then be obtained by the difference, and the results were quite satisfactory when the amount of sediment was not too low. There is a slight error in this procedure, due to the Pasteur filter sometimes absorbing and sometimes giving off dissolved substances. Taking everything into consideration, the standard silica solution seems to be the more practicable procedure at present for routine work, especially when used with a diaphanometer (see Technology Quarterly, Vol. XII, No. 2). At New Orleans this method is being depended upon very largely, although the weight of suspended matter is being determined by the same method as at Cincinnati, as frequently as time allows, in order to establish the ratio between the silica turbidity and the weight of suspended matter.

There are, of course, many instances where turbidity and dissolved color are both present in the same water. As a general proposition, however, this does not seem to be true, as the very highly turbid waters below the glacial drift formation do not generally contain much color. Strictly speaking, however, such a statement would apply only to large rivers, and not to very small streams, which are influenced by swamps. On the other hand, those streams for the most part on the drift or in the neighborhood of swamps, and which are highly colored, do not, as a rule, contain sufficient turbidity to justify any elaborate records of the suspended matter.

In future years the amount of dissolved vegetable matter giving color to a water is bound to be a factor. Information upon this subject is very desirable. As suggested by Mr. Hazen, it is likely that this matter could best be handled in the field by a graduated color scale on glass, the different tints or depths of color to be obtained progressively by the use of different shades of color, or different thicknesses of glass, as found most expedient.

TESTS TO DETERMINE THE ACCURACY OF DISCHARGE MEASUREMENTS OF NEW YORK STATE CANALS AND FEEDERS.[1]

During the summer of 1900 the State of New York undertook investigations to determine the flow, seepage, and evaporation of its canals. The work was under the immediate supervision of Mr. E. Kuichling, member American Society of Civil Engineers. Careful measurements were made by means of floats and current meters at various points on the Erie Canal and its branches. After completing the work it was thought wise to investigate the methods and determine the accuracy of the measurements taken. These special experiments were made under the direction of Prof. G. S. Williams, in charge of the hydraulic laboratory at Cornell University, assisted by the writer, by Mr. W. P. Boright, civil engineer, and by members of the senior class in experimental hydraulics at the university. Float and meter measurements were made in the flume at the hydraulic laboratory, and the results were compared to determine the variation between the two methods of measurement. It is thought that a brief description of the general method applied and of the results obtained will be of interest to engineers.

[1] Report of E. C. Murphy.

The movement of water in canals and feeders is quite different from that of a natural stream. This difference is due mainly to lockage and to irregular feed from one section to another, which cause rapid fluctuations of the surface level and of the velocity—in some cases the surface level dropped several inches in a few seconds and the velocity increased from 25 to 50 per cent. The disturbance of the water at a given place may be due either to lockage or to feed at one or both ends of the section. The water that is needed in a lower level should be passed through a culvert. Ordinarily, however, it is passed through the lock by opening one or more valves in the gates. In some cases four such valves are opened at once for a few minutes, but as a rule only one is opened for a longer time. It will readily be seen, then, that when a boat is passing in or out of a section which is being gaged, or is entering or leaving short adjacent sections, the water in that section is in a very disturbed condition. The length of time required for it to return to a normal condition after one of these disturbances, depends to some extent on the velocity of the water. The greater the velocity, the quicker it will return to normal condition; for very low velocities it requires hours to quiet down. In one case, with a steady gage, it was impossible to obtain a single gaging (which required only five minutes) in a whole day. It will readily be seen that, to be of any value, discharge measurements under such conditions must be made quickly. Even when the surface did not fluctuate the work was often stopped by one or more boats passing the place of measurement. Instantaneous measurements of discharge and a continuous record of surface fluctuations at the point of measurement are desirable. This was approximated by making a rod gaging in from four to ten minutes and reading the surface fluctuations every thirty to sixty seconds.

Two instruments were used to measure the velocity, viz, float rods and current meter. The float rods used were 1.90 inches in diameter, of wood, and weighted at the lower end with iron pipe and lead of the same diameter, so as to float upright. By adjusting the weight at the lower end the immersed length of the rod may bear any ratio to the depth of the water in which it floats. If the immersed length is equal to the depth, the speed or velocity of the rod is very nearly that of the average velocity of the water in the vertical plane in which the rod moves. On account of the action of the wind on the part of the rod which projected above the surface of the water, that part of the rod was limited in length to about 8 inches. Extensions of the rod were used when the depth required them.

In this work it was not possible to have the depth of immersion of the rods more than about 90 per cent of the depth of the water, on account of inequalities in the bottoms and sides of the canals. Neither was it advisable to have rods of many lengths, on account of the labor required to transport them from place to place. Rods of three lengths were carried, viz, 18, 40, and 80 inches, which, with a set of extensions to use on either the 40-inch or the 80-inch rods, gave five lengths. From these were selected those that could be used with the greatest depth of immersion and which would not project more than 8 inches out of the water. The discharge of the channel was computed from a number of gagings made very rapidly, when the surface fluctuated little, with different depths of immersion. It is very desirable that results obtained in this way should be tested by comparing them with results obtained under the same conditions by a more accurate method of measurement.

Two kinds of tests were made: (1) Rod discharge by one party with rod discharge by the other party, and rod discharge with meter discharge, made on the canals and feeders under actual conditions; and (2) rod discharge and meter discharge with discharge over standard weir, made in the hydraulic laboratory of Cornell University.

The discharge of the Erie Canal at Rochester was measured simultaneously with rods by two parties, and was again measured simultaneously with rods by one party and with meter by another party. At Lockport a similar comparison of rod discharge with meter discharge was made. Similar comparisons of rod discharge with rod discharge and of rod discharge with meter discharge were made on the Black River Canal at Boonville and on the Glens Falls feeder at Glens Falls. A comparison of the rod measurements of one party with the simultaneous rod measurements of the other party will show the error in measuring the loss of water between stations, and a comparison of the meter measurements made on the canals with the meter measurements made in the hydraulic laboratory at Cornell will serve to tie together the two sets of tests.

The common method of measuring discharge with a current meter, by observing the velocity at many points in a cross section, could not be used in this work because it required too much time. Two more rapid methods were used, viz, the six-tenths method and the integrating method. The former method consists in making a single observation in each vertical at a distance from the surface equal to six-tenths of the depth of the water. It generally gives, as do the float rods, the mean velocity in a vertical in one observation. The integrating method is more rapid than the six-tenths method, but it is not so accurate. It consists in moving the meter from the bottom to the surface and from the surface to the bottom several times while it is being carried from one side of the channel to the other. In this work the integrating method was only used as a check on the results obtained by the six-tenths method.

The current meter has a small revolving wheel with a rate of motion proportional to the velocity of the water in which it is held. Being small, one observation with this wheel gives the mean velocity for only a few square inches, and it is necessary to hold it in several places in a vertical in order to get the mean velocity in that vertical, while the float rods give the mean velocity in a vertical at one observation. The meter will give the velocity at any point in the depth; the rods will give the mean velocity only. The meter can also be used where the rods can not, and it is a less expensive method of measuring discharge.

The laboratory tests cover a range of velocities of 0.25, 0.50, 1, and 1.50 feet per second for channel depths of 7.5, 8.3, and 9 feet, and 0.5, 1, 1.50, and 2 feet per second for a channel depth of 6 feet. Two depths of immersion were used with each velocity, viz, 75 per cent and 90 per cent. Every velocity, depth of channel, and depth of immersion found in the field work could not be duplicated in the laboratory tests, so that the foregoing range covers only the most important cases. The laboratory experiments were made in the same way as the field experiments, using the same lengths of run and the same distance from the point of starting the floats to the upper chain.

The conditions of the flow were not quite the same in the field tests as in the laboratory tests. The Lockport comparison was made in a rock cut, with nearly vertical rough rock sides and a rough bottom. The meter section was 62.5 feet wide, 8.5 to 9 feet deep, and about 700 feet above the point where the rod measurements were made. The section where the rod discharge was measured was 65 feet wide and 8.5 to 10 feet deep. There was undisturbed flow for at least a half mile on each side of the place of measurement. The Rochester comparisons were made on the Rochester Aqueduct, which has very smooth and nearly vertical sides. The width was 43 feet, the depth 7.5 feet. The flow was undisturbed for a half mile above the point of measurement, but there was a very sharp curve less than 100 feet below the place where the rods were used. The Boonville comparisons were made in an earth cut with side slopes varying so as to make a gradual transition from the flat bottom to the top. The surface width was 43 feet, the greatest depth 7.7 feet. There was unobstructed flow for a quarter of a mile above the point of measurement and for a half mile below it. The sections where the Glens Falls comparisons were made have nearly vertical sides. The width is 32 feet, the greatest depth 6 feet. There is a bend in the feeder about 100 feet above the upper section, and another bend about 1,000 feet below the lower section. The meter section was between the rod-measuring sections, 75 to 100 feet distant from them.

The Cornell University canal has vertical sides of concrete and a concrete bottom. One side is at present roughened somewhat on account of the lining being cut out in places preparatory to its repair. The canal is 16 feet wide, 10 feet deep, and 415 feet long, with a standard sharp-crested weir, and with gates at the upper end for admitting water and at the lower end for controlling the depth of water in the canal, and with piezometers and gages for measuring accurately the head on the weir and the depth of water in the canal.

The discharge of the weir is known for any head on it, so that a simple measurement of the head gives the discharge of the canal. The discharge can then be measured with rods or current meter and compared with the weir discharge, and thus the error by the rods or meter be determined. The weir is 220 feet above the point where the rod measurements were made, and 15 feet below it are baffleboards for quieting the water. About 70 feet below the meter section is a bulkhead, and at the side of it are two rectangular gates. During the experiments the water passed out of the canal through two horizontal slits in the bulkhead, used to secure velocity in all of the water section. At the higher velocities some water passed out under one of these gates. The width of the Cornell channel was only from one-fourth to one-half that of the channels in which the field comparisons were made. At Cornell the water was probably moving in a more disturbed condition than in the canals and feeders. The retarding effect of bottom and sides was less in the former channel than in the latter, and the depth of water and the area of the channel were measured with greater accuracy at Cornell than on the canals.

The results of the field comparisons are given in the following table:

Results of field comparisons.

Place.	Date.	V′r.	V″r.	Vm.	Q′r.	Q″r.	Qm.	Q′r—Q″r in Q′r.	Q′r—Qm in Q′r.	Q″r—Qm in Q″r.
	1900.	*Feet.*	*Feet.*	*Feet.*	*Cu. ft. per sec.*	*Cu. ft. per sec.*	*Cu. ft. per sec.*	*Per ct.*	*Per ct.*	*Per ct.*
Lockport	Sept. 14		1.440	1.531		805.70	799.85			+0.73
Rochester	Sept. 20		.704	.736		235.12	251.57			−7.00
Do	Sept. 21	.893	.884		297.82	302.04		−1.41		
Do	do		.889	.929		301.35	310.83			−3.14
Do	do		.899	.939		307.08	317.54			−3.46
Boonville	Sept. 25	1.073	.813		227.22	227.51		−.13		
Do	do		.850	1.079		238.81	228.66			+4.25
Do	do		.836	1.111		233.54	234.70			−.49
Glens Falls	Oct. 8	.821	.690		164.73	172.77	161.50	−4.88	+1.94	+6.52
Do	do	.756	.640		149.66	158.57	155.23	−5.92	−3.72	+2.11

V′r = mean velocity found by party No. 1, with rods.
V″r = mean velocity found by party No. 2, with rods.
Vm = mean velocity found with meter, using six-tenths method.
Q′r = discharge found by party No. 1, with rods.
Q″r = discharge found by party No. 2, with rods.
Qm = discharge found with meter, using six-tenths method.

In the Lockport and Glens Falls comparisons the meter was suspended from a bridge by means of an insulated wire. In the Rochester and Boonville comparisons it was suspended from a boat by means of the same wire. The conditions were very good during the Lockport comparisons. There was very little wind, the surface did not fluctuate, there was a good measurable velocity in all parts of the cross sections, and no curve near to disturb the direct flow of the water. The meter discharge will be seen to agree closely with the rod discharge.

The conditions were not so good in the Rochester comparisons. The lower gaging station was too near a curve in the canal. The time of run of the individual rods at the same point differs by a considerable amount, much more than at the upper station. On the afternoon of September 20 the surface did not fluctuate much, but rain interfered somewhat with the work. The meter discharge for that day is 7 per cent greater than the corresponding rod discharge. The next day, September 21, the surface fluctuated somewhat, but not more than while much of the regular gaging work was being done. The rod discharge measurements for that day differ by 1.41 per cent, and the average meter discharge is larger than the rod discharge by 3.3 per cent.

At Boonville the conditions were all good. The rod discharges agree closely, as does one of the meter measurements with the corresponding rod measurement.

The Glens Falls comparisons are not very good—the upper gaging station was too near a curve, and there was a strong probability of leakage from the feeder between the points where the rod measurements were made. There was no leakage visible on the surface, but the point where the measurements were made is only a short distance below the portion of the feeder which is noted for its large leakage, so that there probably was some leakage here, although it does not show on the surface.

For the reasons stated we believe that the results of the Glens Falls comparisons should be given little weight, and that those at Rochester should be given only half the weight of those at Lockport and Boonville.

Results of experiments at Cornell hydraulic laboratory.[1]

Date.	Referred to standard weir.	Depth of water.	Rod gagings in canal. Immersion, 75 per cent. Velocity.	Immersion, 75 per cent. Discharge.	Immersion, 90 per cent. Velocity.	Immersion, 90 per cent. Discharge.
	Cu. ft. per sec.	*Feet.*	*Ft. per sec.*	*Cu. ft. per sec.*	*Ft. per sec.*	*Cu. ft. per sec.*
1900.						
October 24	214.6	9.36	1.42	213.8		
Do	140.5	9.25	.96	143.0	0.95	141.0
Do	71.7	9.34	.49	73.5	.48	71.4
Do	38.2	8.81	.28	39.1	.27	38.6
October 26	178.6	7.54	1.51	183.1	1.53	184.8
Do	125.3	7.55	1.08	131.0	1.06	128.3
October 27	61.3	7.47	.53	63.7	.52	62.5
Do	30.9	7.38	.27	31.6	.26	30.3
Do	196.4	6.16	2.07	204.7	2.04	202.4
Do	132.4	6.30	1.35	136.7	1.34	135.8
Do	91.1	6.23	.95	95.4	.94	94.5
Do	50.3	5.85	.56	52.2	.55	51.6
October 31	198.3	8.37	1.54	204.9	1.51	202.4
Do	125.3	8.39	.96	129.1		
October 29	65.4	8.37	.51	68.8	.50	67.3
November 1	31.1	8.26	.25	33.1	.24	32.1

[1] A recomputation of this data gave results slightly different from those contained in this report.

Results of experiments at Cornell hydraulic laboratory—Continued.

Date.	Referred to standard weir.	Depth of water.	Current-meter gagings in canal. Small Price meter (No. 363). Six-tenths method. Velocity.	Discharge.	Integrating method. Velocity.	Discharge.	Small Price meter (No. 351), ordinary method. Analytical. Velocity.	Discharge.	Graphical. Velocity.	Discharge.
1900.	*Cu. ft. per sec.*	*Feet.*	*Ft. per sec.*	*Cu. ft. per sec.*	*Ft. per sec.*	*Cu. ft. per sec.*	*Ft. per sec.*	*Cu. ft. per sec.*	*Ft. per sec.*	*Cu. ft. per sec.*
October 24	216.1	9.46	1.47	223.0	1.43	217.5	1.45	220.4	1.44	219.0
Do	140.5	9.37	.99	148.5	.98	148.1	.95	143.1	.95	143.2
Do	71.7	9.34	.49	73.2	.48	72.7	.48	71.5	.48	72.1
Do	38.3	8.92	.28	40.1	.31	44.4	.24	33.3	.25	35.5
October 26	178.6	7.67	1.49	184.1	1.52	187.8	1.41	174.7	1.43	176.2
Do	125.3	7.64	1.05	128.9	1.08	131.7	.98	120.8	1.00	123.1
October 27	61.3	7.58	.52	63.8	.52	63.8	.50	61.3	.50	60.7
Do	31.2	7.56	.26	31.5	.31	38.1	.23	28.1	.24	29.2
Do	196.4	6.28	1.99	201.4	2.03	205.4	1.86	188.2	1.90	192.1
Do	132.4	6.40	1.32	136.0	1.34	138.1	1.20	123.8	1.24	127.3
Do	91.1	6.32	.94	95.7	.92	93.8	.82	83.9	.86	87.3
Do	50.3	6.01	.54	52.7	.56	54.2	.48	46.5	.49	48.0
October 31	198.3	8.47	1.51	206.5	1.55	211.7	1.38	187.8	1.44	195.8
Do	125.3	8.51	.95	130.0	1.00	137.3	.84	114.5	.86	117.3
October 29	65.3	8.48	.50	67.7	.49	67.1	.44	60.5	.45	61.0
November 1	31.2	8.46	.24	32.7	.32	43.4	.19	25.2	.21	28.9

Date.	True velocity at meter station.	Error in discharge computed by different methods when referred to standard weir. Rod measurements. Immersion, 75 per cent.	Immersion, 90 per cent.	Meter measurements. Six-tenths method. Analytical.	Graphical.	Integrating method.	Ordinary method.	Ordinary method computed from velocity curves.
1900.	*Ft. per sec.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
October 24	1.41	+3.64	....	−4.11	−3.17	− 0.63	− 1.97	−1.13
Do	.93	−1.74	−0.37	−6.13	−5.70	− 5.37	− 1.84	−1.94
Do	.48	−2.56	+ .28	−2.08	−2.08	− 1.59	+ .24	− .64
Do	.27	−2.44	−1.02	−6.00	−4.86	−16.16	+12.84	+7.02
October 26	1.44	−2.57	−3.51	−3.09	−3.09	− 5.17	+ 2.17	+1.34
Do	1.02	−4.55	−2.40	−2.76	−2.86	− 5.12	+ 3.60	+1.75
October 27	.50	−3.94	−1.93	−4.88	−4.08	− 4.08	− .08	+ .90
Do	.26	−2.24	+2.01	−1.04	−1.04	−22.10	+10.00	+6.44
Do	1.94	−4.23	−3.06	−1.46	−2.55	− 4.86	+ 4.14	+2.20
Do	1.28	−3.24	−2.52	−3.18	−2.71	− 4.27	+ 6.49	+3.84
Do	.89	−4.75	−3.74	−5.32	−5.08	− 2.96	+ 7.89	+4.08
Do	.52	−3.74	−2.62	−5.92	−4.75	− 7.65	+ 7.67	+5.72
October 31	1.45	−3.36	−2.11	−3.71	−4.15	− 6.76	+ 5.28	+1.22
Do	.92	−3.05	....	−3.75	−3.75	− 9.54	+ 8.60	+6.41
October 29	.48	−5.14	−2.88	− .81	−2.35	− 2.80	+ 7.44	+6.62
November 1	.23	−6.14	−3.16	−2.47	−4.65	−39.30	+19.34	+7.57

NOTE.—Minus sign indicates that the discharge is greater than that by standard weir; plus sign indicates that it is less than that by standard weir.

Referring to the Rochester comparisons, it must not be inferred that because the rod discharges found by the two parties on September 21 agree closely, and the meter and rod discharges of the 20th differ by 7 per cent of the rod discharge, that this difference is all due to the meter. At least half of it is chargeable to the rod measurement. The two sets of velocity readings given by the meter on the 20th agree closely; there is nothing about them that will account for this large difference. The time of run of the rods, however, differs by a considerable amount, as already stated. The rod-measuring party was hindered by the rain and by the refusal of one of the men to work in the rain.

The results of the experiment work are given in the foregoing tables. The method of procedure was to open the head gates until the head on the weir was such as to give the desired discharge; then the slits in the bulkhead and the height of the gates at the lower end of the canal were adjusted so as to give the desired depth of water in the canal. As soon as the flow of water became steady, three parties began measuring the discharge of the canal, one with rods and two with current meters. Two lots of rods were used, one lot of 75 per cent depth of immersion, the other lot of 90 per cent depth of immersion; the former rods were lettered, the latter rods were numbered, so that they could easily be recognized as they passed under each wire. One of the current-meter parties measured the discharge in the ordinary way; the other party used the six-tenths and the integrating methods, and after completing their measurements they assisted the rod-measuring party, four stop watches being then employed and the number of rods observed in a given time being nearly doubled. The rod work was continued until the other meter party completed its measurement. During the experiment a gage giving the head on the weir and two gages giving the depth of water in the canal and the slope of the water surface, respectively, were read every 30 seconds. As a check on the weir gages and canal gage readings other readings were taken with a hook gage several times during the experiment. The length of run of the rods, or the distance between the chains was as follows: 25 feet for the 2-foot velocity, with a starting distance of 10 feet; 20 feet for the 1-foot and the 1.5-foot velocities, with a 10-foot starting run; 10 feet for the 0.5-foot velocity, with a 10-foot starting run; and 7 feet for the 0.25-foot velocity, with an 8-foot starting run. The number of rod observations made in an experiment varied from 50 to 150. The observations of each rod-discharge experiment were platted, using the distance from the side of the canal as abscissa and the time of run as ordinate, and a mean time curve was drawn. The mean time was found from this curve, and from that the mean velocity, which multiplied by the cross-sectional area gave the discharge.

In the six-tenths method the meter was held with its center at six-tenths of the depth from the surface, and, successively, at 1, 3, 7, 9, 13, and 15 feet from one side of the canal, and the revolutions in two consecutive periods of 50 seconds each were counted from the indications of an electric buzzer. The meter was then held at the same distances from the other side of the canal, and the revolutions in two consecutive 50-second periods were counted as before. These observations gave four measurements of velocity, covering a period of 50 seconds each, in these six verticals, at six-tenths of the depth below the surface. These points were platted, using the distance from the side of the canal as abscissa and the revolutions in 100 seconds as ordinate, and a mean curve was drawn. The mean number of revolutions for the whole cross section was computed from this curve and converted into mean velocity by the use of a rating table. The discharge was then found by multiplying the mean velocity by the cross-sectional area. The discharge was also found, analytically, without platting the points and drawing a mean curve. The difference between the weir discharge and the meter discharge, expressed in per cent, as found by these two processes, is given in the table on page 24. As a rule, the discharge found by using the curve is more accurate than that found without it.

In the integrating method the meter was moved in the following way: Its center started at 0.5 foot from the bottom and 1 foot from the side of the canal, and passed slowly to the surface at 4.5 feet from the side, then to 0.5 foot from the bottom and 8 feet from the side; then to the surface at 11.5 feet from the side, then to 0.5 foot from the bottom and 15 feet from the side. The time at the beginning and end of this operation was noted, and the revolutions of the meter wheel were counted, as indicated by the buzzer. The meter was then carried back over the same path at about the same speed, the time of passage being noted and the revolutions of the meter wheel counted as before. The discharge was computed by dividing the sum of the revolutions of the meter wheel in the passage across the canal and back again by the corresponding time, converting this into velocity and multiplying by the cross-sectional area.

In the ordinary method the meter was held by a rod at five points in the same six verticals in which the other meter was held, and the number of revolutions of the meter wheel, in single periods of 60 seconds each, were read from a recorder. The points in the verticals were usually $1\frac{3}{4}$ inches, 1 foot, and 2 feet from the bottom, the surface, and at one other point between the two. The recorder indicated only complete revolutions, while with the buzzer quarters of a revolution could be recognized. The mean velocity shown by the observations with this meter has been computed in two ways: (1) The mean number of revolutions per second of the meter wheel while being moved from one side of the canal to the other, at the five depths of immersion, have been computed and platted and a curve drawn through them, from which the mean number of revolutions per second for the whole cross section has been found, and this converted into mean velocity by the use of the rating table; and (2) the mean velocity has been computed by using with these observations the observations obtained at the same time with the other meter, using the six-tenths method, the mean revolutions per second at the different depths being converted into velocity and platted on a large scale, the velocity at six-tenths the depth being platted therewith and a mean velocity curve drawn among the points (not necessarily connecting them), from which the mean velocity for the whole cross section was found. The discharge found from the mean velocity computed in the latter way is given in the table on page 24, also the velocity found by the ordinary method.

Meter No. 351 used in the ordinary way did not work well on November 1. The wheel did not turn continuously for the small velocity 0.229 foot per second, but would stop for a few seconds and then start again. The other meter (No. 363) worked much better for the same velocity. The rating tables, however, indicate that the latter meter will measure a smaller velocity than the former. It should be said that the rating table for meter No. 351, which was used to convert revolutions into velocity, is for the meter suspended by a cable and not held by a rod. There was not sufficient time to rate it on a rod before making the computations.

In the table on pages 23 and 24 two values of depths are given; the one in the third column on page 23 is the mean depth for the 40 feet of distance passed over by the rods, the other (third column, top of page 24) is the mean depth at the meter station, and is for a distance of 15 feet. Two values of discharge of the standard weir are given for each experiment, the one in the second column being the average for the period during which discharge was measured by rods and meter, using the ordinary method; the other being for the period during which the discharge was measured by meter, using the six-tenths and integrating methods.

It will be seen from the table on pages 23 and 24 that the rod discharge and the meter discharge for the six-tenths method and for the integrating method are greater than the weir discharge, and that the meter discharge by the ordinary method is less than the weir discharge. The sign used is that of the correction to be applied to the meter or rod discharge to obtain the standard weir discharge. The rod discharge for 90-per cent rod immersion is on an average about 2 per cent greater than the weir discharge, and the rod discharge for 75-per cent rod immersion and the meter discharge by the six-tenths method are each on an average 3.5 per cent greater than the weir discharge. The variation from the weir discharge, which we will call the error, is in each case slightly greater for the lower velocities than for the higher velocities. The extreme percentage difference between any discharge and the mean of all the corresponding discharges is about 2.6 per cent. The error in the discharge as found with the current meter, using the ordinary method, is seen to increase as the velocity decreases, and the error in the meter discharge as found by the integrating method is seen to also increase as the velocity decreases. It also increases as the speed at which the meter is carried through the water increases. This we know must be the case, since the velocity indicated by the meter is the resultant of the velocity of the water and the velocity of the meter as it is moved through the water. When the velocity of the water is small, doubling the speed of the meter will nearly double the indicated velocity. In the following table is given the speed, in feet per second, of the meter, also the percentage of difference between the true velocity and the velocity as found by the integrating method. For a given speed of meter, the error is seen to be greater for the low velocities than for the higher, and for any given velocity of water the error increases with the speed of the meter.

Table showing effect of change of speed of meter in the integrating method, computed from experiments at Cornell University.

Date.	Depth of water.	(S) Speed of meter, integrating method.	(V) True velocity.	(V_1) Velocity by integrating method.	$\frac{V-V_1}{V}$.
1900.	*Feet.*	*Ft. per sec.*	*Ft. per sec.*	*Ft. per sec.*	*Per cent.*
October 24	9.460	0.118	1.409	1.429	− 1.42
Do	9.374	.142	.932	.982	− 5.36
Do	9.338	.164	.477	.485	− 1.68
Do	8.918	.107	.265	.308	−16.23
October 26	7.673	.137	1.444	1.519	− 5.20
Do	7.640	.135	1.018	1.079	− 5.99
October 27	7.582	.143	.502	.522	− 3.99
Do	7.557	.128	.255	.312	−22.35
Do	6.278	.180	1.940	2.030	− 4.64
Do	6.399	.154	1.283	1.338	− 4.29
Do	6.319	.188	.893	.920	− 3.02
Do	6.005	.142	.515	.555	− 7.77
October 29	8.476	.151	.478	.492	−29.29
October 31	8.470	.293	1.454	1.552	− 6.74
Do	8.508	.258	.915	1.002	− 9.51
November 1	8.455	.185	.229	.319	−39.30
November 29	8.476	.301	.478	.572	−19.67

CONCLUSIONS.

Assuming that the discharge given for the Cornell University weir is correct, the greatest percentage error in discharge when measured with rods of 90 per cent depth of immersion is 3.74 per cent. The range of percentage errors, omitting that on November 27 for velocity, 0.255 foot per second, is 4 per cent, the mean error for all depths and velocities is 2 per cent, and the greatest variation from this mean is 2.5 per cent. The greatest percentage error in the discharge when measured with rods of 75 per cent depth of immersion is 6.14 per cent. The range of these percentage errors, omitting that on November 24 for the velocity of 1.409 feet per second, is 4.4 per cent. The mean error for all depths and velocities is 3.5 per cent, and the greatest departure from this mean is 2.6 per cent. The greatest percentage error in the discharge as found with the current meter, using the six-tenths method, is 5.7 per cent, and the range of these percentage errors is 4.7 per cent. The mean percentage error for all depths and velocities is 3.5 per cent, and the greatest departure from this mean is 2.6 per cent.

From these facts we may conclude (1) that a discharge measurement of a canal or feeder may be in error 6 per cent when its mean velocity is small, but that, as a rule, the error will not be more than 3.5 per cent, and (2) that a measurement of loss from a section, which is mainly the difference between two simultaneous discharge measurements, may be in error 4.7 per cent—the largest difference that can be obtained by subtracting any two of the percentage errors in the third, fourth, and sixth columns of the table on page 24, except the two just mentioned, and it is very unlikely that this worst combination of errors will ever occur; but it is quite likely that the errors made by the two parties will be about the same in magnitude and have the same sign, in which case the measured percolation is nearly free from error. The average error in the measured percolation is probably not more than 2 per cent, and does not depend on the correctness of the standard weir discharge.

Of no little interest and importance is the fact, brought out by these comparisons and accuracy tests, that the current meter will give quickly and with a high degree of accuracy the discharge of canals and feeders or other channels of rectangular and trapezoidal cross section with fairly smooth bottoms.

The general subject of the relative accuracies of the various methods of measuring stream flow should be more thoroughly investigated, and it is hoped that more light will be thrown upon obscure points in river hydraulics and some improvements be suggested in the methods of measuring the flow of streams.

MEASUREMENTS AT RIVER STATIONS.

KENNEBEC RIVER AT WATERVILLE, MAINE.

This river was described by Prof. Dwight Porter in the Nineteenth Annual Report, Part IV, pages 65 to 84. Tables of its daily discharge from 1892 to 1898 will be found in Water-Supply Paper No. 27, pages 11 to 14; and similar data for 1898 and 1899 will be found in Water-Supply Paper No. 35, pages 25 and 26. The figures for the latter year, however (April to December, inclusive), were not computed with the same degree of accuracy as were those for former years, and since the publication of Water-Supply Paper No. 35 they have been recomputed, and the revised figures for the year 1899 and those for the year 1900 are presented herewith.

The computations for this station include the figuring of the discharge over the dam, through the waste gates and waste weirs, and through the various wheels of the Hollingsworth and Whitney mills. The Sunday flow at times, especially at low stages of the river, is found to be irregular, as the mill at Waterville is sometimes operated Saturday nights, drawing the water from the pond, so that on Sunday there is no flow except that due to leakage. During the dry season there is usually less water passing on Sundays than on week days, for at many of the mills on the river the dams are closed in order to allow the ponds to fill.

Daily discharge, in second-feet, of Kennebec River at Waterville, Maine, for 1899.

[Drainage area, 4,410 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,529	2,458	3,382	6,411	41,756	13,044	6,115	4,809	1,623	-------	1,390	1,456
2	2,202	2,198	3,047	6,214	39,665	12,790	5,024	3,594	2,010	1,443	2,819	1,441
3	2,274	2,187	3,333	6,160	36,589	10,647	5,363	4,442	567	1,665	4,093	747
4	2,159	2,163	3,324	6,017	36,942	11,673	3,178	4,199	1,612	1,415	4,109	2,913
5	2,452	1,580	1,960	6,207	30,922	12,264	5,258	4,498	2,070	1,969	2,995	3,567
6	2,451	2,505	3,331	6,227	30,531	11,123	5,120	4,415	2,082	1,449	3,327	3,196
7	2,449	2,173	3,563	6,433	30,125	10,563	5,076	5,064	2,070	1,476	3,106	2,015
8	1,739	2,071	3,516	7,007	29,447	12,748	5,367	5,195	-------	-------	2,637	2,070
9	2,757	2,057	3,502	7,541	26,888	12,517	3,936	4,388	2,352	1,215	2,338	1,737
10	2,513	2,152	3,428	9,001	24,803	12,506	5,142	4,128	246	940	2,119	------
11	2,400	2,141	3,357	9,650	22,132	10,738	5,123	4,101	2,635	774	1,698	1,393
12	2,386	2,244	2,302	9,405	20,229	10,278	4,866	3,954	2,067	1,784	-------	1,160
13	2,404	2,348	3,353	11,181	18,697	6,039	5,100	2,699	2,340	1,968	1,488	2,022
14	2,436	1,964	3,423	19,700	19,643	7,030	5,950	3,964	2,370	1,391	1,970	5,223
15	1,678	1,844	3,624	23,106	14,886	6,739	5,078	3,538	2,257	492	2,017	4,410
16	2,731	2,392	3,773	38,826	15,099	7,557	4,043	3,213	1,261	1,378	2,053	4,621
17	2,439	2,434	3,501	30,532	17,307	5,913	4,866	3,007	1,298	1,667	1,823	1,861
18	2,631	2,727	3,253	30,312	15,073	6,807	5,232	3,321	1,416	1,366	1,739	2,695
19	2,434	2,198	1,960	37,096	15,071	7,290	4,948	2,643	2,005	1,096	-------	2,027
20	2,629	2,915	3,320	41,565	15,684	6,483	4,880	1,242	2,362	1,377	1,718	2,611
21	2,440	2,734	3,080	34,540	16,262	7,101	5,499	2,748	2,006	1,120	2,317	1,878
22	2,094	2,744	2,778	30,286	18,287	7,317	6,367	3,377	2,351	-------	1,748	2,340
23	2,709	2,451	2,711	39,550	17,271	7,319	5,688	2,956	2,348	1,408	2,085	2,617
24	2,154	2,745	2,837	45,724	15,900	7,516	6,509	2,534	1,073	1,334	2,035	2,068
25	2,435	2,929	2,770	41,739	15,925	5,673	5,837	2,180	2,031	1,104	2,028	
26	2,450	1,420	2,030	43,139	11,480	7,301	5,916	2,158	1,761	995	-------	------
27	2,454	3,039	2,786	45,795	12,567	7,315	5,502	1,089	1,466	1,149	1,413	2,323
28	2,434	3,362	2,740	39,943	12,303	6,880	5,649	2,288	2,046	1,121	1,743	2,330
29	1,245	-------	2,998	41,584	13,064	7,038	4,170	2,203	1,951	406	1,744	1,821
30	2,513	-------	3,962	39,300	13,035	6,445	2,500	2,065	2,091	1,104	-------	1,474
31	2,453	-------	6,820	-------	12,823	-------	4,087	2,354	-------	1,086	-------	-------
Mean	2,357	2,363	3,218	24,006	21,303	8,821	5,077	3,302	1,854	1,274	2,252	2,741

Daily discharge, in second-feet, of Kennebec River at Waterville, Maine, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,463	7,117	15,468	8,792	22,830	12,115	4,849	4,910	4,238	2,859	2,307	6,540
2	1,565	3,696	13,353	8,381	27,905	12,782	8,232	5,149	1,635	3,337	2,357	4,394
3	1,604	3,628	9,656	9,338	28,823	15,730	7,520	5,525	3,191	3,134	2,293	6,146
4	1,653	-------	11,445	14,047	52,268	25,091	2,763	5,601	3,180	2,876	1,502	5,968
5	1,193	3,166	6,544	15,927	48,843	19,591	6,715	4,431	2,905	2,565	1,660	4,640
6	1,452	3,159	6,240	15,544	39,585	16,103	6,255	5,357	2,913	2,168	2,260	4,583
7	1,304	3,188	9,323	19,353	34,551	14,088	6,271	4,708	2,865	859	1,604	4,506
8	2,324	3,303	4,913	27,072	28,889	12,792	4,799	4,597	2,908	3,457	1,630	4,701
9	2,060	2,925	4,947	24,219	23,561	10,930	6,465	4,573	2,276	3,715	3,819	3,548
10	1,998	3,114	4,927	19,765	28,628	10,495	6,501	4,758	2,330	3,715	17,580	4,498
11	1,751	1,615	4,373	17,053	25,277	10,083	5,767	4,462	2,871	4,051	11,521	2,978
12	1,711	2,933	4,950	20,560	22,411	10,148	4,984	2,627	2,865	4,106	13,301	3,504
13	1,009	12,148	4,932	25,463	20,804	9,661	12,281	4,651	2,560	4,003	10,314	3,851
14	696	15,696	4,799	27,373	18,378	10,168	9,601	4,716	2,851	-------	8,564	4,078
15	1,712	21,761	5,051	26,429	22,307	7,707	6,262	4,450	2,826	2,590	5,839	4,101
16	1,996	19,766	10,516	31,224	29,793	9,141	7,018	4,750	2,426	3,993	4,877	3,080
17	1,755	15,073	7,479	32,034	29,945	7,256	5,112	4,834	3,130	3,993	3,706	3,958
18	1,748	11,998	12,670	35,155	31,845	7,808	6,017	4,624	3,147	4,190	6,533	4,068
19	2,064	5,871	20,538	42,557	40,265	7,308	5,652	3,075	2,776	3,989	5,079	3,505
20	1,792	7,090	12,562	60,541	48,460	5,866	6,057	4,547	2,602	3,720	5,215	3,809
21	656	6,978	12,448	62,291	44,162	6,402	5,678	4,072	3,044	2,392	8,107	3,799
22	2,060	6,123	12,412	55,863	35,060	6,651	4,386	3,203	2,776	3,164	6,360	4,109
23	4,045	5,308	11,361	51,180	25,403	6,613	5,253	4,029	-------	3,185	12,471	1,895
24	3,748	4,117	10,742	44,064	23,333	5,015	4,923	3,649	3,137	2,621	8,620	3,880
25	3,697	18,833	9,792	38,913	21,682	6,669	4,737	----	2,887	2,902	7,886	3,196
26	3,684	13,387	9,460	33,353	18,907	5,066	5,403	1,016	2,563	2,624	7,000	4,311
27	3,609	23,971	8,925	27,800	17,467	5,803	4,857	3,169	2,575	2,373	7,320	4,498
28	3,007	18,375	8,604	23,905	15,469	7,679	4,872	3,501	2,568	1,520	9,693	4,299
29	6,851	-------	8,391	21,793	19,171	7,189	2,344	3,629	3,169	2,902	5,214	4,035
30	4,311	-------	8,410	14,688	16,301	9,043	4,231	3,147	2,197	2,623	6,660	2,468
31	5,399	-------	8,498	-------	14,113	-------	3,725	3,454	-------	2,338	-------	4,050
Mean	2,384	9,050	9,153	28,473	28,272	10,033	5,791	4,173	2,807	3,065	6,376	4,096

COBBOSSEECONTEE RIVER AT RESERVOIR DAM NEAR AUGUSTA, MAINE.

This river is described in the Nineteenth Annual Report, Part IV, pages 79 and 80. The record of the discharge measurements from 1890 to 1899, inclusive, will be found in Water-Supply Paper No. 35, pages 28 to 33. The following measurements of daily discharge for 1900 were furnished by Mr. Alexander H. Twombly, engineer of the Forest Paper Company, of Yarmouthville, Maine. The measurements are made at the reservoir dam, where the discharge of the river is controlled by gates, except during flood stages. The gates are closed on Sundays and no water is allowed to pass. The great Cobbosseecontee dam furnishes a supplementary supply to the reservoir below, and water is occasionally drawn from it.

Daily discharge, in second-feet, of Cobbosseecontee River at upper dam near Augusta, Maine, for 1900.

[Drainage area, 230 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	130	220	815	776	300	300	(a)	260	260	230	180	220
2	130	220	1,463	495	300	300	280	260	(a)	220	165	(a)
3	130	220	2,316	417	300	(a)	280	260	260	190	140	220
4	125	(a)	2,055	656	413	300	(a)	260	260	175	(a)	220
5	125	220	1,911	977	803	280	280	(a)	240	175	130	220
6	125	220	1,622	907	934	280	280	260	240	150	130	220
7	(a)	220	1,481	1,087	831	280	280	260	240	(a)	130	220
8	130	220	1,295	1,379	606	280	(a)	260	240	160	130	220
9	110	220	1,155	1,380	456	280	280	260	(a)	175	200	(a)
10	100	220	1,155	1,342	413	(a)	280	260	240	180	220	220
11	90	(a)	1,153	1,297	348	280	280	260	240	190	(a)	220
12	90	220	1,116	1,297	300	280	280	(a)	240	220	220	240
13	90	220	1,037	1,297	(a)	280	280	260	235	220	220	240
14	(a)	2,194	999	1,297	300	280	280	260	230	(a)	220	230
15	100	1,573	999	1,297	300	280	(a)	260	230	220	220	230
16	95	1,283	999	1,213	300	280	280	260	(a)	220	220	(a)
17	90	856	1,615	1,105	300	(a)	280	260	250	220	220	240
18	90	562	1,611	1,072	300	280	280	260	250	220	(a)	240
19	90	425	1,473	1,260	300	280	280	(a)	250	220	220	240
20	90	294	1,518	1,380	585	280	280	260	250	220	220	240
21	(a)	270	1,811	1,338	704	280	280	275	245	(a)	220	240
22	140	270	1,662	1,260	998	280	(a)	275	250	220	220	240
23	160	270	1,517	1,223	1,325	280	280	275	(a)	220	220	(a)
24	200	270	1,472	1,223	1,422	(a)	280	275	250	220	220	240
25	200	(a)	1,334	1,182	1,301	280	270	275	250	220	(a)	(a)
26	200	564	1,289	869	1,016	280	260	(a)	250	220	220	240
27	200	662	1,206	570	456	280	260	275	250	220	220	240
28	(a)	776	1,206	377	357	280	260	275	245	(a)	220	240
29	220	....	1,105	(a)	300	280	(a)	275	230	220	220	240
30	220	....	1,015	300	300	280	260	260	(a)	220	220	(a)
31	220	....	925	....	300	....	260	260	....	200	....	240
Mean	136	508	1,365	1,044	562	282	276	264	245	206	199	232

a Water shut back on Sunday when under control.

ANDROSCOGGIN RIVER AT RUMFORD FALLS, MAINE.

This river receives the drainage from the Rangeley and other lakes near the border line between Maine and New Hampshire. It flows in a southerly and southeasterly direction, descending with rapid fall, and is one of the most valuable streams in New England for water-power purposes. It is described in the Nineteenth Annual Report, Part IV, pages 84 to 97. Figures of daily discharge will be found in Water-Supply Papers No. 27, pages 14 to 16. and No. 35, page 28; also in the Twentieth Annual Report, Part IV, pages 67 to 69. Figures of monthly discharge for the year 1899 will be found in the Twenty-first Annual Report, Part IV, page 57.

The following table of the daily discharge of Androscoggin River for the year 1900 has been furnished by Mr. Charles A. Mixer, resident engineer of the Rumford Falls Power Company, who states that notable features of the discharge of the river for that year (1900) are the high maximum discharge and the high average for February. There is no previous record or recollection of thaws or rains in that section during that month, but in February, 1900, there were two such periods of thawing and rainfall. The precipitation for the month was 7.96 inches, the greatest on record, most of it in the form of rain. In 1898 the precipitation amounted to 7.25 inches, but all in the form of snow, so that the effect on the river was not apparent until spring.

Daily discharge, in second-feet, of Androscoggin River at Rumford Falls, Maine, for 1900.

[Drainage area, 2,320 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,231	1,351	3,063	1,830	16,182	5,582	1,780	1,611	1,650	1,985	1,530	3,264
2	1,170	1,295	2,849	1,933	13,249	5,952	1,781	1,560	1,600	1,856	1,466	3,250
3	1,171	1,346	2,791	2,026	12,008	6,850	1,705	1,504	1,650	1,987	1,504	3,059
4	1,190	1,869	2,190	2,561	17,092	7,458	1,640	1,512	1,682	2,137	1,460	3,192
5	1,198	1,362	2,434	2,734	13,700	7,016	1,760	1,500	1,672	2,062	1,479	2,088
6	1,258	1,277	2,136	2,791	10,555	6,196	1,744	1,486	1,603	2,056	1,466	2,173
7	1,224	1,334	2,047	3,592	10,165	6,341	1,791	1,490	1,482	2,079	1,547	2,375
8	1,289	1,354	1,794	4,730	9,121	5,627	1,800	1,505	1,299	2,010	1,694	2,833
9	1,189	1,438	1,810	4,603	8,283	5,550	1,803	1,685	1,264	2,053	10,131	2,030
10	1,115	1,420	1,826	3,836	9,468	4,948	1,798	1,722	1,275	2,006	12,061	1,939
11	1,130	1,654	1,801	3,318	8,024	4,850	1,719	1,620	1,247	2,703	7,525	1,983
12	1,135	1,467	1,768	3,989	7,038	4,509	1,777	1,630	1,273	3,754	5,230	2,339
13	1,211	1,777	1,749	4,138	6,720	4,609	1,781	1,592	1,390	3,197	4,436	2,571
14	1,139	6,009	1,600	4,099	7,734	4,263	1,949	1,648	1,352	2,731	3,870	2,329
15	1,178	5,570	1,772	4,943	10,917	4,113	2,000	1,811	1,332	3,472	3,636	2,470
16	1,147	4,151	1,620	6,230	13,415	4,487	1,880	1,942	1,389	3,615	3,610	2,650
17	1,251	3,599	1,901	8,171	12,062	4,439	2,561	2,009	1,478	3,033	3,104	2,003
18	1,196	2,972	2,549	9,220	13,877	3,015	2,992	1,918	1,667	3,007	3,330	2,071
19	1,181	2,954	2,425	16,130	18,383	2,956	3,168	1,703	1,660	3,255	3,330	2,114
20	1,241	2,562	2,179	22,025	24,531	3,384	3,042	1,714	1,656	2,042	3,893	2,357
21	2,195	2,408	2,491	21,980	22,126	3,311	2,850	1,522	1,658	1,930	6,398	2,215
22	3,221	2,306	2,729	21,317	19,930	2,955	2,885	1,462	1,913	1,509	6,794	2,042
23	2,169	2,146	2,647	21,593	17,632	2,037	2,834	1,437	1,860	1,754	5,819	2,265
24	1,879	2,002	2,255	21,837	16,391	1,948	2,779	1,459	1,860	1,765	4,681	1,764
25	1,765	2,326	1,894	20,250	14,778	1,893	2,844	1,391	1,712	1,676	3,500	2,420
26	1,698	5,157	1,930	17,679	13,408	1,855	2,828	1,318	1,745	1,618	2,934	2,622
27	1,628	4,626	1,819	15,739	12,295	1,855	2,727	1,382	1,697	1,430	3,374	2,300
28	1,382	3,814	1,776	13,458	9,687	1,810	2,530	1,387	2,025	1,430	3,112	1,871
29	1,215	......	1,836	12,877	9,250	1,931	2,020	1,369	1,930	1,492	2,624	1,983
30	1,285	......	1,788	13,274	6,973	2,070	1,782	1,413	1,860	1,482	2,834	1,831
31	1,350	......	1,919	......	6,632	......	1,686	1,503	......	1,500	......	1,865
Mean	1,408	2,555	2,109	9,763	12,633	4,127	2,201	1,574	1,596	2,213	3,945	2,331

MERRIMAC RIVER AT LAWRENCE, MASSACHUSETTS.

Careful records of the flow of this river at Lawrence, Massachusetts, have been kept for more than fifty years, but they have never been published in full. Figures for the monthly maximum and minimum discharge from 1890 to 1897 were published in the Nineteenth Annual Report, Part IV, pages 113 to 115, and similar figures for 1898 in the Twentieth Annual Report, Part IV, page 73. In Water-Supply Paper No. 35 will be found the figures for the daily discharge for 1897, 1898, and 1899. The figures for 1900 are published herewith.

Daily discharge, in second-feet, of Merrimac River at Lawrence, Massachusetts, for 1900.

[Drainage area, 4,553 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,230	4,631	17,350	11,129	10,674	5,332	479	2,134	1,389	2,763	2,456	8,975
2	2,696	4,408	33,802	12,507	11,597	4,356	2,653	2,192	417	2,490	2,468	7,374
3	2,471	2,871	37,732	13,412	11,485	4,397	2,370	2,338	284	2,289	1,608	7,641
4	1,860	2,468	33,090	15,389	12,887	6,520	311	1,505	2,340	2,137	277	6,844
5	1,902	5,520	26,893	16,797	15,881	7,492	2,226	113	2,206	2,109	2,643	11,383
6	1,209	5,687	20,329	17,602	13,223	7,616	2,369	2,038	2,099	1,482	2,478	17,046
7	82	5,910	17,011	19,458	11,654	6,491	1,695	1,694	1,912	246	2,263	15,505
8	2,649	5,933	14,368	21,184	10,332	5,721	350	1,771	1,252	2,315	2,082	12,137
9	2,561	7,112	13,356	21,511	9,817	4,178	2,471	1,860	90	2,515	2,526	9,237
10	2,220	9,550	13,067	18,308	9,661	3,873	2,372	1,939	1,901	2,580	12,221	7,839
11	2,182	9,060	12,211	15,157	10,324	5,275	2,315	1,347	1,637	2,752	12,035	6,101
12	2,327	9,930	11,403	13,660	8,880	3,899	2,339	100	1,540	3,300	9,477	6,020
13	1,463	12,720	11,067	14,497	7,629	3,701	2,270	2,562	1,626	4,406	6,906	5,764
14	266	47,000	10,875	14,557	7,972	3,702	1,629	2,461	1,428	2,914	5,804	5,537
15	2,654	52,989	8,984	13,646	7,001	3,811	186	2,218	732	4,103	5,063	4,338
16	2,574	41,745	10,684	14,643	8,313	2,705	2,022	2,354	37	3,316	4,473	4,023
17	2,269	28,923	13,364	15,945	10,062	2,800	2,206	2,483	1,673	2,904	3,158	5,321
18	2,335	19,311	14,243	17,886	8,772	4,368	2,228	1,986	2,155	3,201	2,466	4,268
19	2,394	13,731	14,536	22,372	7,885	3,526	2,299	1,372	2,242	3,117	4,473	3,692
20	1,893	12,947	16,437	29,896	11,519	2,940	2,283	3,541	2,202	2,283	3,626	3,798
21	2,041	11,549	20,324	34,926	18,169	2,931	1,483	2,469	1,977	890	3,348	4,245
22	6,810	12,317	19,517	30,809	15,538	3,062	146	2,229	1,245	3,248	6,071	3,177
23	7,950	19,300	16,729	27,402	12,433	2,233	2,125	2,072	36	2,702	7,477	3,125
24	8,184	20,400	14,555	24,627	10,344	1,487	2,365	2,072	2,175	2,643	6,235	4,826
25	7,234	24,772	12,680	23,144	9,195	3,915	2,133	1,433	2,385	2,438	4,868	5,034
26	6,027	27,591	12,449	20,338	7,867	2,987	2,159	296	2,229	2,447	7,257	7,615
27	4,401	23,911	11,429	16,730	6,824	2,732	2,189	1,754	2,209	1,568	12,845	7,827
28	3,891	19,187	11,065	14,422	7,271	2,377	1,641	2,030	2,159	961	15,338	6,859
29	6,291	......	11,264	11,727	6,455	2,448	242	1,958	1,498	2,887	12,689	5,119
30	5,323	......	11,290	11,326	5,109	1,825	2,487	1,889	309	2,484	10,844	4,139
31	4,776	......	11,484	......	6,272	......	2,317	1,956	......	2,523	......	5,473
Mean	3,360	16,481	16,245	18,500	10,034	3,957	1,818	1,876	1,513	2,517	5,849	6,783

NASHUA RIVER AT CLINTON, MASSACHUSETTS.

On the south branch of this stream, near the town of Clinton, the Metropolitan Water Board is now constructing the Wachusett reservoir, for the supply of water to the city of Boston and neighboring cities and towns. Measurements of the flow of Nashua River at Clinton have been made by that board since July, 1896, but the figures have not been published. They have, however, been presented in testimony in court, and have thus been made public. Careful records of rainfall on this watershed have also been made.

SUDBURY RIVER AND LAKE COCHITUATE, MASSACHUSETTS.

Sudbury River and Lake Cochituate have been studied by the engineers of the city of Boston, the State Board of Health of Massachusetts, and the Metropolitan Water Board, and records of rainfall in the Sudbury watershed have been kept since 1875 and in the Cochituate basin since 1852, but the latter have been considered of doubtful accuracy previous to 1872. The records of run-off from 1875 to 1898, inclusive, were published in the Twentieth Annual Report, Part IV, page 75, and those for 1899 in Water-Supply Paper No. 35, page 37, where will also be found a short description of the watersheds of the river and the lake. The following table gives the record for 1900. All of the records were furnished by Mr. Desmond Fitz Gerald.

Run-off of Sudbury River and Lake Cochituate watersheds, in second-feet per square mile, for 1900.

Month.	Sudbury River watershed.	Lake Cochituate watershed.	Month.	Sudbury River watershed.	Lake Cochituate watershed.
January	1.229	1.060	August	— .052	.558
February	5.880	4.136	September	.101	.640
March	5.653	4.020	October	.287	.689
April	2.088	1.454	November	1.026	1.087
May	2.031	1.641	December	1.696	1.502
June	.489	.455			
July	— .028	.293	Mean	1.674	1.445

MYSTIC LAKE, MASSACHUSETTS.

This lake has been a source of water supply for the city of Charlestown, Massachusetts, since 1864. A brief description of the watershed is given in Water-Supply Paper No. 35, page 39, and on page 40 the run-off, in inches, for the watershed from 1878 to 1897, inclusive. Records for 1898, 1899, and 1900 are not available, although observations have been continued. The lake is no longer used as a source of water supply.

CONNECTICUT RIVER AT ORFORD, NEW HAMPSHIRE.

This river has its source in Connecticut Lake, in the extreme northern portion of New Hampshire. A gaging and observation station was established August 6, 1900, by E. G. Paul, on the covered highway bridge over the river between Orford, New Hampshire, and Fairlee, Vermont, about 75 miles from the source of the stream. The gage for making observations of the variations in the height of water in the river consists of a scaleboard 20 feet long, graduated to feet and tenths, fastened horizontally to the inside timbers on the upper side of the bridge, 125 feet from the left-bank abutment, and a steel sash chain running over a side pulley with a 5-pound weight, the length of the chain from the extreme end of the weight to the copper-rivet marker being 42.95 feet.

The observer is Frank H. Gardner, of Orford, New Hampshire. One discharge measurement was made during 1900, as follows:

August 7: Gage height, 3.6 feet; discharge, 1,529 second-feet.

Daily gage height, in feet, of Connecticut River at Orford, New Hampshire, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	3.00	5.30	4.60	8.55	17	6.90	3.05	7.95	6.90	6.60
2	......	3.65	6.50	4.50	8.40	18	6.45	2.95	7.60	6.25	6.50
3	......	3.70	6.30	4.40	8.00	19	5.60	2.85	7.15	6.50	6.50
4	......	3.25	5.20	4.15	7.70	20	5.20	2.85	6.80	7.95	6.60
5	......	3.00	4.80	3.85	7.50	21	4.60	2.75	6.50	11.30	6.70
6	3.90	2.35	4.20	3.80	7.40	22	4.15	3.05	6.25	13.90	6.50
7	3.65	2.75	5.15	4.30	7.50	23	3.85	4.35	5.65	14.80	6.70
8	3.75	2.70	6.20	6.00	7.50	24	3.60	5.00	5.75	14.30	6.90
9	4.05	2.80	5.85	11.25	7.50	25	3.40	4.60	5.65	12.70	7.90
10	4.85	3.00	6.15	13.40	7.90	26	3.45	4.15	5.75	11.05	9.00
11	4.95	2.80	7.20	13.35	7.50	27	3.45	3.75	5.70	11.20	8.80
12	5.10	2.70	12.43	12.40	7.50	28	2.70	3.50	5.45	11.40	8.50
13	5.35	2.45	12.80	10.35	7.60	29	3.15	4.15	5.40	9.95	8.20
14	5.75	2.70	10.65	9.55	7.50	30	3.10	4.85	5.00	8.90	......
15	6.65	2.65	8.90	8.35	7.20	31	3.05	......	4.75	......	......
16	7.50	2.75	8.15	7.95	6.70						

CONNECTICUT RIVER AT HOLYOKE, MASSACHUSETTS.

Measurements have been made of the flow of Connecticut River at Holyoke for many years. For records see Water-Supply Paper No. 35, pages 40 to 42. The figures are furnished by Mr. A. F. Sickman, assistant engineer of the Holyoke Water Power Company. The record for the year 1900 is not available.

CONNECTICUT RIVER NEAR HARTFORD, CONNECTICUT.

Observations of the height of Connecticut River near Hartford are made by the Connecticut River bridge and highway district, Edwin D. Graves, chief engineer, as noted in the Twentieth Annual Report, Part IV, page 77. Daily readings from February 8, 1896, to January 1, 1899, were published in Water-Supply Paper No. 35, pages 42 to 44. The record for 1900 is given in the following table:

Daily gage height, in feet, of Connecticut River near Hartford, Connecticut, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	5.7	7.5	......	12.1	5.7	......	3.1	2.5	2.0	3.3	7.1
2	4.0	5.6	17.6	7.0	10.7	5.0	2.4	2.9	......	2.0	3.3	7.0
3	4.0	5.6	18.9	8.0	......	......	2.8	2.7	2.0	2.0	3.0	6.6
4	......	......	15.1	8.7	10.9	4.8	2.0	2.5	2.5	2.0	3.3	6.3
5	......	6.9	12.9	8.3	11.2	7.0	2.2	......	2.5	2.6	3.0	8.0
6	......	9.8	10.5	9.8	......	7.5	2.6	1.9	2.5	2.0	2.9	9.3
7	......	8.7	8.7	10.5	10.2	6.7	2.4	1.9	3.0	2.6	2.9	9.9
8	2.5	7.3	7.8	......	9.5	5.9	......	2.4	2.5	2.6	3.3	8.4
9	......	8.6	7.3	14.2	9.0	5.5	2.3	2.5	......	2.9	3.6	6.9
10	3.0	10.7	7.3	13.5	8.4	......	2.4	2.0	.5	3.0	3.0	......
11	......	9.4	......	12.0	8.4	4.7	2.7	2.9	......	3.0	4.0	4.9
12	4.0	8.5	6.8	10.6	8.4	4.7	2.9	2.0	......	3.3	5.9	......
13	......	11.8	5.9	10.5	......	4.3	3.0	1.9	2.0	4.0	5.6	......
14	......	21.7	6.0	11.2	7.9	4.4	3.0	1.9	2.0	4.6	6.6	......
15	3.1	23.4	5.8	......	7.3	4.3	......	3.4	2.0	5.0	5.9	4.5
16	3.2	22.0	5.4	10.7	6.9	4.0	3.2	3.4	2.0	5.0	5.0	......
17	3.0	19.0	5.5	12.5	6.7	......	3.5	3.7	2.0	4.6	4.9	5.3
18	3.0	14.0	......	14.5	7.2	4.0	3.4	4.5	1.0	4.0	4.3	5.8
19	3.0	10.3	6.0	17.2	8.4	3.9	2.9	......	1.0	3.6	3.9	5.5
20	3.5	9.3	8.4	20.6	......	......	2.6	3.3	1.0	3.6	4.6	5.5
21	......	8.4	11.2	22.2	13.3	3.4	2.8	3.3	1.3	3.0	3.9	5.2
22	7.8	7.6	10.8	22.8	14.7	3.5	......	3.0	1.5	3.0	4.6	......
23	9.9	11.7	9.5	22.3	13.9	3.4	2.6	2.8	1.3	3.6	7.0	......
24	6.9	11.3	8.9	21.7	13.0	......	3.0	3.0	1.5	3.0	7.0	5.2
25	6.7	10.5	......	21.1	11.0	3.0	2.9	2.9	1.6	3.3	7.3	4.8
26	5.7	11.1	7.4	20.5	9.5	3.3	3.4	......	1.6	3.0	8.5	5.5
27	5.4	9.7	7.3	20.4	......	3.4	3.4	2.5	1.3	3.0	10.9	6.0
28	6.0	7.8	6.9	17.9	7.4	3.2	3.4	3.0	1.6	3.6	10.1	6.0
29	7.2	......	6.6	13.9	6.9	3.0	......	2.9	2.0	3.3	10.2	5.3
30	6.7	......	6.6	13.6	6.5	3.2	3.3	2.8	1.6	3.6	8.9	......
31	6.4	......	6.8	......	5.9	......	......	2.5	......	3.0	......	5.7

HOUSATONIC RIVER AT GAYLORDSVILLE, CONNECTICUT.

This gaging station was established October 24, 1900, by E. G. Paul. It is near Merwinsville Station, on the New York and New Haven Railroad. Gage-height observations are made by means of a weight suspended by a sash chain from the covered bridge across the river. The distance from the extreme end of the weight to the copper-rivet marker in the chain is 30.45 feet. The distance from the center of the side pulley to the datum of the gage is 29.35 feet. The gage is referred to a 16-foot scaleboard, graduated to feet and tenths, fastened horizontally to the woodwork on the inside of the covered bridge. The observer is G. H. Monroe, a farmer living within a short distance of the station. As the cross section of the river channel at the bridge was not favorable for making discharge measurements, a cable was stretched across the stream 1¼ miles below the bridge. The span of the cable is 200 feet. It is supported on the right bank by timbers 25 feet high, and is anchored to a large rock which was placed 5 feet below the surface of the ground. On the left bank the cable is fastened to a large sycamore tree, and is anchored to the base of a large oak tree by means of a turn-buckle. A tag wire with markers every 10 feet was placed above the cable. The initial point of sounding is the large sycamore tree which supports the cable on the left bank.

During 1900 the following discharge measurements were made by Mr. Paul:

August 9: Gage height, 3.30 feet; discharge, 450 second-feet.
August 10: Gage height, 3.25 feet; discharge, 422 second-feet.
October 20: Gage height, 3 feet; discharge, 303 second-feet.
October 24: Gage height, 3.10 feet; discharge, 370 second-feet.

Daily gage height, in feet, of Housatonic River at Gaylordsville, Connecticut, for 1900.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	......	3.2	4.9	12	......	3.7	4.2	23	2.9	3.9	4.8
2	......	3.1	4.6	13	......	3.6	4.2	24	3.1	3.9	5.1
3	......	3.1	4.3	14	......	3.7	4.2	25	3.2	3.8	4.3
4	......	2.9	4.2	15	......	3.7	Ice.	26	3.1	4.6	4.2
5	......	3.0	5.6	16	......	3.7	Ice.	27	3.1	5.5	4.1
6	......	2.9	5.8	17	......	3.6	Ice.	28	3.1	5.4	4.2
7	......	2.8	5.4	18	......	3.5	Ice.	29	3.1	5.1	4.0
8	......	3.2	5.1	19	......	3.6	Ice.	30	3.0	4.9	3.9
9	......	3.5	4.9	20	......	3.7	Ice.	31	......	......	4.2
10	......	4.1	4.5	21	......	4.1	Ice.				
11	......	3.9	4.2	22	......	4.0	Ice.				

MISCELLANEOUS MEASUREMENTS OF STREAMS NEAR GREATER NEW YORK.

Measurements of the discharge of three small streams near the city of New York were made by E. G. Paul in 1900. These streams—Tenmile River, Wallkill River, and Esopus Creek—have been under consideration as possible sources for increasing the water supply of Greater New York. Following are the discharge measurements made by Mr. Paul:

Miscellaneous measurements of streams near Greater New York.

Date.	Stream.	Locality.	Discharge.
1900.			*Sec.-ft.*
Aug. 9	Tenmile River	Webatuck, N. Y	46
Oct. 20	do	do	32
Aug. 13	Wallkill River	Rockford Bridge, N. Y	70
Aug. 14	Esopus Creek	Brodheads Bridge, N. Y	92

METHODS EMPLOYED IN THE GAGING OF NEW YORK STREAMS DURING THE YEAR 1900.[1]

The location of gaging stations which have been maintained or established in New York State during the year 1900 are given in the first of the tables which follow. Most of the older stations were established either in connection with the Upper Hudson storage survey of 1895 and 1896 or by the United States Board of Engineers on Deep Waterways in 1898. All of the older stations are in connection with dams and mills. The methods employed in computing the flow of streams from such records are described in Water-Supply Paper No. 35, page 39, and records of flow for past years will be found in the same paper. In connection with all such stations an effort has been made to improve upon the methods formerly used, and to check the previous results by making current-meter measurements to determine the volume of flow through turbines, and the proper allowance to be made for leakage of dams, also to check the calculated flow over dams.

Measurements of streams in New York State have been made with the cooperation of the State engineer and surveyor, Edward A. Bond, and the deputy State engineer and surveyor, William Pierson Judson. The stations established during the year are chiefly current-meter stations, a gage being read once or twice daily to determine the stage of the river, and the current-meter measurements made as opportunity permits, with the water at different stages. A sufficient number of current-meter measurements have not yet been made at any of the stations to permit the construction of rating curves, so that the daily flows in second-feet can not yet be given.

In addition examinations have been made of various streams, notably of those flowing from the northern slope of the Adirondack region, to determine favorable localities for establishing gaging stations, and a number of gaging records have been obtained which are not yet ready for publication.

No single method of gaging has been followed exclusively, but different methods have been pursued, with a view to checking the results obtained. In a number of instances weir and current-meter measurements have been combined at a single station, the former method being employed to calculate the flow over dams, the latter method to estimate diversion to canals or for water-power purposes.

Many of the older stations had been neglected, and at the beginning of the year the gages were out of repair. Many of the gages have been replaced by new ones having metallic figures and division marks, and other changes have been made with a view to increasing the accuracy of the results.

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[1] Report of Robert E. Horton, under whose direction the measurements in New York State have been made.

Location of gaging stations on New York streams.

Stream.	Location.	Kind of station.	Duration of record.	Gage reader.
Mohawk River	Ridge Mills	Dam and waterworks.	Oct. 1, 1898, to Nov. 28, 1900.	Daniel Brown.
Oriskany Creek	Oriskany	Dam and feeder	Oct. 16, 1898, to Jan. 31, 1901.	Frank Baker.
Sauquoit Creek	New York Mills (No. 3).	Dam and mill	Sept. 20, 1898, to Sept. 30, 1900.	Robert Hughes.
West Canada Creek.	Twin Rock Bridge.	Bridge	Sept. 9, 1900—Cont'd	Utica Elec. Lt. and Power Co.
Do	Middleville	Dam and mill	Oct. 7, 1898—Cont'd *a*.	E. J. Nelson.
Mohawk River	Little Falls	Dam and mills	Sept. 23, 1898—Cont'd	J. J. Gilbert and Wm. Hoffman.
East Canada Creek.	Dolgeville	Dam and power plant.	Sept. 23, 1898—Cont'd	Henry Meyer.
Cayadutta Creek	Below Johnstown.	do	Oct. 1, 1898—Cont'd	A. N. Terry.
Schoharie Creek	Fort Hunter	Dam and feeder.	Sept. 23, 1898, to July 31, 1900. *b*	H. J. Wittemeier.
Do	Erie Canal aqueduct.	Bridge	May 2, 1900, to Oct. 13, 1900.	James Shutts.
Do	Mill Point	do	July 6, 1900—Cont'd	Henry Peters.
Do	Schoharie Falls	Dam and plant	June, 1900—Cont'd	Empire State Power Co.
Mohawk River	Near Schenectady.	Bridge	Feb. 1, 1899—Cont'd *c*.	L. Diggins.
Do	Rexford Flats	Dam and feeder.	Dec. 8, 1898—Cont'd	H. R. Betts.
Do	Dunsbach Ferry.	Dam	Mar. 12, 1898—Cont'd *d*	Kept for D. J. Howell, C. E.
Indian River	Indian Lake dam	Storage dam	July 22, 1900—Cont'd.	Frank Pelon
Schroon River	Below Warrensburg.	Dam and mill	Nov. 1, 1895—Cont'd	Joseph Goodfellow.
Hudson River	Fort Edward	Dam and mills.	Dec. 1, 1895—Cont'd	B. A. Carr.
Do	Mechanicsville	do	Dec. 1, 1887—Cont'd	The Duncan Co.
Seneca River	Baldwinsville	do	Nov. 12, 1898—Cont'd.	Chas. Brannock.
Chittenango Creek.	Bridgeport	do	Sept. 16, 1898—Cont'd	Jefferson Downs.
Oneida Creek	Kenwood	Dam and mill	Oct. 4, 1898, to Dec. 31, 1900. *e*	Wm. Padgham.
Fish Creek, West Branch.	McConnellsville	Dam and mills	Sept. 13, 1898—Con'd *f*	Frank S. Harden.
Oswego River	High dam	do	Apr. 1, 1897—Cont'd	Oswego Waterworks Co.
Do	Above Minetto	Cable	Sept. 14, 1900—Cont'd	H. L. Woodcock.
Salmon River	Above Pulaski	Bridge	Sept. 4, 1900—Cont'd	H. A. Walker.
Moose River	Moose River	Cable	June 5, 1900—Cont'd	Frank W. Smith.
Black River	Huntingtonville dam.	Waterworks dam.	Feb. 22, 1897—Cont'd	Alonzo Dressor.

a No record February 1 to May 9, 1900, inclusive.
b No record December, 1899, and February, 1900.
c No record October 3, 1899, to April 7, 1900, inclusive.
d No record April 1, 1899, to August 31, 1900, inclusive.
e No record August and September, 1899, and February and May, 1900.
f No record August, 1899, to April, 1900.

In the foregoing table there have been included a number of rivers which belong to the Great Lakes drainage, descriptions of which will be found in Water-Supply Paper No. 49, the same being Part III of this series, a geographic arrangement of the streams having been followed, as in former years. The streams referred to are Seneca River at Baldwinsville, Chittenango Creek at Bridgeport, Oneida Creek at Kenwood, West Branch of Fish Creek at McConnellsville, Oswego River at Minetto and at high dam, Salmon River above Pulaski, Moose River below McKeever, Beaver River, and Black River at Huntingtonville.

The following table gives the results of current-meter measurements made on the principal of these streams during the year 1900. A modified form of the Price meter which has been adopted by the United States Geological Survey was used. The usual mode of procedure was to submerge the meter six-tenths of the depth of the stream, at measured intervals across the channel, and record the revolutions for a period of 100 seconds. In cases of doubt, surface and bottom velocities were also taken, or, as a check, the flow was determined by the integrating method. Many of these measurements were made at places where permanent stations have not been maintained, and the gage-height figures given are the distances to water surface measured from some fixed point of reference, usually the coping of either a pier or an abutment. In addition to the results included in the table, 35 current-meter measurements have been made in headraces, feeders, power canals, and other channels, to determine the leakage of dams, the flow through turbines, and the amount of diversions. The results of these measurements will be found in connection with the descriptions of the various gaging stations.

Summary of current-meter measurements of New York streams during 1900.

Date.	Stream.	Location.	Point of measurement.	Hydrographer.	Gage height	Discharge.
					Feet.	*Sec.-ft.*
May 29	Mohawk River	Riverside Bridge	Two miles above Rome.	R. E. Horton	14.90	202
Aug. 31	do	Rome	Below Erie Canal feeder dam.	do		38
Do	do	do	Above Erie Canal feeder dam.	do		188
Apr. 22	do	Ridge Mills	At highway bridge above dam.	H. A. Pressey	1.96	1,385
Aug. 23	do	do	In channel below dam.	R. E. Horton		116
Apr. 30	Oriskany Creek	Oriskany	Wood road bridge	do	12.20	289
Sept. 7	West Canada Creek.	Twin Rock Bridge.		do	.37	182
Sept. 10	do	Middleville		do		245
May 1	Mohawk River	Little Falls	Suspension bridge	do	18.70	4,773
May 23	do	do	Astronga Bridge	do	1.33	1,569
May 22	East Canada Creek.	Dolgeville	Iron highway bridge	do	20.12	412
July 27	do	do	do	do	20.16	452
July 29	do	do	Below High Falls dam.	do		108
Apr. 24	Schoharie Creek	Fort Hunter	West Shore railroad bridge.	H. A. Pressey		5,573
May 2	do	do	Erie Canal aqueduct	E. D. Walker	2.26	1,257
June 21	do	do	Inflow to Mohawk	R. E. Horton		30
July 18	do	do	Below aqueduct; inflow to Mohawk.	E. D. Walker		38
Do	do	do	Total outflow at dam.	do		114
Aug. 22	do	do	Below aqueduct; inflow to Mohawk.	do		44
July 5	do	Mill Point		do	.64	87
Aug. 22	do	do		do	.47	141
May 12	Mohawk River	Schenectady	Freeman's bridge	do	6.50	4,135
July 17	do	do	do	do	5.26	667
Aug. 21	do	do	do	do	5.40	976
Oct. 19	Indian River	Sabael	Below Indian Lake dam.	R. E. Horton	8.20	451
July 25	Schroon River	Warrensburg	Two miles above Warrensburg.	do	16.40	383
Aug. 9	do	do	One mile above mouth.	do		286
July 26	Hudson River	Fort Edward	Highway bridge below paper mill.	do		2,704
Oct. 20	do	Mechanicsville	Highway bridge below Duncan & Co.'s dam.	do	21.50	1,871
June 11	Seneca River	Baldwinsville		do		1,863
June 16	Chittenango Creek.	Bridgeport	Highway bridge below Butternut Creek.	do		95
Sept. 17	Oneida Creek	Kenwood	Headrace above mill.	do	3.25	20
June 1	do	Oneida Castle		do	8.50	36
May 17	Fish Creek, East Branch.	Point Rock		do		485
Sept. 15	Oswego River	Cable station	Three miles above Minetto.	do	5.40	1,677
Sept. 4	Salmon River	Bridge station	Two miles above Pulaski.	do	1.03	103
June 6	Black River	Glen Park Bridge	Two miles below Watertown.	do		2,175

Field work was begun so late that in many instances current-meter measurements to check the calculated flow over dams during high water could not be made. Additional meter measurements are also needed at all of the current-meter stations to establish discharge curves. This report must therefore be considered as in some degree preliminary.

For mill streams, where the water is held back as pond storage during the dry season, and where the mills are stopped on Sundays or holidays, it is impossible to determine the natural regimen of flow. If at the time the water wheels are stopped the water stands below the level of the crest of the dam, the flow in the stream channel below will be nil, or at best will only equal the leakage of the dam, flumes, or penstocks. With regard to estimation of Sunday flow, no uniform rule has been followed. In some of the older records the Sunday flow during the dry season has been taken as the mean of the calculated flow for the preceding and following days, and in cases where this method had previously been used it has been adhered to in computing the daily discharge of the streams. In other instances the daily flow given in the table is that shown by the gaging record, and represents as nearly as may be the actual amount of water flowing in the stream channel below the dam, but it may be quite different from the amount entering the pond above the dam.

The relation existing between the canals of New York and the streams of the central portion of the State is very complicated. In many cases diversion from the headwaters of the streams for the supply of canals virtually reduces their effective drainage areas. As a result, the watersheds during the summer may be materially less in area, and in their water-yielding characteristics may differ widely from the region tributary to the streams when the canals are not in operation. It is evident that the run-off from such streams is not comparable with that from streams having an undisturbed regimen.

It often happens that a single gage reading taken at or near the culmination of a flood shows a larger flow than the mean for any single day. The results of such isolated observations, together with other data relative to extremes of flow, have been given for a number of stations.

The drainage areas of the various streams above the gaging stations and at other points are given in the following table:

Drainage areas of New York streams.

Stream.	Location.	Area.
		Sq. miles.
Batten Kill *a*	At mouth	*b* 438
Beaver River	do	322
Do	Above Beaver	153
Do	Below Beaver	169

a Hudson River tributary. *b* Upper Hudson storage surveys.

Drainage areas of New York streams—Continued.

Stream.	Location.	Area.
		Sq. miles.
Black Creek *a*	At mouth	39
Black River	do	1,930
Do	At gaging station	1,889
Do	At Forestport	*b* 268
Cayadutta Creek *c*	At mouth	*b* 62
Do	At gaging station	*b* 40
Chittenango Creek	At mouth	*b* 309
Do	At Bridgeport *d*	*b* 307
East Canada Creek *c*	At mouth	283
Do	At gaging station	256
Fish Creek, East Branch	At Point Rock	*b* 104
Fish Creek, West Branch	At McConnellsville *d*	*b* 187
Fulton Chain	Above Old Forge	41
Hoosic River *e*	At mouth	*f* 730
Hudson River	At Troy	*f* 8,000
Do	Above Mohawk	4,627
Do	At Mechanicsville	*f* 4,500
Do	At Fort Edward	*f* 2,800
Do	At Hadley *g*	*f* 1,092
Indian Lake *e*	At gaging station	146
Lake Neatahwanta *a*	At mouth of outlet	23
Mohawk River	At mouth	*b* 3,468
Do	At Rexford Flats *d*	*b* 3,385
Do	At Schenectady *d*	3,212
Do	At Little Falls *d*	*b* 1,306
Do	At Ridge Mills *d*	*b* 153
Moose River	At mouth	406
Do	At cable station	346
Ninemile Creek *c*	At mouth	*b* 74
Do	At gaging station	*b* 63
Oneida Creek	At mouth	*b* 149
Do	At Kenwood *d*	*b* 59
Oneida River	At mouth	*b* 1,402
Oriskany Creek *c*	do	*b* 146
Do	At State dam *d*	*b* 144
Oswego River	At mouth	5,002
Do	At high dam	5,000
Do	At cable station	4,990
Do	At Fulton	4,916
Do	Below Three River Point	*b* 167
Sacandaga River *e*	At mouth	*b* 1,056
Salmon River	At bridge station	264
Do	One mile above falls	*b* 191
Sauquoit Creek *c*	At mouth	67
Do	At gaging station	52
Schoharie Creek *c*	At mouth	*b* 947
Do	At Fort Hunter *d*	*b* 947
Do	At Mill Point *d*	934
Do	At Schoharie Falls *d*	930
Schroon River	At gaging station	563
Seneca River	At mouth	*b* 3,433
Do	At Baldwinsville *d*	*b* 3,103
West Canada Creek *c*	At mouth	569
Do	At Middleville *d*	518
Do	At Trenton Falls	375
Do	At Twin Rock Bridge *d*	252

a Oswego River tributary.
b United States Board of Engineers on Deep Waterways.
c Mohawk River tributary.
d Gaging station.
e Hudson River tributary.
f Upper Hudson storage surveys.
g Not including Schroon River.

MOHAWK RIVER GAGING STATIONS.

Gaging records have been kept on this stream at the following dams and mills: Rome waterworks pumping station at Ridge Mills, lower dam at Little Falls, New York State dam at Rexford Flats, and West Troy Company's dam at Dunsbach Ferry. A current-meter station at Freeman's bridge, below Schenectady, has also been maintained.

An important series of gagings has also been instituted on Mohawk River by the New York State canal survey, under the direction of Edward A. Bond, State engineer and surveyor. A statement regarding these gagings has been furnished by Mr. D. J. Howell, consulting engineer of the New York State canal survey. Gages have been erected at various places along the stream, from Herkimer to the confluence of the river with Hudson River at Cohoes, both above and below each dam and near the points of inflow of the more important tributaries, and the positions of the gage zeros have been determined with reference to mean tide as a datum. Gages previously maintained by the United States Geological Survey have been used wherever available. Observers are employed to take simultaneous daily readings of the gages, from which the slope of the water surface for each level or division will be determined and the velocity of flow computed. It is the intention to take cross sections of the stream channels in each level, at different stages, and to make current-meter or other discharge measurements during high water.

The regimen of Mohawk River during the navigation season is undoubtedly influenced to a large extent by the Erie Canal, which runs parallel to it from Rome to Cohoes. The water supply of the Erie Canal east of the summit level at Rome is, with a single exception, derived from Mohawk River and its tributaries. The State dams and feeders are located as follows:

Location of State dams and feeders.

Stream.	Location.
Mohawk River	Delta, 6 miles above Rome.
Do	Rome.
Oriskany Creek	Oriskany.
Mohawk River	Little Falls.
Do	Fivemile or Rocky Rift dam.
Schoharie Creek	Fort Hunter.
Mohawk River	Rexford Flats.

A large diversion from the watershed at these feeders is in some measure counterbalanced by return water to the main channel, from seepage through canal and feeder banks, and from flow over wasteweirs.

The gaging records at Rexford Flats and at Little Falls indicate that during the navigation season the yield of the watershed, in second-feet per square mile, and frequently, also, the actual flow of the river, in second-feet, is considerably less at the former station than at the latter station. The drainage area above Rexford Flats is 3,385 square miles, or 2.6 times that at Little Falls, which is 1,306 square miles. This fact appears to be confirmed by the other gaging records kept on the stream, but the results of these have not been sufficiently worked up to permit a final discussion of the subject at this time. The diminished water-yielding capacity of the lower Mohawk Basin may be attributed in part to the low water of Schoharie Creek. The total drainage area of that creek is 947 square miles. Weir measurements at Schoharie Falls show that the flow sometimes falls below 50 second-feet. During practically the entire summer no water flows over the crest of the State dam at Fort Hunter; the major portion of the flow is diverted to the Erie Canal feeder, and the remainder leaks through the dam. During the summer of 1900, from June to October, inclusive, the direct inflow to the Mohawk from this tributary did not, with the exception of a few days, exceed 45 second-feet, or 0.05 second-foot per square mile.

MOHAWK RIVER AT RIDGE MILLS, NEW YORK.

A description of this station will be found in Water-Supply Paper No. 35, page 45. During the present season (1900) the calculated discharge of the turbines has been made to depend on current-meter measurements, instead of on the observed wheel-gate openings, as formerly.

Table showing relation of speed of pumps to water flowing in tailrace.

Date.	Speed of pumps.	Measured flow in tailrace.
1900.	*Rev. per min.*	*Second-feet.*
May 29	15	122
August 23	12	95

The discharge of the turbines is sensibly proportional to the rate at which the waterworks pumps which they drive are run, and a straight-line diagram has been prepared, using the foregoing data, from which the flow through the turbines has been estimated.

On August 23, when no water was flowing over the crest, a measurement of the leakage of the dam was made in the stream channel below; it was found to be 20 second-feet, and an allowance of that amount has been made in estimating the daily flow. The results of other meter measurements at this station, and in the vicinity, will be found in the table on page 39.

The gaging record at Ridge Mills does not include any allowance for diversion to Black River Canal at the Delta feeder, 4 miles upstream, nor for return water from seepage and wasteweirs.

Daily discharge, in second-feet, of Mohawk River at Ridge Mills, New York, for 1898.

[Drainage area, 153 square miles.]

Day.	Oct. *a*	Nov. *a*	Dec. *a*	Day.	Oct. *a*	Nov. *a*	Dec. *a*
1	154	269	123	18	215	294	169
2	149	249	144	19	199	294	144
3	133	215	133	20	249	304	159
4	127	199	133	21	215	279	342
5	143	215	169	22	999	369	609
6	249	249	184	23	859	697	974
7	199	369	144	24	794	409	639
8	173	259	169	25	519	294	419
9	159	249	169	26	609	215	344
10	149	1,134	154	27	1,251	191	319
11	143	2,134	184	28	574	199	159
12	149	697	184	29	409	134	219
13	154	515	121	30	539	104	324
14	259	439	136	31	314	......	644
15	889	371	159				
16	349	359	159	Mean	369	401	261
17	319	315	154				

a Revised figures.

Daily discharge, in second-feet, of Mohawk River at Ridge Mills, New York, for 1899.

Day.	Jan. *a*	Feb. *a*	Mar. *a*	Apr. *a*	May. *a*	June.	July.	Aug.	Sept.	Oct.	Nov. *a*	Dec. *a*
1	316	214	351	364	321	337	262	218	......	93	515	225
2	243	214	394	319	319	319	252	233	......	203	515	695
3	296	214	366	254	239	279	232	248	......	233	345	395
4	298	214	306	311	204	259	249	131	......	253	295	345
5	2,373	199	176	344	176	214	202	146	......	200	365	295
6	896	164	1,074	391	151	232	127	131	......	310	295	295
7	409	123	735	439	102	232	262	126	......	290	265	275
8	316	166	414	1,264	94	262	322	121	......	260	295	235
9	299	126	346	1,034	129	259	669	125	85	290	295	235
10	219	129	219	686	138	279	499	129	85	310	245	235
11	164	129	254	799	344	249	379	139	85	340	315	315
12	157	129	1,174	1,364	414	282	359	169	95	260	295	3,625
13	157	129	1,211	1,499	296	282	339	265	89	310	265	1,155
14	153	173	701	2,181	361	302	339	245	85	260	265	510
15	911	265	364	1,744	214	402	319	275	99	310	265	455
16	725	258	321	1,841	161	399	399	295	115	240	265	365
17	459	184	239	1,364	389	359	319	230	135	220	295	295
18	324	126	219	1,654	361	339	399	230	112	290	295	295
19	223	166	274	2,226	549	282	382	245	85	290	265	1,075
20	199	151	581	2,034	614	279	339	245	79	290	245	1,495
21	193	160	464	1,404	436	262	302	265	79	240	245	1,095
22	208	494	364	1,264	319	259	382	295	56	260	265	315
23	214	697	389	1,139	274	299	299	272	56	260	265	315
24	261	389	436	959	239	259	282	289	56	310	265	345
25	338	346	416	766	219	259	275	262	60	540	295	315
26	318	296	344	614	204	259	262	269	69	220	265	285
27	244	436	274	549	189	249	289	309	69	310	265	285
28	223	451	241	439	386	249	165	309	53	340	265	285
29	208	......	536	354	1,136	249	133	278	53	360	205	285
30	170	......	436	319	546	229	178	315	79	260	205	75
31	170	......	436	......	344	......	178	200	......	260	......	75
Mean	377	244	467	997	320	281	310	226	81	278	291	532

a Revised figures.

Daily discharge, in second-feet, of Mohawk River at Ridge Mills, New York, for 1900.

Day.	Jan.*a*	Feb.	Mar.	Apr.	May.*b*	June.*b*	July.*b*	Aug. *b*	Sept.*b*	Oct.*b*	Nov.
1	270	200	784	810	130	168	125	104	155	175	395
2	270	132	815	1,080	130	216	115	120	115	185	365
3	270	100	750	1,245	130	285	105	120	109	165	340
4	290	180	630	1,135	130	230	105	92	105	113	340
5	310	100	280	1,065	130	180	160	90	112	115	460
6	310	248	224	1,245	130	168	158	104	112	113	1,970
7	340	128	354	2.205	130	215	175	84	112	115	965
8	1,115	125	359	1,845	130	180	170	84	104	111	835
9	475	1,628	320	1,070	130	230	112	107	85	113	705
10	530	1,128	300	740	130	230	110	100	100	127	725
11	475	854	280	680	130	185	120	88	100	118	725
12	420	738	219	930	125	180	150	154	107	118	640
13	415	3,162	254	930	100	180	137	365	92	109	620
14	305	1,928	254	835	100	215	130	458	95	102	645
15	305	1,058	219	900	100	165	100	364	115	395	580
16	265	618	164	1,485	105	155	100	88	115	395	580
17	265	578	149	1,685	210	158	160	84	215	395	620
18	345	284	159	3,375	210	180	140	80	325	109	640
19	365	202	169	1,805	147	165	163	84	118	90	1,550
20	1,365	188	544	935	147	170	165	92	179	90	1,760
21	1,535	198	590	930	130	170	250	98	625	95	1,480
22	875	288	594	1,235	130	165	185	124	615	95	965
23	655	803	594	930	112	185	125	97	415	95	965
24	285	714	370	675	105	205	132	84	435	895	735
25	365	268	164	555	105	140	515	165	395	415	1,665
26	480	172	160	365	105	145	270	165	205	395	3,990
27	285	202	164	365	105	123	198	120	175	410	(*c*)
28	265	132	160	315	105	180	175	185	127	395	------
29	270	------	164	275	110	130	180	125	185	345	------
30	270	------	116	225	105	124	107	124	205	95	------
31	270	------	112	------	105	------	117	179	------	95	------
Mean	160	581	336	1,062	126	180	160	140	198	212	971

a Record doubtful; owing to ice on crest of dam.
b Record doubtful; flashboards changed frequently.
c Dam and gage injured in flood.

ORISKANY CREEK AT ORISKANY, NEW YORK.

A description of this station, as well as of a second station which was maintained for a time at Coleman, on the same stream, will be found in Water-Supply Paper No. 35, page 47. The Oriskany station is located at the New York State dam. During the summer the entire flow, less leakage, is ordinarily diverted to the canal feeder. H. Waterbury & Company's dam, located just below the State dam, backs water above the toe of the latter dam, so that direct measurements of the leakage of the State dam can not readily be made. During the winter and spring the flow of the river is available for power from the lower dam, but during the season of navigation the inflow to the river from this tributary amounts to only a few second-feet. The computed flow at the gaging station represents the total outflow from the pond above the State dam, and includes water diverted from Chenango River through the channel of Oriskany Creek to feed Erie Canal. A record is kept of the height of water in the pond above the dam, and also of that in the feeder channel below the head gates. The observed difference, or the head on the feeder gates, together with the area of the gate openings, have been used in the formula for discharge through submerged orifices to determine the flow. A screen rack in the forebay, just above the feeder gates, often becomes clogged with drift, causing a loss of head of several inches. In order that the correct head on the feeder gates might be obtained, at the beginning of the navigation season of 1900 a gage was placed in the forebay between the screen rack and the feeder gates.

Current-meter measurements have been made in the Oriskany feeder, as follows:

Current-meter measurements in Oriskany feeder.

Date.	Hydrographer.	Measured discharge.	Computed discharge.
		Second-feet.	*Second-feet.*
October 15, 1898	W. D. Lockwood	49.5	48.9
Do	do	118.9	119.1
April 28, 1900	R. E. Horton	167.9	170.3
May 29, 1900	do	103.2	

During the dry season the gateways leading to the feeder are wide open and the water flows through unobstructed, as in an open channel, so that the formula for discharge through orifices can not be applied.

In this connection the difficulties encountered in gaging the flow in canal feeders are worthy of comment. Broadly speaking, the amount of water required for the supply of canals is proportional to lockage and evaporation jointly, with, perhaps, a constant factor added for seepage losses. As a matter of fact, however, the rate of flow in the feeder often fluctuates, within wide limits, several times a day. Usually gates are placed in both the inlet and the outlet ends of the feeder channel. The height of the water in the feeder is influenced by the height of the water in the canal and in the supply pond above, while the velocity of flow may be varied by changes in the gate openings at either end. Isolated discharge measurements are of value in a general way, but it may be said that nothing short of a continuous record, both of the stage of the water in the feeder and of its velocity of flow, will serve to determine the actual diversion from day to day.

Daily discharge, in second-feet, of Oriskany Creek at Oriskany, New York, for 1898.

[Drainage area, 144 square miles.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1		329	266	18	212	304	160
2		298	259	19	231	310	220
3		274	428	20	266	392	195
4		276	413	21	248	359	300
5		266	457	22	328	263	380
6		269	445	23	350	300	825
7		267	445	24	316	324	410
8		236	462	25	230	278	355
9		284	393	26	330	253	210
10		370	388	27	564	502	150
11		740	425	28	457	335	100
12		370	460	29	403	309	235
13		365	346	30	339	254	235
14		333	160	31	336		285
15		352	150				
16	338	311	300	Mean	325	327	327
17	248	304	280				

Daily discharge, in second-feet, of Oriskany Creek at Oriskany, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	180	157	495	180	238	90	......	206	83	180	320	90
2	180	167	355	170	144	80	......	206	87	138	175	103
3	195	150	425	160	139	80	......	167	73	108	115	73
4	220	177	460	260	139	80	......	126	10	99	138	108
5	220	167	910	390	129	80	......	126	75	119	144	80
6	250	217	650	425	124	80	138	177	108	132	346	107
7	285	230	410	525	122	80	184	177	101	122	374	99
8	220	243	300	1,270	122	80	170	195	133	138	429	40
9	260	277	240	770	124	80	104	195	176	95	364	30
10	220	277	215	600	124	80	110	195	180	58	394	10
11	255	343	175	490	28	89	117	195	159	106	634	45
12	255	343	645	1,220	28	94	124	195	95	97	534	340
13	410	364	490	1,440	25	89	124	195	73	92	564	330
14	505	343	340	1,160	25	94	124	195	87	26	584	80
15	550	364	280	910	30	104	124	206	85	72	564	65
16	505	337	255	625	105	101	208	206	89	45	484	80
17	380	343	200	370	122	94	208	206	115	106	524	40
18	315	337	230	340	134	113	197	206	123	58	584	65
19	255	304	355	290	139	113	183	206	119	71	202	250
20	260	297	370	260	120	113	183	206	138	48	53	130
21	290	390	330	230	140	113	270	206	161	82	124	110
22	270	410	285	130	160	113	270	206	129	73	154	50
23	290	404	355	50	140	118	270	206	162	85	174	50
24	290	303	280	50	115	118	196	206	102	88	214	70
25	260	287	285	50	115	118	196	206	112	70	174	50
26	285	297	240	416	159	118	196	194	181	70	438	40
27	305	367	220	406	144	118	196	184	222	54	318	30
28	340	244	215	120	139	113	196	184	216	158	318	35
29	305	......	205	335	139	113	196	184	185	72	582	30
30	290	......	190	325	129	113	196	98	206	55	789	65
31	300	......	190	....	134	......	196	98	......	115	......	70
Mean	295	291	342	466	119	99	180	186	126	91	360	89

Daily discharge, in second-feet, of Oriskany Creek at Oriskany, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	64	139	254	1,318	238	95	110	100	82	70	186	250
2	133	212	786	1,391	192	95	110	100	74	70	191	205
3	81	326	876	1,046	163	95	110	100	76	70	136	185
4	96	286	776	546	163	95	110	100	84	70	117	175
5	41	416	736	426	144	95	110	100	66	70	122	607
6	76	302	398	916	183	95	140	100	81	70	73	427
7	54	218	756	896	161	95	88	100	85	70	95	330
8	101	302	454	596	163	97	73	100	85	175	101	285
9	54	1,871	366	308	136	95	104	100	61	66	105	205
10	114	596	302	206	133	95	101	100	73	63	35	177
11	56	416	218	194	150	95	107	100	73	75	185	202
12	96	139	163	286	70	95	105	100	61	75	151	147
13	51	3,116	157	316	105	95	105	100	70	75	106	292
14	68	454	157	254	94	95	105	124	70	75	113	142
15	81	248	139	212	105	95	105	107	70	78	136	112
16	133	139	133	206	118	95	105	103	70	84	96	157
17	145	114	127	470	144	95	105	100	70	81	113	202
18	114	76	76	1,090	171	95	105	100	70	78	114	217
19	546	60	170	427	156	95	107	100	70	80	81	217
20	1,376	81	696	315	148	95	105	100	70	80	127	337
21	576	127	496	212	161	95	107	100	70	75	127	277
22	721	170	294	877	115	95	124	100	70	75	78	242
23	176	236	326	379	113	95	105	100	70	77	158	272
24	91	96	386	260	113	95	105	100	70	83	161	1,172
25	481	91	254	239	113	95	114	100	70	75	430	427
26	156	56	236	235	113	95	110	100	70	75	2,592	242
27	51	170	183	201	113	95	112	110	70	103	857	217
28	106	133	227	283	113	97	108	132	75	100	342	172
29	91	......	286	282	113	95	33	111	85	100	242	172
30	114	......	686	272	113	95	32	100	85	100	297	192
31	156	......	846	......	113	95	30	100	......	191	......	177
Mean	199	378	386	488	136	95	100	103	73	85	255	272

SAUQUOIT CREEK AT NEW YORK MILLS, NEW YORK.

A description of this station will be found in Water-Supply Paper No. 35, page 48. During the summer little water flows over the dam, the entire volume being used to drive the water wheels in the adjoining cotton mills. The leakage of the dam was measured by current meter on May 31, and was found to be 5.6 second-feet.

This station was discontinued October 1, 1900.

Daily discharge, in second-feet, of Sauquoit Creek at New York Mills, New York, for 1898.

[Drainage area, 52 square miles.]

Day.	Sept.	Oct.	Nov.	Dec.
1	......	16	42	49
2	......	*7	43	44
3	......	27	38	34
4	......	18	36	*50
5	......	31	32	46
6	......	54	*59	42
7	......	35	38	44
8	......	23	36	49
9	......	*23	38	42
10	......	35	132	28
11	......	52	140	*22
12	......	46	58	42
13	......	46	*69	42
14	......	46	62	36
15	......	144	52	37
16	......	*80	49	42
17	......	105	49	34
18	......	105	49	*30
19	......	60	43	42
20	18	36	*95	33
21	26	38	46	76
22	18	42	61	104
23	16	*73	69	288
24	22	71	76	99
25	*37	48	42	*76
26	30	59	66	62
27	40	140	*62	46
28	40	74	36	44
29	30	68	43	38
30	21	*66	42	74
31	......	57	......	52
Mean	27	56	57	57

* Sunday.

Daily discharge, in second-feet, of Sauquoit Creek at New York Mills, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	*72	42	77	45	56	42	12	17	18	(*)	53	19
2	158	36	48	*40	50	34	(*)	11	5	29	42	13
3	58	38	48	57	48	18	27	43	(*)	24	21	*23
4	111	18	42	73	36	*30	10	30	......	21	26	32
5	140	*40	*480	104	33	42	30	12	33	15	*29	22
6	74	36	109	165	28	56	27	(*)	32	16	32	26
7	50	36	72	188	*26	48	18	26	6	8	22	26
8	*13	26	73	47	47	39	16	25	21	*13	24	19
9	58	30	62	*156	35	23	*25	22	12	18	24	12
10	38	21	60	100	26	34	31	......	(*)	18	19	*14
11	30	6	85	144	30	*13	30	25	22	18	29	16
12	36	*65	*300	160	50	28	27	14	19	18	*29	72
13	54	35	87	585	25	20	19	(*)	19	16	29	64
14	41	35	85	350	*9	19	22	25	8	7	24	38
15	*185	29	82	253	47	30	13	22	5	*13	24	32
16	57	29	71	*228	36	34	*30	18	15	18	21	35
17	68	33	50	122	52	38	23	5	(*)	15	24	*35
18	48	37	43	118	47	*7	27	18	19	16	21	38
19	30	*13	*447	119	51	30	27	5	19	18	*24	32
20	36	48	80	98	52	30	19	(*)	13	14	26	42
21	42	58	65	90	*12	23	11	22	14	12	26	54
22	*13	409	87	53	52	21	3	19	21	*18	26	35
23	48	100	90	*86	35	25	(*)	16	10	24	25	32
24	52	62	90	59	36	23	27	5	(*)	18	21	*30
25	44	50	55	80	29	*23	30	15	22	22	18	25
26	44	*65	*95	76	33	26	22	10	15	19	*22	32
27	42	173	69	58	20	20	27	(*)	22	15	24	28
28	14	62	79	54	*40	19	11	22	13	7	24	16
29	*59	......	76	43	42	20	14	30	18	*19	21	19
30	36	......	71	*50	42	21	(*)	18	10	32	21	13
31	30	......	78	......	43	......	27	5	......	26	......	*14
Mean	58	58	111	127	38	23	20	16	14	17	26	29

* Sunday.

Daily discharge, in second-feet, of Sauquoit Creek at New York Mills, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	86	87	69	*207	81	42	*5	23	27
2	46	77	81	337	81	20	38	23	*5
3	46	97	35	267	81	*29	38	34	5
4	40	*45	*21	135	87	42	5	10	23
5	40	69	81	135	30	42	38	*5	23
6	17	72	74	91	*43	35	86	30	17
7	*25	67	89	269	87	29	34	23	20
8	50	147	89	*207	81	40	*9	23	26
9	36	495	86	103	81	24	65	20	*5
10	42	65	38	87	74	*17	65	17	23
11	40	*67	*17	87	77	42	28	15	37
12	46	172	74	113	41	46	32	*5	5
13	18	1,413	74	95	*55	41	32	23	5
14	*9	130	68	87	87	25	22	20	10
15	50	92	68	*135	65	32	*5	17	17
16	43	68	63	85	26	24	42	20	*5
17	50	37	42	207	35	*5	35	20	13
18	50	*55	*13	297	35	29	35	37	17
19	306	74	68	170	24	41	28	*5	17
20	272	68	371	95	*29	38	32	30	17
21	*117	68	95	193	35	38	33	18	17
22	92	379	93	*295	35	25	*5	20	13
23	97	392	93	95	35	27	38	17	*9
24	115	34	55	103	35	*5	38	17	13
25	95	*13	*67	91	35	32	48	18	17
26	65	80	89	87	14	38	42	*5	13
27	22	47	68	87	*33	25	32	30	17
28	*68	74	87	49	28	32	22	37	13
29	83	....	86	*55	22	57	*5	35	13
30	91	....	199	91	5	33	38	35	*5
31	63	....	165	....	35	....	35	37	....
Mean	72	146	84	138	49	32	32	22	15

* Sunday.

WEST CANADA CREEK AT TWIN ROCK BRIDGE, NEW YORK.

Twin Rock Bridge crosses West Canada Creek 2 miles above Hinckley, at practically the point of emergence of the stream from the Adirondacks. The bridge is of iron, has two spans, and is 167.5 feet long between abutments. The stream bed is of gravel and rock, and the conditions are unusually favorable for a current-meter station. A gage board was set and a record commenced on September 7, 1900. The gage is read at 7 a. m. and at 6 p. m. each day, and the average of the two daily readings is given in the appended table. A current-meter measurement made on September 7 showed the discharge to be 182 second-feet. The gage reading was 0.37 foot.

The record at Twin Rock Bridge is kept by the Utica Electric Light and Power Company. This company is erecting a power plant at Trenton Falls, 4 miles farther downstream. A concrete dam has been constructed, which will give a head of 265 feet on the turbines, which are of special design. It is the intention, after the plant is completed, to keep a continuous record of the amount of water used by the turbines and of the flow over the spillways.

The drainage areas at the different gaging stations are as follows:

Drainage areas of West Canada Creek.

	Square miles.
At mouth	569
At Middleville	519
At Trenton Falls	375
At Twin Rock Bridge	252

Daily gage height, in feet, of West Canada Creek at Twin Rock Bridge, New York, for 1900.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		0.85	0.90	1.60	17	0.45	1.05	1.50	1.50
2		.75	1.60	1.85	18	.30	1.00	1.80	1.50
3		.65	1.10	2.00	19	.30	.95	5.50	1.50
4		.70	1.05	1.90	20	1.65	1.15	5.30	1.50
5		.60	1.15	1.75	21	2.90	.62	5.30	1.50
6		.55	1.70	1.55	22	2.35	.60	4.45	1.50
7		.65	4.55	1.40	23	1.50	2.30	3.75	1.75
8		.85	4.25	1.40	24	.95	2.45	2.00	1.70
9	0.35	.75	3.05	1.50	25	1.10	1.75	6.25	1.65
10	.32	.90	1.45	1.50	26	.90	1.70	6.20	1.60
11	.35	.85	2.05	1.50	27	.95	2.55	4.40	1.55
12	.32	.70	1.90	1.50	28	1.00	1.95	3.55	1.50
13	.35	.60	1.55	1.50	29	.85	1.15	1.90	1.50
14	.35	1.25	1.60	1.50	30	.90	1.20	1.70	
15	.38	1.30	1.50	1.50	31		1.50		
16	.78	1.10	1.50	1.50					

WEST CANADA CREEK AT MIDDLEVILLE, NEW YORK.

A description of this station will be found in Water-Supply Paper No. 35, page 49. In the past the principal element of uncertainty with regard to this record was considered to be the leakage of the dam, etc., which had been taken at 50 second-feet. Current-meter measurements were made on September 10, 1900, to determine the leakage of the dam and the low-water flow of the stream at this station, with the following results:

	Second-feet.
Highway bridge below dam, measured flow in main stream channel	113
Measured flow in hydraulic canal	132
Total flow by current-meter measurements	245

The calculated flow from the gage record is as follows:

	Second-feet.
Flow over dam, gage reading 0.67 foot	60
Leakage previously estimated	50
Total flow in main channel	110
Calculated diversion to water wheels	131
Total estimated flow	241

Unfortunately no current-meter measurements to check the calculated flow during high water have been made. The highest water observed was in August, 1898, when it reached a depth of 5.5 feet on the crest of the Middleville dam. The discharge at that time can not accurately be estimated, as a part of the water flowed around the end of the dam and passed overland to the stream channel below. High-water marks at the Newport dam indicate that the spring freshet discharge has been as great as 22,000 second-feet, or 46.6 second-feet per square mile, from a drainage area of 472 square miles. The lowest water in this stream occurs on Sundays, when the flow is held back, as pond storage, by dams above Middleville. Aside from this, the most notable low-water period was September 2 to 12, inclusive, 1899, the mean flow at Middleville for eleven days being 183 second-feet per square mile.

Daily discharge, in second-feet, of West Canada Creek at Middleville, New York, for 1898.

[Drainage area, 519 square miles.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	....	777	650	18	968	752	*1,349
2	....	670	580	19	783	800	1,374
3	....	584	580	20	689	*970	1,469
4	....	595	*539	21	737	904	1,288
5	....	450	589	22	981	801	1,614
6	....	*550	651	23	*1,894	990	2,072
7	1,662	911	588	24	1,758	983	2,083
8	407	626	465	25	1,299	775	*1,739
9	*404	711	483	26	1,055	602	1,425
10	398	1,679	624	27	2,436	*740	1,181
11	447	4,240	*519	28	2,554	1,224	892
12	461	4,163	531	29	1,580	679	711
13	481	*2,410	552	30	*1,129	713	1,082
14	569	1,318	742	31	979	....	1,492
15	2,152	1,071	1,123				
16	*1,894	788	1,362	Mean	1,161	1,110	1,024
17	1,263	816	1,413				

* Sunday.

Daily discharge, in second-feet, of West Canada Creek at Middleville, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	*1,216	1,135	1,563	821	2,979	1,114	198	273	257	*480	1,281	330
2	1,241	1,205	1,354	*523	4,760	763	*140	292	191	510	2,867	580
3	1,378	1,335	1,208	620	2,696	593	200	345	*145	470	1,744	*710
4	1,376	1,340	1,191	622	2,735	*550	116	316	145	436	1,199	710
5	3,445	*1,292	*1,348	680	1,926	531	240	237	210	337	*1,040	518
6	3,500	1,203	1,635	680	1,455	480	240	*155	205	253	831	540
7	1,858	1,101	1,835	748	*1,238	294	256	286	195	288	469	1,750
8	*1,315	1,172	1,207	1,697	1,187	314	204	262	219	*190	542	1,670
9	1,173	937	942	*1,503	2,170	258	*675	256	169	232	482	840
10	782	1,535	812	1,601	1,422	182	993	242	*145	220	390	*700
11	462	1,350	751	1,588	1,073	*130	807	246	188	234	420	640
12	786	*1,690	*1,340	2,230	1,189	283	443	214	201	210	*410	3,150
13	1,119	1,418	1,724	2,465	1,003	297	445	*125	221	239	342	4,710
14	1,132	1,227	1,632	3,228	*995	248	343	254	205	219	313	2,530
15	*1,615	1,666	1,181	3,582	1,196	753	236	216	204	*140	372	740
16	1,760	2,640	1,071	*3,513	888	839	*430	253	189	241	343	840
17	1,771	2,500	814	3,549	1,143	499	600	239	*145	238	363	*640
18	1,102	2,111	944	3,751	1,064	*320	560	235	197	235	372	1,060
19	621	*2,410	*1,060	4,477	1,183	339	479	174	208	217	*220	1,880
20	519	1,562	1,175	5,717	1,633	331	345	*110	213	152	337	3,520
21	563	1,816	1,555	5,564	*1,240	373	327	221	239	261	310	2,530
22	*535	1,966	1,412	5,381	1,274	346	225	245	238	*190	363	1,400
23	568	2,044	1,179	*6,083	996	263	*140	257	204	245	293	990
24	616	1,764	1,180	5,956	884	203	241	229	*145	225	273	*1,150
25	701	1,660	1,203	5,904	844	*155	241	254	209	238	273	900
26	763	*1,490	*1,313	6,994	801	283	241	183	476	231	*249	840
27	640	1,564	764	6,208	728	273	244	*110	433	267	312	580
28	626	1,444	795	5,779	*810	280	239	255	248	224	292	540
29	*605	....	762	4,969	1,255	308	171	247	213	*965	310	640
30	818	....	685	*4,513	1,179	275	*115	262	386	1,040	310	540
31	1,010	....	758	....	1,191	....	234	269	....	629	....	*860
Mean	1,150	1,594	1,176	3,365	1,456	397	324	235	221	324	577	1,259

* Sunday.

Daily discharge, in second-feet, of West Canada Creek at Middleville, New York, for 1900.

Day.	Jan.	May.*a*	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	824	....	415	*320	362	457	470	450	1,517
2	722	....	358	338	450	*320	469	320	*1,232
3	984	....	*530	381	450	459	426	285	1,025
4	1,001	....	490	330	315	453	401	*270	1,175
5	1,219	....	524	299	*190	464	336	270	1,325
6	1,227	....	522	289	249	494	219	340	1,325
7	*1,240	....	491	358	235	534	*193	360	1,044
8	1,244	....	557	*500	206	421	369	880	1,030
9	1,156	....	676	523	205	*280	467	1,010	*818
10	1,106	1,667	*480	448	168	401	404	1,010	677
11	972	1,643	536	454	200	393	339	*700	573
12	937	1,228	495	538	*363	324	327	580	483
13	930	*1,429	420	442	437	278	330	430	483
14	*965	1,037	412	350	971	270	*280	430	483
15	1,011	1,281	368	*320	1,021	176	576	430	399
16	1,051	1,069	341	439	1,516	*136	726	340	*390
17	1,068	1,127	*284	424	541	227	646	340	413
18	1,442	1,268	332	517	490	266	466	*410	413
19	2,440	1,205	389	523	*370	282	466	580	463
20	1,485	*1,362	334	487	415	291	324	1,430	502
21	*2,680	959	281	547	344	321	*170	2,900	564
22	2,403	744	316	*530	327	818	290	2,630	559
23	2,006	637	298	488	269	*947	299	2,340	*560
24	2,874	595	*284	349	258	940	778	1,900	812
25	2,396	544	273	511	398	608	958	*3,120	942
26	2,093	437	219	636	*320	574	727	5,920	898
27	2,394	*390	306	567	506	464	461	5,670	900
28	*730	466	326	445	551	364	*460	2,900	900
29	870	423	520	*373	674	286	464	1,980	900
30	780	380	431	481	599	*320	454	1,665	*1,020
31	530	413	....	386	534	....	594	....	955
Mean	1,366	924	406	451	463	419	448	1,536	800

a No record for February, March, and April.
* Sunday.

MOHAWK RIVER AT LITTLE FALLS, NEW YORK.

This gaging station, which has been described in Water-Supply Paper No. 35, page 51, is located at the lower (Gilbert's) dam at Little Falls. Current-meter measurements have been made to check the calculated flows, with very satisfactory results. They are as follows:

		Second-feet.
October 20 to 21, 1898, at suspension bridge 2 miles below Little Falls, W. D. Lockwood, hydrographer:		
Total flow by current meter		1,758
Computed flow (mean of two days)		1,733
May 1, 1900, at suspension bridge 2 miles below Little Falls, R. E. Horton, hydrographer:		
Total flow by current meter		4,773
Computed flow over dam	4,060	
Computed diversion to Gilbert's mill	183	
Computed diversion to paper mill	556	
Total computed flow		4,799
May 23, 1900, at Astronga Bridge, Little Falls, R. E. Horton, hydrographer:		
Total flow by current meter		1,567
Computed flow over dam	950	
Computed diversion to Gilbert's mill	176	
Computed diversion to paper mill	405	
Total computed flow		1,531

Diversion to paper mill, September 19, 1900:

Metered flow in headrace	302
Computed flow through turbines, etc	288

There are three dams at Little Falls. The two lower are used for water-power development; the upper one is a State dam, diverting water for the supply of Erie Canal. The gage record kept at the lower dam shows the amount of water flowing downstream from Little Falls, but does not include the diversion at the State dam above the gaging station, and hence does not represent the total yield or inflow from the tributary drainage area of 1,306 square miles.

Current-meter measurements were made in the feeder channel below the State dam, as follows:

Current-meter measurements in feeder channel below State dam.

Date.	Measured diversion.
1900.	*Second-feet.*
May 23	143
September 19	179

Adding the foregoing amounts to the mean daily flow at Gilbert's dam for the same dates, we obtain the following:

Volumes of inflow and outflow at Little Falls diversion.

Date.	Total inflow at Little Falls.	Outflow in main channel.
1900.	*Second-feet.*	*Second-feet.*
May 23	1,596	1,453
September 19	693	514

Water is again diverted to the canal at Fivemile dam, below Little Falls. On November 3, 1900, the measured flow in this feeder, at Lansing's farm bridge, was 236 second-feet.

High water occurred at Little Falls as follows:

High water at Little Falls.

Date.	Depth of water on crest of dam.	Volume.	
	Feet.	*Second-feet.*	*Sec.-ft. per sq. mile.*
April 15, 1899	7.33	13,000	10.0
April 20, 1900	8.21	15,240	11.7

The most notable low-water period was August 3 to August 10, inclusive, 1899, the mean flow for eight days being only 120 second-feet, or 0.07 second-foot per square mile.

Daily discharge, in second-feet, of Mohawk River at Little Falls, New York, for 1898.

[Drainage area, 1,306 square miles.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	....	1,121	2,261	1,499	18	....	2,265	2,220	*1,173
2	....	*916	1,880	1,547	19	....	1,699	2,399	1,499
3	....	849	1,790	1,451	20	....	1,745	*2,878	1,499
4	....	895	1,560	*1,173	21	....	1,722	2,771	1,834
5	....	2,083	1,345	1,553	22	....	2,646	2,361	2,909
6	....	1,627	*1,501	1,763	23	1,125	*4,096	2,794	4,734
7	....	1,558	1,946	1,639	24	3,484	4,339	2,694	5,279
8	....	1,179	2,040	1,269	25	*4,093	3,240	2,538	*4,708
9	....	*916	1,700	969	26	2,718	2,574	1,950	3,759
10	....	900	4,420	1,462	27	2,445	6,290	*1,473	2,209
11	....	867	9,433	*1,508	28	2,220	6,188	1,137	1,899
12	....	915	7,925	1,709	29	1,615	5,121	1,412	1,499
13	....	1,028	*6,728	1,409	30	1,320	*3,246	1,562	1,929
14	....	1,040	5,245	1,259	31	....	2,628	....	3,979
15	....	5,490	3,520	1,309					
16	....	*5,026	2,891	1,259	Mean	2,378	2,493	2,891	2,036
17	....	3,081	2,370	1,434					

Sunday.

Daily discharge, in second-feet, of Mohawk River at Little Falls, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	*2,854	941	3,258	3,041	6,360	1,957	569	506	278	*704	2,829	2,096
2	1,796	906	3,154	*2,519	6,708	1,610	*493	506	271	651	6,600	1,709
3	1,846	861	2,304	2,329	5,619	1,321	359	135	*30	651	4,738	*1,962
4	1,936	884	2,298	2,536	3,925	*1,075	424	136	396	491	3,081	2,175
5	6,821	*646	*3,408	2,387	2,905	1,466	490	166	545	534	*3,262	2,097
6	7,440	1,063	5,544	4,297	2,339	1,216	663	*000	382	399	2,847	1,668
7	5,886	983	5,544	4,637	*1,560	1,016	627	133	272	240	1,908	1,468
8	*4,269	983	5,154	7,212	1,801	1,062	651	131	275	*160	1,718	1,588
9	4,377	846	4,534	*6,759	1,571	962	*1,660	131	211	357	1,628	1,630
10	2,529	803	3,054	7,079	1,470	764	2,593	130	*7	297	1,451	*1,016
11	1,467	871	2,572	6,729	1,469	*1,176	1,800	316	273	274	717	2,779
12	1,378	*789	*3,967	7,979	1,846	660	1,320	383	270	305	*1,112	6,704
13	1,298	983	6,614	9,644	2,273	660	1,222	*000	270	274	1,526	10,996
14	1,992	903	6,529	12,484	*1,920	685	941	329	211	258	1,448	8,435
15	*4,104	1,222	6,304	12,502	2,212	960	884	352	230	*196	1,150	7,367
16	4,848	1,333	6,354	*12,649	1,746	1,860	*643	351	184	354	1,069	3,500
17	4,703	748	2,129	11,339	1,896	1,800	1,315	244	*55	339	1,120	*1,326
18	4,279	1,326	2,254	10,716	2,492	*965	1,211	251	278	344	1,037	1,692
19	1.509	*669	*3,195	10,869	2,843	568	1,086	216	267	339	*984	4,812
20	1,608	1,248	3,658	11,638	3,742	1,010	1,068	*65	281	355	1,070	8,540
21	1,687	1,523	2,704	12,159	*3,650	1,105	767	158	220	331	1,120	7,216
22	*1,794	2,598	3,429	10,878	3,143	985	95	223	249	*142	1,145	5,822
23	1,885	4,506	3,494	*10,409	2,172	866	*363	235	129	350	1,066	5,147
24	1,859	4,001	3,694	10,920	1,696	745	496	203	*55	401	987	*1,753
25	2,284	3,664	3,824	9,870	1,470	*851	496	203	238	392	909	2,186
26	2,060	*1,456	*3,258	8,990	1,309	759	516	246	225	369	*829	1,877
27	1,813	2,376	2,829	9,180	1,290	634	496	*136	556	387	822	1,571
28	1,175	3,201	2,345	7,880	*1,680	585	510	348	920	314	969	1,641
29	*1,574	....	2,514	7,139	2,323	560	460	188	642	*1,398	969	1,390
30	1,154	....	3,029	*6,299	3,827	535	*50	219	723	2,293	886	1,049
31	1,126	....	3,029	....	2,903	....	697	277	....	1,882	....	*932
Mean	2,753	1,510	3,757	8,102	2,651	1,014	803	223	298	509	1,699	3,360

* Sunday.

Daily discharge, in second-feet, of Mohawk River at Little Falls, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	595	1,594	1,454	*5,785	4,673	645	*395	481	629	667	1,289	4,845
2	961	1,372	1,496	8,497	4,510	761	1,053	509	*545	849	1,289	*4,027
3	1,040	1,251	1,539	10,124	4,362	*1,119	1,804	515	455	881	1,197	3,200
4	1,040	*421	*1,001	9,162	4,014	1,346	311	339	503	499	*1,264	3,109
5	608	1,457	2,228	8,114	3,774	1,174	644	*93	503	491	885	6,316
6	578	1,682	2,013	7,936	*2,443	1,014	505	284	503	493	920	5,504
7	*180	1,594	1,967	9,998	1,658	760	788	274	629	*282	982	5,727
8	1,592	1,814	2,125	*10,065	1,698	1,214	*625	195	228	449	3,350	5,620
9	1,966	4,712	2,228	8,587	2,304	1,643	1,048	374	*326	665	5,335	*4,725
10	1,921	5,053	2,250	6,660	2,591	*1,283	876	452	294	747	3,837	2,579
11	1.772	*3,449	*1,889	5,053	2,595	1,134	754	153	326	747	*2,673	2,562
12	1,726	5,305	2,013	4,532	2,330	1,134	754	*181	200	499	1,901	2,388
13	1,576	10,192	1,818	4,304	*2,132	864	694	365	483	598	1,738	2,388
14	*1,731	11,128	1,875	4,202	1,462	864	666	2,041	515	*459	1,600	2,178
15	1,636	11,642	1,818	*4,607	1,859	896	*545	2,370	377	691	1,598	1,586
16	1,496	8,292	1,726	5,672	1,732	801	668	1,434	*461	1,231	1,368	*1,866
17	1,455	8,961	1,696	7,261	1,927	*555	724	1,084	515	1,032	1,207	1,630
18	1,455	*3,671	*1,380	11,128	1,778	702	826	874	713	983	*1,336	2,230
19	1,592	3,678	1,496	13,542	1,882	599	754	*745	501	881	1,998	1,825
20	4,302	2,334	1,967	15,242	*1,745	561	794	651	492	785	3,929	2,361
21	*7,291	1,968	3,345	15,032	1,732	650	1,170	494	599	*622	6,057	2,180
22	7,194	2,386	3,740	*11,275	1,637	579	*1,430	494	1,777	564	5,353	1,981
23	7,736	4,303	3,740	10,624	1,453	437	1,088	499	*1,380	643	4,515	*1,828
24	6,150	3,614	4,135	9,437	1,453	*72	696	475	953	1,114	3.417	3,509
25	4,740	*1,681	*3,720	8,497	1,165	474	1,424	527	1,034	2,137	*3,094	5,291
26	4,670	1,592	3,405	7,282	1,085	390	2,109	*795	915	1,884	12,083	5,177
27	4,242	1,456	3,030	6,921	*1,014	474	1,898	689	819	1,470	14,551	4,143
28	*1,528	1,541	3,030	5,490	751	474	1,384	657	914	*1,356	13,520	3,007
29	2,176	....	3,150	*4,559	751	674	*1,262	1,255	652	1,632	8,615	2,606
30	1,772	....	4,233	4,672	723	740	874	959	*668	1,322	4,734	*1,909
31	1,496	....	5,024	....	723	....	696	721	....	1,192	....	2,159
Mean	2,523	3,862	2,469	8,142	2,063	801	943	694	630	899	3,854	3,240

* Sunday.

EAST CANADA CREEK AT DOLGEVILLE, NEW YORK.

A description of this station, together with the estimated daily discharge as originally computed, June to December, 1899, will be found in Water-Supply Paper No. 35, page 52. A new rating table for the dam has been prepared, using coefficients of discharge derived from Freeman's experiments on a model of the round-crested portion of the Croton dam, which apparently corresponds closely with the ogee section of the Dolgeville dam, as regards friction on the crest, vertical contraction of the nappe, and siphonage.[1]

In computing the record here given, the new rating table has been used, beginning June 1, 1899. The flow through the turbines has also been computed from current-meter measurements made in the tailrace of the electric power plant, instead of from the observed head and the gate openings of the water wheels, as formerly. The effect of these changes has been to slightly increase the extreme high-water and low-water flows, the estimated flow for mean stages remaining substantially the same.

[1] See Report on New York's Water Supply, made to Bird S. Coler, comptroller (1900), by John R. Freeman, p. 137.

Current-meter measurements were made from the bridge across the tailrace below the power plant, as follows:

Current-meter measurements of flow in tailrace at Dolgeville electric-light and power dam.

Date.	Flow in tailrace.	Gate opening of 36-inch wheels.	Wheel.
1900.	*Second-feet.*	*Per cent.*	
May 22	84	0.50	No. 2.
July 27	76	.38	No. 2.
July 29	63	.28	No. 1.
August 9	80	.38	No. 1.

Only one of the two 36-inch Victor turbines was running in each instance, together with the 15-inch exciter wheel. The depths of gate openings of the 36-inch wheels are shown in the foregoing table. The 15-inch exciter wheel ran at thirteen-hundredths gate in each case. The head on the wheels was 72 feet. Observations of the wheel-gate openings were taken at the beginning and end of each test, and the average is given in the table.

The results of the current-meter measurements of the total flow of the stream have been given in the general table on page 39.

The relation between the metered and calculated flows on different days is shown in the following tables, from gage readings taken at the time the measurements were made:

Current-meter measurements of East Canada Creek.

Date.	Flow in tailrace.	Flow over dam.	Total flow.
1900.	*Second-feet.*	*Second-feet.*	*Second-feet.*
May 22	84	328	412
July 27	76	376	452
August 7	80	*a* 28	108

a Measured in stream channel above point of confluence with tailrace.

Calculated flow of East Canada Creek.

Date.	Crest gage reading.	Flow over dam.	Flow in tailrace.	Total flow.
1900.	*Feet.*	*Second-feet.*	*Second-feet.*	*Second-feet.*
May 22	0.69	282	84	366
July 27	.79	362	84	446
August 7	.20	29	78	107

In the first two cases the total flow was measured at the Dolgeville bridge above the dam, and the difference between the observed and calculated flows in the first instance is probably due to pond storage.

The accompanying tables of mean daily flow show the amount of water passing down the stream from the dam each day, with the exception of Sundays, for which the flow has been taken as a mean between that of the preceding and following days. Dams on this stream are not numerous, nor is there extensive pond storage, so that the tables may be taken as a fair representation of the natural regimen of flow.

The highest water observed was on April 19, 1900, when a depth of 4.5 feet on the crest of the dam was reached, corresponding to a flow of 5,750 second-feet, or 22.6 second-feet per square mile. The most notable low-water period was September 13 to 16, inclusive, 1899, when the average volume of flow was 67 second-feet, or 0.3 second-foot per square mile.

Daily discharge, in second-feet, of East Canada Creek at Dolgeville, New York, for 1898.

[Drainage area, 256 square miles.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	....	275	503	372	18	....	465	540	(a)
2	....	*330	478	372	19	....	447	540	(a)
3	....	275	443	372	20	....	477	*630	400
4	....	270	363	*372	21	....	452	570	650
5	....	310	343	372	22	....	637	535	775
6	....	330	*395	372	23	485	*1,323	500	1,275
7	....	290	398	(a)	24	1,180	1,082	465	975
8	....	280	378	(a)	25	943	832	440	*700
9	....	*213	398	(a)	26	680	762	370	600
10	....	252	648	(a)	27	625	1,222	*305	600
11	....	242	333	(a)	28	465	1,082	235	500
12	....	267	1,937	(a)	29	370	877	235	400
13	....	287	*1,620	(a)	30	355	*635	279	450
14	....	322	1,360	(a)	31	....	602	....	600
15	....	1,422	1,110	(a)					
16	....	*1,073	850	(a)	Mean	638	581	689	564
17	....	690	590	(a)					

*Sunday. *a* Ice on crest of dam.

Daily discharge, in second-feet, of East Canada Creek at Dolgeville, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	*486	472	542	462	1,701	384	116	118	109	*135	1,046	134
2	486	462	447	*359	1,401	294	*82	192	145	118	1,674	292
3	530	447	372	355	1,391	218	112	210	*145	106	874	*335
4	530	492	422	412	1,261	*212	79	139	78	106	757	388
5	1,320	*370	*833	452	1,006	206	106	99	78	94	*648	282
6	1,390	402	852	512	771	200	103	*81	71	89	540	234
7	1,135	397	787	642	*474	194	126	118	68	89	404	152
8	*992	397	682	922	421	234	215	112	67	*94	372	152
9	922	397	542	*713	371	194	*324	100	67	92	340	132
10	722	372	472	822	371	194	394	106	*67	89	322	*195
11	622	372	447	952	421	*183	270	126	67	77	282	258
12	542	*348	*550	1,217	401	194	194	143	74	75	*258	2,000
13	502	410	742	1,642	431	194	194	*123	67	74	234	3,029
14	562	462	772	2,152	*534	206	194	103	67	74	234	1,530
15	*342	502	722	2,972	601	264	175	83	67	*74	234	1,094
16	1,187	502	602	*2,077	541	249	*304	78	67	74	288	914
17	1,167	397	562	2,512	441	175	374	104	*67	77	258	*733
18	1,942	402	472	2,682	601	*134	264	78	67	118	234	1,325
19	822	*370	*490	3,532	811	239	175	76	67	100	*234	1,947
20	742	447	542	4,182	741	161	126	*75	74	103	234	676
21	642	477	572	4,472	*674	274	119	74	74	100	208	1,422
22	*542	590	602	3,472	601	206	100	74	74	*90	292	874
23	572	992	602	*3,791	541	174	*112	67	74	81	292	757
24	652	742	702	3,972	471	133	106	74	*74	100	184	*648
25	672	512	672	3,992	421	*112	110	94	74	94	152	542
26	672	*460	*520	4,132	391	152	135	74	192	94	*148	436
27	642	742	447	3,782	371	152	111	*44	192	89	143	330
28	602	742	492	3,592	*324	144	135	74	139	89	143	282
29	*542	....	472	3,017	391	119	115	74	126	*266	134	282
30	522	....	492	*2,141	373	119	*101	74	152	372	134	254
31	472	....	472	....	421	....	87	74	....	246	....	*259
Mean	816	439	519	1,978	633	196	166	97	92	112	377	706

*Sunday.

Daily discharge, in second-feet, of East Canada Creek at Dolgeville, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	264	288	252	*631	1,476	(a)	*130	153	132	120	(a)	(a)
2	264	288	240	794	1,188	(a)	112	126	*151	185	242	*(a)
3	288	288	252	914	800	(a)	112	110	129	145	218	(a)
4	288	*288	*227	914	610	(a)	115	111	190	144	*194	(a)
5	300	288	240	914	474	591	118	*93	167	110	242	1,192
6	346	266	192	1,626	*410	394	152	82	149	116	218	844
7	*346	264	152	2,321	346	372	184	89	157	*100	242	614
8	410	288	192	*2,714	474	608	*193	98	118	94	632	614
9	410	800	258	1,374	610	827	200	108	*118	99	722	*577
10	372	718	340	1,094	800	*643	182	98	73	94	582	614
11	362	*718	*321	1,002	610	460	167	87	152	85	*432	279
12	318	718	306	1,012	546	406	145	*111	142	84	398	279
13	300	3,759	270	1,020	*454	376	132	192	142	84	(a)	224
14	*258	4,320	234	1,020	362	394	124	396	136	*81	(a)	224
15	264	2,467	234	*1,197	342	376	*137	274	128	238	(a)	210
16	252	1,632	192	1,374	342	335	150	250	*93	205	(a)	*82
17	240	1,232	152	1,926	288	*304	162	185	117	199	(a)	63
18	682	*939	*173	4,626	288	274	202	167	104	186	*(a)	210
19	546	646	262	5,335	288	256	190	*133	95	180	(a)	215
20	960	562	306	4,917	*264	256	158	92	73	185	1,005	345
21	*1,704	518	340	4,842	240	250	310	110	196	*158	1,197	215
22	1,380	540	340	*4,368	288	246	*252	111	184	153	1,148	215
23	1,144	709	340	3,895	288	326	194	142	*130	171	1,016	*342
24	1,012	562	340	3,095	288	*300	374	117	154	582	713	310
25	820	*470	*340	2,840	276	274	686	117	99	510	*1,146	438
26	709	378	306	2,355	264	294	767	*77	(a)	322	3,802	345
27	604	346	282	2,243	(a)	294	422	92	(a)	350	3,164	345
28	*508	312	282	1,586	(a)	300	276	223	(a)	*306	1,689	317
29	410	......	306	*1,506	(a)	300	*219	136	(a)	292	1,128	317
30	346	......	420	1,207	(a)	149	162	181	*(a)	268	929	*252
31	346	......	468	......	(a)	......	110	151	......	(a)	......	263
Mean	531	879	276	2,086	486	370	221	144	133	195	957	368

a No record. * Sunday.

CAYADUTTA CREEK NEAR JOHNSTOWN, NEW YORK.

A description of this station will be found in Water-Supply Paper No. 35, page 53. The record is kept at the dam of the Johnstown Electric Light and Power Company, 1 mile below Johnstown. Since the establishment of the station standard sharp-crested gaging weirs have been erected by Prof. Olin H. Landreth, C. E. One of these weirs has been placed across the main stream above the head of slack water from the dam. A second weir has been placed in the tailrace below the power house.

During the summer the water does not ordinarily flow over the dam, which is practically tight, but the entire flow passes through the turbines. A series of gagings at the tailrace weir has been made in order to determine the discharging capacity of the water wheels when running under different conditions.

Dams are located at frequent intervals along the stream, and during the dry season the amount of flow from one to another is largely controlled by the water wheels.

Daily discharge, in second-feet, of Cayadutta Creek near Johnstown, New York, for 1898.

[Drainage area, 40 square miles.]

Day.	Oct.	Nov.	Dec.
1	24	41	39
2	*10	36	48
3	22	38	46
4	25	32	*51
5	119	39	23
6	246	*12	51
7	67	32	50
8	55	35	39
9	*14	179	38
10	37	734	38
11	23	429	*25
12	27	110	46
13	33	*64	37
14	38	68	36
15	290	55	33
16	*117	49	32
17	68	57	34
18	47	57	*27
19	46	97	33
20	39	*67	35
21	47	67	45
22	55	50	58
23	*105	54	98
24	56	63	67
25	48	55	*60
26	36	42	75
27	58	*24	42
28	55	46	31
29	138	59	34
30	*13	42	50
31	41	-------	44
Mean	64	91	44

*Sunday.

Daily discharge, in second-feet, of Cayadutta Creek near Johnstown, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	*20	27	66	72	57	30	21	20	16	*12	33	19
2	39	25	48	*70	66	28	*15	22	20	24	31	------
3	31	29	36	83	36	29	24	32	*12	24	28	*14
4	42	26	40	132	32	*17	17	22	19	25	48	37
5	71	*19	*111	252	28	29	20	21	28	17	*34	27
6	69	29	282	263	27	28	20	*11	16	15	26	23
7	40	23	122	313	*12	18	19	19	23	19	28	23
8	*64	19	71	503	29	30	34	20	22	*9	26	23
9	42	18	72	*320	26	21	*16	20	17	18	22	23
10	29	18	67	413	25	19	27	20	*7	20	27	*13
11	24	20	53	579	27	*18	25	17	16	24	26	27
12	27	*14	*123	415	47	30	18	23	19	23	*20	238
13	26	19	155	811	29	25	18	*8	20	13	28	207
14	43	21	105	751	*31	24	16	20	17	20	28	145
15	*125	24	84	802	25	25	18	20	19	*17	30	55
16	51	25	46	*218	28	25	*13	20	20	24	20	40
17	43	26	38	190	34	25	23	20	*11	26	21	*44
18	35	27	35	196	33	*17	25	20	19	33	20	36
19	31	*15	*66	225	43	25	26	19	20	21	*6	51
20	33	32	67	168	47	37	20	*9	21	------	27	85
21	28	33	66	135	*34	32	19	15	20	------	27	62
22	*16	55	50	142	34	33	23	16	17	(*)	26	42
23	35	91	74	*123	26	32	*8	14	19	------	25	26
24	40	39	59	41	31	32	18	16	*14	------	24	*19
25	27	40	52	65	26	*18	22	16	20	21	26	56
26	32	*43	*54	66	25	29	19	14	32	18	*14	60
27	32	53	48	44	30	26	16	*11	36	18	30	25
28	24	48	54	52	*15	30	17	15	26	19	28	24
29	*13	------	48	60	32	30	17	16	27	*16	28	20
30	33	------	46	*31	13	22	*14	16	26	30	15	19
31	33	------	48	------	28	------	25	16	------	30	------	*11
Mean	39	31	74	251	31	26	20	18	20	21	26	49

*Sunday.

Daily discharge, in second-feet, of Cayadutta Creek near Johnstown, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	27	39	41	*250	38	36	*6	12	11
2	27	29	42	292	25	22	14	22	*7
3	25	22	44	339	25	*8	20	20	21
4	20	*20	*23	212	25	30	6	18	17
5	18	251	55	199	28	26	15	*7	17
6	20	43	41	200	*24	25	15	20	17
7	*24	42	50	293	30	23	15	20	17
8	60	148	45	*155	25	24	*7	20	21
9	39	235	45	102	81	33	31	22	*8
10	43	76	44	78	63	*13	19	18	21
11	37	*82	*39	77	30	29	18	14	20
12	34	116	66	91	24	29	20	*4	6
13	30	1,404	48	106	*19	16	23	27	7
14	*14	89	40	78	23	24	18	28	18
15	35	77	41	*91	26	29	*12	29	16
16	37	59	39	133	23	22	19	34	*9
17	29	46	41	200	24	*9	20	35	19
18	40	*23	*19	314	29	24	18	33	21
19	92	42	42	164	26	24	17	*10	19
20	705	41	45	102	*22	24	14	18	21
21	*306	39	52	76	25	22	19	21	21
22	101	44	52	*116	24	21	*7	20	21
23	83	107	111	92	19	17	15	21	*14
24	55	87	82	80	22	*10	18	22	32
25	71	*41	*52	71	23	17	17	22	32
26	50	60	46	64	26	19	26	*7	21
27	43	42	50	48	*19	14	25	20	21
28	*23	39	49	46	22	17	26	19	23
29	44	......	106	*22	19	19	*13	20	23
30	36	......	165	25	20	18	13	20	*10
31	31	......	296	......	22	......	13	18	......
Mean	71	119	62	137	27	21	17	20	18

* Sunday.

NOTE.—Records for October, November, and December are not available at present.

SCHOHARIE CREEK AT FORT HUNTER, NEW YORK.

Schoharie Creek rises on the western slope of the Catskill Mountains. In its lower stages it flows through a long, flat valley, in a stream bed covered with cobbles and gravel, over which the water finds its way in a thin sheet during the dry season.

The State dam at Fort Hunter is near the mouth of the stream, and high water from Mohawk River backs up to the toe of the dam. The condition existing at this station during the summer months has been described in connection with the Mohawk River gaging stations, page 42. A record has been kept of the elevation of the water surface in the pond above the dam, and also in the channel below the dam. The average difference, or head, is 5.25 feet, and it is nearly constant, except when water falls below the crest level above the dam.

The dam is of timber backed with gravel, and there are a number of leaks above the gravel line 2 feet below the crest. During the summer this leakage represents practically the total inflow from Schoharie Creek to the Mohawk. Current-meter measurements of the leakage were made below the Erie Canal aqueduct, at a point where the entire flow is concentrated in a narrow channel.

Current-meter measurements of leakage of Fort Hunter dam.

Date.	Hydrographer.	Leakage.
1900.		*Second-feet.*
June 21	R. E. Horton	30
July 18	E. D. Walker	38
August 22	do	44

In the computation the leakage of the dam has been assumed to be 35 second-feet.

In establishing this station the intention was to maintain a record of the height of the water above and below the head gates, at the entrance to the canal feeder, from which the effective head of the gate openings could be determined and the flow computed by the formula for submerged orifices. During the dry season the water falls below the lip of the gates and flows in an open channel, making this method inapplicable. In recomputing the record the diversion to the canal feeder was estimated from the following current-meter measurements:

Current-meter measurements of flow of water in feeder.

Date.	Hydrographer.	Measured flow.
1900.		*Second-feet.*
June 21	R. E. Horton	112
July 18	E. D. Walker	76
August 22	do	73

Inflow to the Erie Canal is controlled by gates at the lower end of the feeder channel, so that the flow in the feeder is not directly a function of the stage of the water. Owing to the uncertainty of the low-water measurements, this station was abandoned July 31.

The accompanying tables show the total outflow from the pond above the Fort Hunter dam. A table of the flow, as originally computed, allowing 315 second-feet for leakage, will be found in Water-Supply Paper No. 35, page 55.

The drainage areas tributary to Schoharie Creek at various gaging stations are as follows:

Drainage areas of Schoharie Creek.

	Square miles.
At mouth	947.0
At Erie Canal aqueduct	946.8
At Fort Hunter dam	946.7
At Mill Point bridge	934.0
At Schoharie Falls dam	930.0

Daily discharge, in second-feet, of Schoharie Creek at Fort Hunter, New York, for 1898.

[Drainage area, 947 square miles.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	....	161	1,617	1,139	18	....	791	1,517	1,539
2	....	161	1,717	939	19	....	861	2,417	859
3	....	161	917	1,339	20	....	791	3,967	689
4	....	161	917	1,439	21	....	791	2,842	814
5	....	1,661	767	1,839	22	....	791	2,067	1,639
6	....	3,211	767	1,639	23	....	1.061	1,967	2,639
7	....	1,361	847	1,839	24	129	861	1,967	2,089
8	....	791	767	1,839	25	129	861	1,517	3,289
9	....	1,761	667	1,739	26	129	861	1,517	814
10	....	791	5,067	1,239	27	129	1,361	1,217	1,539
11	....	611	9,517	939	28	129	2,261	917	1,539
12	....	611	5,767	1,639	29	129	1,911	767	939
13	....	581	2,917	1,539	30	129	1,561	767	1,239
14	....	1,661	2,967	1,639	31	....	1,661	....	3,864
15	....	2,136	2,417	1,539					
16	....	2,461	1,817	1,639	Mean	129	1,142	2,148	1,573
17	....	711	1,517	1,339					

Daily discharge, in second-feet, of Schoharie Creek at Fort Hunter, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	1,741	1,651	4,915	1,335	1,515	295	182	148	148	3,867	935
2	1,641	1,351	3,655	1,335	1,460	295	178	152	148	1,967	1,615
3	1,641	1,651	3,165	1,335	1,560	395	182	145	145	1,767	1,515
4	941	1,251	2,935	2,135	1,140	395	182	138	145	2,247	935
5	5,791	1,251	6,635	2,785	860	295	185	142	148	2,467	935
6	4,791	951	13,635	3,185	860	295	185	145	148	1,967	765
7	3,541	951	6,235	3,655	710	295	190	148	148	1,767	935
8	3,141	851	3,435	7,685	585	225	195	138	142	1,547	935
9	3,541	901	2,935	5,335	585	205	198	138	152	1,767	785
10	2,241	901	3,535	3,655	610	195	185	135	152	967	765
11	1,991	851	4,085	4,585	440	195	182	138	152	967	935
12	1,641	851	7,685	5,735	440	195	190	138	148	1,547	1,615
13	1,841	657	11,135	7,685	340	195	198	132	148	1,547	1,835
14	1,841	701	4,455	7,635	260	195	202	132	145	1,967	1,515
15	2,091	801	3,175	9,335	260	195	202	135	145	1,547	1,515
16	2,341	951	2,635	7,685	340	195	198	138	142	2,247	935
17	3,291	951	2,235	5,215	480	195	202	138	138	967	935
18	2,741	1,551	2,035	4,085	585	195	202	138	145	797	765
19	2,291	1,751	2,335	4,385	510	195	195	142	145	587	765
20	2,341	1,551	2,515	3,812	585	195	195	145	148	967	765
21	1,991	3,151	2,775	3,532	585	195	190	142	148	797	635
22	1,641	2,876	2,775	2,342	510	195	185	148	148	587	635
23	1,541	3,407	2,775	3,532	440	195	185	148	148	967	453
24	1,541	3,726	2,635	3,342	340	195	165	142	148	797	453
25	2,741	3,726	2,515	3,193	340	195	198	145	152	1,967	515
26	1,991	4,301	2,335	3,883	260	195	190	148	182	1,767	455
27	2,091	4,885	2,035	2,633	260	195	185	142	6,984	2,147	425
28	1,841	6,035	2,135	2,698	260	195	182	148	6,126	1,547	335
29	1,541	....	1,435	2,298	340	195	190	145	5,740	1,967	335
30	1,641	....	1,335	2,948	260	195	190	148	4,790	2,147	295
31	1,541	....	1,435	....	260	....	190	145	....	1,547	....
Mean	2,307	1,944	3,792	4,100	579	226	187	142	916	1,603	875

NOTE.—No record for December.

Daily discharge, in second-feet, of Schoharie Creek at Fort Hunter, New York, for 1900.

Day.	Jan.	Mar.	Apr.	May.	June.	July.
1	735	3,465	2,915	835	360	111
2	735	7,335	2,775	985	155	102
3	575	7,515	3,335	835	245	102
4	575	6,785	3,635	985	245	111
5	435	5,585	3,335	1,208	284	90
6	315	2,485	3,335	490	239	76
7	435	3,335	3,635	412	212	76
8	315	3,335	2,635	409	242	76
9	485	3,035	2,495	315	515	135
10	435	2,740	2,135	519	276	140
11	315	3,335	2,015	472	360	143
12	365	3,035	2,015	390	305	140
13	485	2,775	2,275	300	305	135
14	575	2,355	2,915	293	257	127
15	435	2,255	2,915	312	260	123
16	575	2,015	3,635	327	260	118
17	575	1,885	4,735	319	235	118
18	735	1,755	6,035	312	220	111
19	2,785	1,755	4,935	330	157	111
20	4,595	1,755	4,595	1,530	153	111
21	8,235	3,035	5,355	1,550	147	106
22	4,595	2,135	6,615	1,020	143	72
23	3,465	1,755	6,615	500	139	122
24	3,145	2,495	5,095	412	139	130
25	1,325	2,275	4,035	409	139	144
26	735	2,635	3,335	315	105	135
27	735	2,495	2,915	315	113	127
28	485	2,775	2,635	250	122	127
29	575	3,035	1,885	322	122	118
30	485	3,035	1,325	355	122	118
31	435	3,035	....	360	....	111
Mean	1,313	3,137	3,530	561	219	115

NOTE.—No record for February; station abandoned July 31.

SCHOHARIE CREEK AT ERIE CANAL AQUEDUCT, NEW YORK.

The Erie Canal crosses Schoharie Creek between the Fort Hunter dam and Mohawk River. A gaging station was established at the aqueduct on May 2, 1900, by Prof. E. D. Walker. A current-meter measurement of the flow through the archways of the canal aqueduct was made by him on that day, the result being a discharge of 1,257 second-feet, with a gage height of 2.26 feet. Owing to cross currents above the aqueduct, the conditions are not favorable for meter measurements, and the station was abandoned on October 13. The record is chiefly of interest in connection with slope measurements of Mohawk River, described elsewhere (p. 42).

Daily gage height, in feet, of Schoharie Creek at Erie Canal aqueduct, New York, for 1900.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.
1	......	1.38	0.60	0.67	0.54	0.53	17	1.58	0.82	0.58	1.43	0.65
2	2.24	1.47	.62	.65	.53	.54	18	1.52	.71	.56	1.32	.65
3	2.20	1.76	.58	.64	.54	.51	19	1.47	.82	.60	1.92	.65
4	2.14	1.62	.60	.63	.53	.53	20	1.98	.70	.61	.97	.65
5	2.10	.94	.60	.62	.54	.58	21	2.84	.72	.63	.78	.65
6	2.00	.95	.57	.61	.54	.61	22	2.43	.70	.65	.71	.65
7	1.10	.87	.56	.52	.53	.62	23	2.14	.67	.62	.68	.64
8	2.00	.90	.50	.52	.54	.58	24	1.93	.60	.68	.64	.62
9	1.97	1.90	.43	.51	.64	.54	25	1.87	.60	.71	.63	.53
10	2.00	1.84	.52	.50	.64	.52	26	1.80	.60	.73	.54	.56
11	1.10	1.80	.60	.52	.65	.59	27	1.67	.60	.78	.53	.57
12	1.97	1.40	.63	.53	.65	.56	28	1.40	.62	.72	.54	.53
13	1.89	1.68	.64	.52	.65	.57	29	1.47	.61	.60	.53	.52
14	1.76	1.40	.60	.57	.64	......	30	1.45	.60	.63	.53	.53
15	1.70	1.13	.54	.54	.65	......	31	1.40	......	.64	.54	......
16	1.67	1.20	.53	.53	.64	......						

SCHOHARIE CREEK AT MILL POINT, NEW YORK.

The current-meter station was established at the Mill Point highway bridge on July 5, 1900, by Prof. E. D. Walker. The stream bed is stony and fairly permanent. The channel is of nearly constant width at all stages of the stream. The following current-meter measurements were made by Professor Walker:

July 5: Gage height, 0.64 foot; discharge, 87 second-feet.
August 22: Gage height, 0.70 foot; discharge, 141 second-feet.

Daily gage height, in feet, of Schoharie Creek at Mill Point, New York, for 1900.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	0.65	0.35	0.50	0.55	2.10	17	0.60	0.95	0.35	0.40	0.65	1.65
2	......	.65	.35	.50	.45	1.90	18	.65	1.45	.30	.45	.70	1.70
3	......	.45	.35	.45	.60	1.80	19	.65	.95	.35	.45	.75	1.82
4	......	.40	.30	.40	.60	1.70	20	.65	.72	.25	.45	.98	1.95
5	......	.50	.25	.40	.50	3.02	21	.60	.70	.00	.40	1.45	2.30
6	0.60	.35	.22	.45	.40	2.60	22	.95	.75	.00	.30	1.42	2.10
7	.35	.40	.40	.35	.60	2.35	23	.90	.70	.00	.60	1.50	1.70
8	.70	.35	.30	.30	.60	2.25	24	.80	.60	.30	.60	1.35	1.88
9	.50	.30	.30	.15	.65	2.10	25	.85	.55	.35	.50	1.30	2.95
10	.80	.30	.25	.00	.85	1.80	26	.80	.50	.30	.70	1.72	3.70
11	.70	.40	.45	.00	.60	1.75	27	.80	.45	.30	.75	3.60	1.70
12	.70	.40	.45	.35	.60	1.75	28	.80	.50	.35	.52	2.75	2.05
13	.60	.45	.35	.45	.80	1.72	29	.70	.50	.45	.45	2.25	1.95
14	.60	.30	.35	.15	.90	1.70	30	.70	.55	.45	.52	2.15	1.50
15	.60	.25	.30	.30	.72	1.65	31	.65	.43	......	.50	......	1.60
16	.65	.40	.35	.30	.70	1.60							

SCHOHARIE CREEK AT SCHOHARIE FALLS, NEW YORK.

A dam and power plant have been erected by the Empire State Power Company, of Amsterdam, New York, at Schoharie Falls, 7 miles from Amsterdam. The dam is of masonry, backed with timber. It has a flat crest, nearly level, 380 feet long, 1 foot wide, and a slope on the upstream face of approximately 2½ to 1. The dam was completed early in the summer of 1900, and a record of the depth of water flowing over the main spillway was kept by the engineers of the company from July 18 to December 31. Some further data are needed, however, for the final reduction of this record, which is reserved for future publication. The dam is about 1 mile above the current-meter station on Schoharie Creek, at the Mill Point highway bridge, and it is the intention to use the results of the meter measurements made there in the preparation of a calibration curve for the spillway of the dam.

Soon after the completion of the dam a weir of standard form was placed in an opening in the water-power canal embankment, at a point where the entire flow of the stream could be concentrated so as to pass over the gaging weir. The weir has a sharp crest, 25 feet in length, with two complete contractions, and the following observations of flow were computed from the observed depths by the Francis formula:

Flow over weir at Schoharie Falls dam.

Date.	Time of measurement.	Discharge.	Date.	Time of measurement.	Discharge.
1900.		*Second-feet.*	1900.		*Second-feet.*
June 25	11 a. m.	86.2	June 29	5 p. m.	86.2
June 26	11 a. m.	91.6	June 30	11 a. m.	92.9
Do	5 p. m.	91.5	Do	5 p. m.	92.9
June 27	11 a. m.	92.9	July 1	11 a. m.	92.9
Do	5 p. m.	92.9	Do	5 p. m.	91.5
June 28	11 a. m.	86.2	July 2	11 a. m.	91.6
Do	5 p. m.	91.5	Do	5 p. m.	92.9
June 29	11 a. m.	86.2	July 3	9 a. m.	93.4

The power plant at the dam contains two double horizontal Samson turbines, each 40 inches in diameter. The turbines are designed to work under a head of 42 feet, and are rated at 1,800 horsepower per pair. A wheel similar to these has been tested at Holyoke, and with the rating curve established, which shows the proportional discharge of the wheels for various depths of gate opening, the turbines can be used as water meters to determine the flow in the power canal. The plant was set in operation about January 1, 1901, and a gaging record is being kept, which shows the depth of flow over the crest of the dam and spillway, the discharge through the flood gates, and the amount of water used by the turbines. It should be stated that this stream is subject to extreme variations of flow, and that the weir measurements given above represent unusually low water. Plans have been made for a system of storage reservoirs to conserve the entire discharge of the stream and maintain a nearly uniform regimen of flow throughout the year.

MOHAWK RIVER AT SCHENECTADY, NEW YORK.

A current-meter station at Freeman's tollbridge, near Schenectady, was established by Prof. E. D. Walker February 1, 1899, and remained under his supervision until October 1, 1900. A description of this station is contained in Water-Supply Paper No. 35, page 55. The following current-meter measurements were made by Professor Walker:

April 3, 1899: Gage height, 7.18 feet; discharge, 5,294 second-feet.
May 26, 1899: Gage height, 6.22 feet; discharge, 2,092 second-feet.
June 30, 1899: Gage height, 5.38 feet; discharge, 482 second-feet.
May 12, 1900: Gage height, 6.50 feet; discharge, 4,135 second-feet.
July 17, 1900: Gage height, 5.26 feet; discharge, 667 second-feet.
August 21, 1900: Gage height, 5.40 feet; discharge, 976 second-feet.

A rating curve for the cross section at this station has not yet been prepared.

Daily gage height, in feet, of Mohawk River at Schenectady, New York, for 1900.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		7.40	5.50	5.22	5.38	5.35	5.20	5.55	7.80
2		7.40	5.50	5.20	5.35	5.25	5.25	5.60	7.35
3		7.10	5.50	5.22	5.25	5.22	5.20	5.58	7.00
4		6.90	5.75	5.18	5.23	5.20	5.25	5.50	6.75
5		6.80	5.65	5.15	5.25	5.10	5.20	5.45	8.75
6		6.65	5.55	5.20	5.20	5.15	5.20	5.42	8.85
7		6.45	5.60	5.20	5.15	5.22	5.02	5.35	8.15
8	11.15	6.20	5.40	5.20	5.18	5.15	5.10	5.35	8.00
9	10.05	6.45	5.60	5.25	5.10	5.18	5.18	6.40	7.70
10	8.85	6.70	6.45	5.35	5.08	5.05	5.10	7.05	7.25
11	8.18	6.70	6.00	5.40	5.10	5.10	5.10	6.60	6.75
12	7.90	6.50	5.75	5.35	5.10	5.15	5.18	6.15	6.15
13	8.25	6.25	5.60	5.32	5.10	5.10	5.15	5.85	6.70
14	8.15	6.10	5.55	5.30	5.15	5.10	5.25	5.80	6.85
15	7.80	6.05	5.50	5.30	5.25	5.08	5.15	5.75	6.20
16	8.10	6.00	5.50	5.28	6.25	5.10	5.18	5.70	6.00
17	8.50	6.05	5.45	5.29	5.90	5.05	5.20	5.65	5.85
18	10.65	6.00	5.42	5.20	5.80	5.08	5.20	5.50	5.95
19	12.05	6.95	5.35	5.23	5.62	5.00	5.42	5.60	5.90
20	11.90	6.05	5.22	5.35	5.45	5.05	5.35	5.80	6.00
21	11.68	6.50	5.25	5.35	5.40	5.08	5.20	6.95	6.15
22	10.85	6.20	5.25	5.40	5.32	5.10	5.20	7.60	6.20
23	11.65	6.10	5.35	5.70	5.25	5.10	5.18	7.30	6.10
24	11.90	5.95	5.22	5.58	5.20	5.70	5.20	7.00	6.10
25	10.05	5.90	5.20	5.43	5.25	5.53	5.28	6.70	6.70
26	9.35	5.75	5.20	5.38	5.28	5.45	6.15	8.48	8.00
27	8.60	5.70	5.18	6.15	5.22	5.35	6.00	11.65	7.60
28	8.25	5.55	5.20	6.05	5.20	5.22	5.70	11.35	7.08
29	7.72	5.50	5.22	5.72	5.25	5.28	5.65	10.05	6.70
30	7.45	5.45	5.20	5.55	5.20	5.22	5.75	8.50	6.40
31		5.50		5.50	5.45		5.65		6.25

MOHAWK RIVER AT REXFORD FLATS, NEW YORK.

This station, which is located at the New York State feeder dam 4 miles below Schenectady, is described in Water-Supply Paper No. 35, page 57.

The accompanying tables of daily and monthly mean flow include the amount diverted to the Erie Canal. They therefore represent the total inflow of Mohawk River at this point, which is considerably greater than the amount which passes downstream from the dam during the season of canal navigation. Prior to 1900 the amount of diversion to the Erie Canal was assumed to be 128 second-feet. During the present year a different method of estimating diversion to the canal has been used. Current-meter measurements in the Rexford Flats feeder gave the following results:

Current-meter measurements in Rexford Flats feeder.

Date.	Hydrographer.	Flow in canal feeder.
		Second-feet.
October 27, 1898	W. D. Lockwood	128
June 25, 1900	R. E. Horton	272

These results were compared with the mean rate of evaporation from a water surface, as determined for several years at Rochester,[1] and it was found that an apparently constant relation existed between the two. The diversion for the remaining months of the canal season has been estimated from the observed evaporation, as follows:

Estimated monthly flow in Rexford Flats feeder.

	Second-feet.
May	200
June	260
July	290
August	270
September	220
October	148

The flow over the dam—that is, the amount of water passing downstream from Rexford Flats—compares with the total flow as follows:

Table showing relation of flow over Rexford Flats dam to total inflow of feeder.

Month.	Total inflow.	Flow below dam (inflow less diversion).
1900.	*Second-feet.*	*Second-feet.*
May	2,857	2,657
June	1,503	1,243
July	1,447	1,157
August	1,746	1,476
September	981	761

The water did not fall below the crest of the dam during the summer of 1900, so that it was not possible to make measurements of the leakage, or a new profile of the crest, which is greatly needed. During high water for several days of the year 1900 the water on the downstream side of the dam rose above the crest level and the dam was completely submerged. Experiments on the flow over a similar submerged weir are not available, and the high-water flows have been taken from the usual discharge curve. On the morning of February

[1] See annual reports of the executive board of the city of Rochester, 1892 to 1899, inclusive.

14, 1900, the water attained a depth of 9.25 feet on the crest of the dam, corresponding to a discharge of 55,700 second-feet, or 16.5 second-feet per square mile. This is the highest water observed since the record was started.

During 1900 the following discharge measurements were made by Prof. E. D. Walker, at Freeman's bridge, 3 miles above the Rexford Flats gaging station:

May 12: Gage height, 6.50 feet; discharge, 4,135 second-feet.
July 17: Gage height, 5.26 feet; discharge, 667 second-feet.
August 21: Gage height, 5.40 feet; discharge, 976 second-feet.

Daily discharge, in second-feet, of Mohawk River at Rexford Flats, New York, for 1898.

[Drainage area, 3,385 square miles.]

Day.	Dec.	Day.	Dec.	Day.	Dec.	Day.	Dec.
8	5,050	15	4,959	22	2,850	29	3,350
9	5,050	16	3,250	23	5,150	30	2,400
10	5,050	17	2,450	24	11,550	31	1,800
11	5,450	18	2,300	25	9,350		
12	4,200	19	2,675	26	7,350	Mean	4,471
13	3,625	20	2,550	27	4,450		
14	5,250	21	2,300	28	4,900		

Daily discharge, in second-feet, of Mohawk River at Rexford Flats, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	9,000	2,950	6,300	5,850	9,828	2,288	928	328	228	2,728	1,368	1,328
2	4,850	3,460	5,750	6,350	8,828	2,288	928	328	228	2,928	1,368	1,328
3	3,350	4,350	5,170	5,350	8,428	2,078	679	438	228	2,928	2,928	3,208
4	3,600	3,950	4,650	5,270	8,528	2,078	608	438	228	2,628	5,028	2,448
5	9,350	3,950	6,920	7,880	5,828	2,078	608	528	228	2,628	6,528	2,628
6	16,850	4,550	25,700	10,510	5,178	1,538	608	608	228	2,628	6,528	2,908
7	12,550	3,350	15,110	14,050	2,628	1,538	438	328	228	2,478	8,628	3,578
8	9,350	2,700	9,770	18,330	2,328	1,538	438	278	228	2,328	9,028	4,548
9	7,925	2,600	8,450	21,770	2,328	1,378	608	278	228	2,178	7,928	6,078
10	4,850	2,400	8,350	13,340	2,178	1,378	528	278	228	1,428	4,828	8,328
11	4,250	2,100	7,000	15,590	2,178	1,128	438	278	228	728	2,778	8,958
12	3,600	2,850	9,160	18,600	2,428	1,128	438	278	228	728	2,178	10,028
13	2,850	3,350	20,670	24,040	2,328	928	378	278	228	728	1,578	10,828
14	3,825	4,750	14,000	29,550	2,078	928	328	278	228	728	1,928	15,828
15	4,650	4,650	10,950	30,630	1,828	1,038	328	278	238	1,228	2,078	21,358
16	5,400	3,850	10,050	29,350	2,428	1,038	328	278	278	1,578	1,578	24,228
17	8,750	3,460	8,350	22,000	1,978	2,928	758	278	278	1,828	1,368	19,128
18	9,200	2,700	5,750	20,550	1,778	3,528	928	278	278	1,928	1,368	13,128
19	5,400	2,400	5,470	20,350	1,678	4,628	678	278	278	1,428	1,128	8,128
20	4,475	2,400	8,250	21,150	4,778	5,128	678	228	278	1,348	1,128	10,228
21	2,850	2,250	13,560	21,628	6,028	2,628	438	228	278	1,348	1,228	6,328
22	2,850	2,600	12,600	19,228	6,828	3,228	328	228	278	1,348	1,478	4,928
23	2,750	5,450	11,400	17,878	6,728	2,168	328	228	278	1,228	1,578	4,578
24	3,050	10,150	6,460	17,878	5,428	2,168	308	228	278	1,148	1,578	4,578
25	3,450	5,750	7,050	17,878	4,928	2,078	288	228	278	1,128	1,468	2,428
26	4,300	5,550	6,740	17,028	4,378	1,538	288	278	3,228	1,028	1,368	2,928
27	4,475	4,650	5,370	16,428	3,128	1,538	328	278	9,178	828	1,128	2,928
28	4,950	7,000	4,750	16,428	2,228	1,538	438	238	6,328	728	1,128	2,828
29	4,750	------	4,650	15,668	1,828	1,428	328	208	1,678	1,228	1,128	2,628
30	5,575	------	5,560	11,148	2,778	1,538	378	208	2,778	1,348	1,368	2,428
31	4,850	------	5,170	------	2,778	------	338	208	------	1,348	------	2,228
Mean	5,739	3,935	9,004	17,057	4,084	2,014	498	294	980	1,608	2,824	7,001

Daily discharge, in second-feet, of Mohawk River at Rexford Flats, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,030	2,850	4,650	8,750	5,500	1,470	1,500	1,970	1,920
2	1,500	1,860	4,650	9,400	4,800	1,470	940	1,830	1,670
3	1,500	2,030	4,450	11,150	4,150	1,580	940	1,720	1,670
4	1,260	3,830	4,450	11,400	3,300	1,710	940	1,720	1,540
5	1,260	4,450	4,450	12,850	2,850	1,710	820	1,720	1,430
6	1,500	4,950	4,800	13,550	3,000	1,470	750	1,970	1,430
7	1,860	5,550	3,325	13,850	3,450	1,470	750	1,720	1,430
8	2,250	7,150	3,000	14,650	3,300	1,710	820	1,970	1,020
9	2,550	7,250	2,250	15,070	3,800	1,710	1,090	1,970	1,020
10	2,550	7,950	2,250	15,950	4,400	1,960	1,090	1,970	1,120
11	1,860	10,730	1,860	17,150	3,800	2,240	1,290	1,970	1,220
12	1,610	13,050	1,610	18,300	3,650	2,910	1,500	1,970	1,020
13	1,500	27,250	1,500	15,650	3,300	2,240	1,500	1,970	870
14	1,500	45,050	1,500	13,850	3,300	1,580	1,290	2,250	870
15	1,860	24,850	1,370	9,390	3,800	1,580	1,290	2,390	430
16	2,700	14,850	1,260	9,000	3,300	1,580	1,290	2,470	430
17	3,830	9,650	1,160	12,350	3,000	1,710	1,090	5,020	680
18	6,500	5,750	1,160	20,750	2,850	1,710	1,090	1,830	680
19	10,730	3,150	1,750	27,450	2,700	1,470	1,090	1,830	750
20	21,850	2,470	3,150	25,550	2,250	1,260	1,090	1,970	870
21	45,750	3,830	3,950	26,250	2,250	1,260	1,400	1,070	870
22	27,850	5,150	4,800	28,370	1,750	1,260	1,610	1,070	680
23	28,450	6,690	4,800	26,050	1,650	1,060	1,740	1,070	1,020
24	21,750	8,750	5,150	21,730	1,650	1,060	1,990	1,270	1,020
25	13,300	7,850	5,950	17,050	1,650	1,060	2,270	1,170	750
26	9,250	6,150	6,900	11,900	1,500	1,060	2,270	1,070	680
27	6,100	5,150	7,700	11,400	1,900	1,060	2,490	920	680
28	5,150	4,650	7,700	9,850	1,650	910	2,380	1,000	540
29	5,150	....	8,430	8,750	1,425	910	2,270	1,000	600
30	4,450	....	8,550	7,250	1,425	910	2,270	1,070	540
31	4,250	....	8,750	....	1,425	....	1,990	1,170	....
Mean	7,860	9,032	4,235	14,996	2,857	1,503	1,447	1,746	981

NOTE.—Records for October, November, and December are not available at present.

MOHAWK RIVER NEAR DUNSBACH FERRY, NEW YORK.

A gaging record has been kept at the dam of the West Troy Water Company near Dunsbach Ferry, 9 miles from the mouth of Mohawk River. The dam is of masonry, and has a flat granite crest 5.5 feet wide, standing 0.75 foot higher at the crest lip than at the upstream edge. An island in the center of the stream divides the dam into two sections. The crest of the right wing, at the upper end of the island, is 380 feet long, with an average elevation of 174.15 feet. The crest of the left wing, at the lower end of the island, is 280 feet in length, and stands at an elevation of from 173.46 to 173.50 feet. Openings which existed in the dam during a part of the time the record has been kept should be taken into consideration in computing the flow.

The crest of the dam at the present time stands nearly level. The elevation of the zero of the crest gage is 172 feet. Readings are taken twice daily, usually between 6 and 7 a. m. and between 5 and 6 p. m. The mean of the readings taken for each day is given in the accompanying table.

In the adjacent pumping station are two Eclipse turbines, built by Stout, Mills & Temple, of Dayton, Ohio. One is 68 and the other 72 inches in diameter. They are run with gates wide open, under a head of from 7 to 8 feet.

The record at Dunsbach Ferry was established primarily for the purpose of checking a system of levels which were run for the United States Board of Engineers on Deep Waterways, by D. J. Howell, C. E., who furnished the record to the Geological Survey. No record was kept from April 1, 1899, to July 31, 1900.

The drainage area above the station at Dunsbach Ferry is 3,422 square miles.

Daily gage height, in feet, of Mohawk River near Dunsbach Ferry, New York, for 1898.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	-------	4.00	3.20	3.00	1.40	2.50	2.80	2.40	3.60	3.20
2	-------	3.60	3.10	2.70	1.00	5.50	2.40	2.40	3.40	3.10
3	-------	3.20	3.20	2.40	.60	2.20	2.20	2.40	3.20	3.00
4	-------	3.00	3.60	2.40	.40	2.70	2.20	2.40	3.20	3.00
5	-------	2.80	4.20	2.40	.20	2.60	2.10	2.60	3.00	3.10
6	-------	2.60	4.20	2.20	.00	3.50	2.20	5.80	3.00	3.40
7	-------	2.50	4.20	2.00	—.10	3.00	2.40	4.20	3.00	3.30
8	-------	2.60	3.50	1.80	—.10	2.40	2.60	3.30	3.00	3.20
9	-------	2.60	3.10	1.70	—.10	2.00	3.00	3.20	3.10	3.20
10	-------	2.40	2.60	1.70	—.20	1.60	2.70	3.10	3.30	3.20
11	-------	2.40	2.60	1.80	—.30	1.80	2.30	2.80	8.40	3.10
12	7.60	2.40	2.40	1.80	—.40	1.50	2.00	2.70	6.80	3.00
13	8.20	2.40	3.60	2.70	—.60	1.20	1.80	2.70	5.50	2.90
14	8.40	2.50	3.80	3.40	—.60	1.00	1.60	2.80	4.90	2.80
15	7.50	2.60	3.40	3.10	—.60	.90	1.40	3.60	4.40	2.80
16	6.40	2.80	3.00	2.90	—.60	.80	1.30	4.90	4.00	2.80
17	5.60	3.00	2.80	2.60	—.80	1.40	1.30	4.30	3.60	2.80
18	5.60	2.80	2.60	2.20	—.70	2.40	1.20	3.80	3.60	2.80
19	5.30	2.70	2.40	2.00	—.70	2.50	1.20	3.40	3.60	2.80
20	6.50	2.80	2.50	2.00	1.70	2.90	1.80	3.30	4.80	2.80
21	6.20	3.20	2.60	2.60	2.20	3.40	2.20	3.30	4.30	2.80
22	5.40	3.30	2.60	2.20	1.90	2.90	2.00	3.40	3.80	3.00
23	4.80	3.40	2.40	2.20	1.70	2.60	2.00	4.00	3.70	3.60
24	4.80	4.70	2.50	2.00	.80	3.00	2.20	4.20	3.80	4.60
25	4.10	7.00	3.30	1.80	—.20	6.10	3.00	4.00	3.80	4.50
26	3.80	6.80	4.80	1.70	.00	6.40	3.20	3.80	3.50	4.20
27	3.60	6.20	5.20	1.70	1.20	5.20	2.80	4.40	3.50	3.80
28	3.60	5.00	5.20	1.60	1.80	4.00	2.80	5.40	3.00	3.40
29	4.00	4.30	4.00	1.40	1.60	3.20	2.60	5.00	3.00	3.00
30	4.80	3.70	3.40	1.40	1.20	2.80	2.50	4.30	3.00	2.80
31	4.70	------	3.20	------	.60	2.80	------	3.80	------	3.20

Daily gage height, in feet, of Mohawk River near Dunsbach Ferry, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.
1	3.90	2.60	4.00	17	4.20	2.20	4.40
2	3.40	2.60	3.80	18	4.00	2.30	3.80
3	3.20	2.60	3.60	19	3.80	2.40	3.60
4	3.30	2.60	3.30	20	3.40	2.40	4.20
5	4.00	2.60	3.40	21	3.20	2.60	4.40
6	5.80	2.60	6.60	22	3.00	3.00	4.00
7	5.00	2.50	6.00	23	3.00	3.40	3.80
8	4.40	2.40	4.80	24	3.00	4.60	4.00
9	4.00	2.20	4.20	25	3.10	3.90	4.40
10	3.60	2.20	4.10	26	3.20	3.60	4.00
11	3.20	2.20	3.80	27	3.20	3.50	3.80
12	3.20	2.20	3.90	28	3.00	3.80	3.60
13	3.00	2.20	6.00	29	2.80	--------	3.60
14	3.10	2.20	5.60	30	2.70	--------	3.60
15	3.60	2.20	4.90	31	2.70	--------	3.50
16	4.40	2.20	4.50				

Daily gage height, in feet, of Mohawk River near Dunsbach Ferry, New York, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.30	2.20	2.00	2.40	3.75	17	2.70	1.80	2.00	2.45	2.85
2	2.20	2.20	2.00	2.40	3.70	18	2.60	1.80	2.20	2.35	2.80
3	2.10	2.10	2.00	2.45	3.55	19	2.40	1.60	2.20	2.40	2.90
4	2.00	2.00	2.00	2.35	3.50	20	2.30	1.60	2.20	2.50	2.90
5	2.10	2.00	2.00	2.30	4.80	21	2.20	1.70	2.00	3.50	2.85
6	2.00	1.80	2.00	2.20	4.80	22	2.20	1.80	2.00	4.00	2.80
7	2.00	1.80	2.00	2.15	4.40	23	2.00	2.00	2.00	3.80	2.90
8	1.90	1.80	1.90	2.20	4.40	24	2.00	2.50	2.00	3.45	2.90
9	1.80	1.90	1.80	2.85	4.20	25	2.00	2.40	2.00	3.30	3.35
10	1.80	2.00	1.70	3.55	3.70	26	2.20	2.20	2.75	4.10	4.25
11	1.80	2.00	1.70	3.10	3.25	27	2.20	2.20	2.75	6.50	3.75
12	1.80	2.20	1.80	2.90	3.00	28	2.10	2.20	2.50	6.35	3.55
13	1.80	1.70	1.80	2.75	3.25	29	2.00	2.00	2.45	5.50	3.35
14	1.90	1.70	1.80	2.55	3.20	30	2.00	2.00	2.50	4.50	3.20
15	2.20	1.70	1.90	2.50	3.10	31	2.20	......	2.40	......	3.10
16	2.80	1.70	1.90	2.50	2.95						

INDIAN RIVER AT INDIAN LAKE DAM, NEW YORK.

Indian River, a tributary of the upper Hudson, has a precipitous forested mountain area of 146 square miles in eastern Hamilton County. In 1898 a masonry storage dam was built at the foot of Indian Lake, replacing the lumbermen's dam which was formerly there, and raising the level of the artificial lake so formed 23 feet. The storage capacity of the present lake is 5,000,000,000 cubic feet, the area of its water surface is 5,035 acres, and the elevation of the spillway crest above mean tide is 1,650 feet. The dam was built by a federation of water-power users on Hudson River, in cooperation with the State of New York, under the direction of Mr. George W. Rafter, engineer in charge, the primary object being to store flood waters from this drainage area, to be turned into the Hudson during the low-water period of the year, thereby equalizing to some extent the flow of that stream. Water is also used for sluicing logs during the river driving season.[1]

Since July 22, 1900, a gaging record has been kept at the dam, with a view to determining the total outflow from this reservoir. The facts recorded are the elevation of the water surface in the reservoir, the depth of water flowing over the spillway or flashboards, the depth of opening and the head on the main and subsidiary logways, and the depth of the opening and the effective head on each of the 5-foot sluice gates. These data enable a calculation of the outflow from the reservoir to be made, and, by comparison with gaging records kept on Hudson River at Fort Edward and Mechanicsville, the effect of storage on the low-water flow of the latter river can be determined.

A meteorological station has been established at the dam by the United States Weather Bureau, and records are kept of the rainfall, temperature, etc. The regimen of flow of Indian River below the dam is largely artificial, though in the course of a year or more the total annual run-off of the drainage area will appear in the stream,

[1] Engineering News, May 18, 1899.

and it is hoped, in the course of time, to determine the relation between the rainfall and run-off of what constitutes a rather typical Adirondack watershed.

When the reservoir is full the excess of inflow passes over the spillway, which has a level crest 106.05 feet long in the clear. To facilitate the calculation of discharge over this spillway a series of experiments was made at Cornell University June 6, 1899, on a full-sized model of the spillway section (6.58 feet long), from which the proper coefficients of discharge have been determined.[1]

The discharge through the two 5-foot sluice gates, provided for the purpose of drawing the water down as required, is calculated from the observed head and from the area of the lune-shaped gate orifices by the ordinary formula, the value of the coefficients of discharge to be applied being checked by current-meter measurements made at a convenient bridge below the dam.

A meter measurement of the flow at this point on October 19, 1900, showed the rate of draft from the reservoir to be 451 second-feet, both sluice gates being wide open and under an effective head of 11 feet. A measurement of Hudson River at Mechanicsville, made on the afternoon of the following day, October 20, showed the total flow at that point to be 1,871 second-feet.

The following table shows the stage of the Indian Lake reservoir during the year 1900, the depth being measured from the base of the invert of the 5-foot discharge tunnels, also the estimated storage capacity of the reservoir at different depths:

Estimated storage capacity of Indian Lake reservoir.

Water surface.	Elevation.	Area.	Storage capacity.
	Feet.	*Acres.*	*Cubic feet.*
Original lake	1,616–17	1,000	----------
Lumbermen's dam	1,627	3,007	800,000,000
Crest of present dam	1,650	5,035	4,468,000,000
Top of flashboards of present dam	1,651.1	----------	5,000,000,000

Depth of water, in feet, in Indian Lake reservoir, New York, for 1900.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	------	29.42	25.01	16.00	8.62	------	17	------	27.00	20.50	11.83	6.33	------
2	------	29.17	25.00	15.75	8.37	9.50	18	------	27.00	20.08	11.54	6.17	10.83
3	------	28.92	24.83	15.46	8.17	------	19	------	27.00	19.75	11.25	6.08	------
4	------	28.75	24.58	15.17	8.00	------	20	------	27.00	19.42	11.82	6.33	------
5	------	28.58	24.33	14.87	7.79	------	21	------	27.00	19.17	10.79	6.50	------
6	------	28.33	24.17	14.58	7.58	------	22	33.50	27.00	18.87	10.54	6.58	11.08
7	------	28.25	23.92	14.42	7.42	------	23	33.00	26.92	18.54	10.33	6.58	------
8	------	28.08	23.58	14.08	7.33	------	24	32.50	26.75	18.25	10.12	------	11.25
9	------	27.92	23.29	13.79	7.33	10.25	25	32.17	26.63	17.92	9.96	------	------
10	------	27.83	22.00	13.50	7.29	------	26	31.92	26.37	17.58	9.79	------	11.58
11	------	27.67	22.71	13.21	7.25	------	27	31.25	26.17	17.25	9.58	------	------
12	------	27.33	22.37	12.92	7.17	10.42	28	30.83	26.00	16.92	9.38	------	------
13	------	27.29	21.00	12.67	7.00	------	29	30.42	25.83	16.67	9.17	------	11.83
14	------	27.25	21.63	12.42	6.87	------	30	30.08	25.58	16.33	8.96	9.25	------
15	------	27.21	21.25	12.25	6.71	------	31	29.75	25.33	------	8.83	------	12.08
16	------	27.12	20.88	12.08	6.50	10.75							

[1] Proc. Am. Soc. Civ. Engs., March, 1900, p. 288.

SCHROON RIVER AT WARRENSBURG, NEW YORK.

A gaging record was established at the dam of the Schroon River Pulp Company, 2 miles below Warrensburg, by George W. Rafter, member American Society of Civil Engineers, November 1, 1895, in connection with the upper Hudson storage surveys.[1] The conditions at the Warrensburg gaging station are somewhat peculiar. During ordinary water an attempt is made to turn the entire flow of the stream, less leakage, through the water wheels, which run 24 hours a day, Sundays excepted. This is accomplished by the use of flashboards and by draft from the storage impounded by the Starbuckville dam. During extreme low water the mill is shut down altogether. As a rule, no water passes over the dam at this time, the entire flow leaking through. A balance is maintained between the inflow and the outflow by fluctuations in the pond level, thereby varying the pond storage and also the head on the leaks. As no record is kept when the mill is not running, it has been necessary to estimate the low-water flow, which was taken at 150 second-feet in 1899, this being the assumed leakage of the Starbuckville dam.[2] The apparently uniform regimen of the stream during considerable periods may be accounted for as the result of draft and storage from the Starbuckville dam.

A current-meter measurement of the leakage of the dam, flume, and flashboards at the Schroon River Pulp Company's mill was made on August 9, 1900, in the open channel about a half mile below the dam. The flow at that point was found to be 285 second-feet, which amount has been taken as the low-water flow and leakage during the present year (1900). The dam is of timber, and was considered nearly watertight when built, but there is evidence that the leakage has increased year by year.

The flow over the dam without flashboards has been taken from a diagram deduced from experiments made at Cornell University on a weir having a similar cross section. The flow over the flashboards has been calculated by means of Francis's formula, with a constant coefficient of 3.33.

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[1] Ann. Rept. State Engineer and Surveyor of New York, 1895, p. 118; also Water-Supply and Irrigation Paper U. S. Geol. Survey No. 35, p. 58.

[2] Report on a water supply from the Adirondack Mountains for the city of New York, by Geo. W. Rafter: Rept. of Merchants' Association of New York on the water supply of the city of New York, p. 337.

Daily discharge, in second-feet, of Schroon River at Warrensburg, New York, for 1899.

[Drainage area, 563 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	*641	478	478	708	4,854	1,506	304	150	150	*381	1,468	708
2	641	478	478	*708	4,854	1,506	*304	150	150	381	1,468	708
3	641	478	478	708	4,854	1,506	304	150	*150	381	1,468	*708
4	641	478	478	708	4,854	*1,367	304	150	150	381	1,468	708
5	641	*478	*478	708	4,854	1,228	304	150	150	478	*1,468	708
6	641	478	478	708	4,854	1,228	304	*150	150	478	1,468	708
7	608	478	478	708	*4,487	1,228	304	150	150	478	1,468	708
8	*575	478	478	708	4,121	1,228	304	150	150	*478	1,468	708
9	575	478	478	*1,999	4,121	1,228	*304	150	150	478	1,318	708
10	575	478	478	3,291	4,121	1,228	304	150	*150	478	1,318	*708
11	575	478	478	3,291	4,121	*1,228	304	150	150	478	1,171	708
12	575	*478	*478	3,291	4,121	1,228	304	150	150	478	*1,106	708
13	575	478	478	3,291	3,493	1,228	150	*150	150	478	1,041	931
14	608	478	478	3,291	*3,307	1,228	150	150	150	478	983	983
15	*641	478	478	3,291	3,121	1,228	150	150	150	*478	901	1,041
16	641	478	478	*3,362	3,121	1,228	*150	150	150	478	861	1,101
17	641	478	478	3,443	2,931	1,228	150	150	*150	478	841	*1,127
18	641	478	559	3,443	2,931	*1,228	150	150	150	478	841	1,153
19	641	*478	*641	3,443	2,931	1,228	150	150	150	478	*841	1,153
20	641	478	641	3,443	2,381	1,228	150	*150	381	478	841	1,153
21	608	478	641	3,443	*2,181	1,228	150	150	381	478	841	1,153
22	*575	478	641	3,443	1,981	1,228	150	150	381	*478	841	1,153
23	575	478	641	*4,273	1,981	1,228	*150	150	381	478	841	1,153
24	575	478	718	5,103	1,981	970	150	150	*381	478	841	*1,153
25	575	478	718	5,103	1,981	*675	150	150	381	478	841	1,153
26	575	*478	*718	5,103	1,981	381	150	150	381	478	*774	1,153
27	575	478	718	5,103	1,506	381	150	*150	381	478	708	1,101
28	575	478	718	5,103	*1,448	381	150	150	381	478	708	1,101
29	*575	......	718	5,103	1,391	381	150	150	381	*478	708	1,041
30	575	......	718	*5,103	1,391	381	*150	150	381	478	708	1,041
31	575	......	718	....	1,391	....	150	150	......	478	....	*1,041
Mean	606	478	564	2,877	3,150	1,093	210	150	234	462	1,047	948

* Sunday.

Daily discharge, in second-feet, of Schroon River at Warrensburg, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	810	810	1,360	*1,162	3,965	1,085	*885	285	285	285	517	939
2	810	810	1,290	1,215	2,885	1,217	810	285	*285	535	517	*285
3	810	810	1,230	1,315	2,625	*1,349	810	285	285	535	517	989
4	810	*810	*1,204	1,395	2,305	1,565	810	285	285	535	*285	989
5	810	810	1,178	1,535	2,155	1,990	810	*285	285	517	535	989
6	810	810	1,140	1,535	*2,045	1,890	810	285	285	517	535	989
7	*810	810	1,123	1,741	1,935	1,890	810	285	285	*285	535	989
8	810	810	1,123	*1,947	1,748	1,890	*810	285	285	535	517	989
9	810	810	1,123	2,155	1,715	1,890	616	285	*285	535	517	*285
10	810	810	1,123	2,155	1,715	*1,725	616	285	285	535	517	989
11	810	*1,895	*1,123	2,155	1,715	1,565	616	285	285	517	*285	989
12	810	2,035	1,123	2,225	1,715	1,425	616	*285	285	517	535	989
13	810	1,165	1,123	2,305	*1,670	1,300	616	806	285	517	535	989
14	*810	1,945	1,123	2,465	1,625	1,290	616	806	285	*285	535	989
15	810	1,945	1,123	*2,765	1,605	1,300	*616	806	285	535	517	989
16	810	1,945	1,123	3,065	1,585	1,300	539	806	*285	535	517	*285
17	810	1,945	1,123	3,365	1,545	*1,187	539	806	285	535	517	788
18	810	*1,892	*1,120	3,545	1,535	1,075	539	806	285	517	*285	788
19	810	1,840	1,117	4,115	1,525	963	365	*285	285	517	401	788
20	810	1,795	1,107	5,365	*1,470	963	365	806	285	517	535	788
21	*810	1,710	1,100	7,010	1,415	963	285	806	285	*285	535	788
22	810	1,608	1,089	*7,745	1,375	963	*285	806	285	535	535	788
23	810	1,608	1,085	6,945	1,355	963	285	806	*285	535	574	285
24	810	1,608	1,085	6,945	1,295	*963	285	612	285	535	285	*285
25	810	*1,571	*1,085	6,210	1,295	963	285	612	285	517	*285	788
26	810	1,535	1,085	6,685	1,125	963	285	*285	285	517	806	788
27	810	1,475	1,155	6,315	*1,025	963	285	285	285	517	806	788
28	*810	1,435	1,130	5,365	1,085	963	285	285	285	*285	806	788
29	810	....	1,110	*5,095	1,085	963	*285	285	285	535	806	788
30	810	....	1,110	4,825	1,085	963	285	285	*285	535	806	285
31	810	....	1,110	....	1,085	....	285	285	......	535	......	*788
Mean	810	1,380	1,140	3,688	1,688	1,280	528	474	285	488	530	773

* Sunday.

HUDSON RIVER AT FORT EDWARD, NEW YORK.

This station, located at the dam of the International Paper Company, was established in 1895, by George W. Rafter, member American Society of Civil Engineers, in connection with upper Hudson storage surveys. The dam is of timber, on slate rock foundation, and has but little leakage. The crest is straight, very nearly level, and 587.6 feet in length. The zero of the crest gage stands at the level of the lip of the dam proper. Flashboards from 15 to 18 inches in height are usually maintained on the dam. A record is kept of the height of the flashboards and of the times of their setting and removal.

In the adjoining mill there are 62 water wheels, nearly all of modern types, which have been tested at the Holyoke flume. A record is kept of the daily run of each wheel, in hours, as well as of the working head, which usually is 19 feet. The discharge through the turbines is estimated from diagrams expressing the flow as a function of the working head and the number of wheel-hours run.

In the winter of 1896–97 a flood spillway was cut around the south end of the dam, over which the water flows whenever it reaches the level of the crest of the flashboards. The profile of the spillway is very irregular, and causes some uncertainty in the calculated flows during high water.

When the flashboards are off the flow is computed by means of the East Indian Engineers' formula;[1] when they are on the flow is computed by Francis's well-known formula for sharp-crested weir. During the dry season little water passes over the dam, the entire flow being employed to drive the turbines. A current-meter measurement was made at the highway bridge below the dam on July 26, 1900, and the flow was found to be 2,704 second-feet.

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[1] Mullin's Irrigation Manual.

Daily discharge, in second-feet, of Hudson River at Fort Edward, New York, for 1899.

[Drainage area, 2,800 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	*2,415	2,822	3,744	6,514	23,033	3,106	583	363	923	*2,181	9,268	1,941
2	2,619	2,822	3,744	*1,600	23,033	3,106	*945	363	923	2,181	11,948	1,941
3	2,619	2,502	3,744	4,378	23,033	3,106	945	363	*20	1,785	12,250	*1,280
4	2,619	2,606	6,154	4,378	19,689	*1,356	945	363	1,186	1,785	9,403	4,267
5	2,619	*945	*2,415	4,378	19,689	2,218	583	363	1,186	1,211	*14,930	4,307
6	2,877	1,839	5,444	4,378	21,949	2,218	289	*(a)	1,184	912	9.402	4,307
7	2,877	1,539	5,444	4,654	*12,340	2,218	743	(a)	920	1,172	5 668	4,243
8	*4,335	1,539	5,444	4,654	21,940	2,218	762	(a)	920	*20	7 974	4,243
9	4.320	1,539	5,444	*1,560	21,949	2 218	*100	(a)	920	1,008	7 951	4,243
10	3,896	1,539	5,444	4,334	8,283	2,138	1,547	(a)	*20	1,112	6,149	*1,016
11	3,872	1,162	5,444	9,202	6,549	*1,356	1,547	(a)	975	1,182	6,149	2,194
12	2,944	*942	*3,025	9,967	7,049	1,917	1,817	(a)	953	1,182	*1,860	2,369
13	3,225	2,109	5,444	9,967	2,049	1,917	1,817	*(a)	867	1,182	8,923	9,675
14	4,300	2,109	5,444	17,428	*6,960	1,912	1,817	574	631	919	3,817	11,410
15	*2,415	2,109	5,444	17,406	7,049	1,912	1,817	574	620	*20	3,135	11,410
16	5,368	2,109	5,315	*20,095	5,204	1,860	*455	574	577	1,177	3,133	8,130
17	5,388	2,109	4,335	21,222	5,204	1,720	1,817	916	*20	575	3,133	*5,882
18	5,388	1,504	4,335	21,222	5,204	*945	1,817	916	624	576	3,133	8,229
19	5,388	*1,150	*3,344	21,800	5,204	1,683	1,817	916	624	826	*20	8,229
20	5,388	1,682	6,099	27,059	8,617	1,454	1,817	*20	577	861	2,900	8,574
21	5,388	1,682	6,229	29,545	*700	988	1,645	1,176	954	1,184	2,900	8,574
22	*1,356	1,682	6,229	29,618	4,864	752	1,645	1,176	1,024	*20	2,900	8,574
23	3,491	2,012	6,229	*25,640	4,864	590	*465	1,176	1,024	1,446	2,580	8,220
24	3,776	2,308	5,703	32,158	4,184	590	1,368	916	*20	1,439	2,311	*2,415
25	3,618	1,600	5,703	32,159	4,282	*747	1,300	916	1,184	923	2,044	2,415
26	3,623	*1,600	*2,415	29,619	3,901	1,329	1,103	916	3,404	918	*20	4,809
27	3,623	2.853	5,444	29,619	3,901	894	1,103	*574	4,889	919	2,311	4,234
28	3,041	2,842	5,444	29,620	*1,356	888	1,275	1,176	4,889	919	2,206	4,234
29	*925	-------	5,506	27,032	3,104	585	1,275	576	4,181	*20	2,206	4,234
30	2,816	-------	5,506	*23,120	3,104	583	*20	576	4,181	1,183	2,206	4,234
31	2,816	-------	5,506	--------	3,104	-------	461	948	-------	1,183	--------	*20
Mean	3,527	1,902	5,005	16,811	9,561	1,617	1,150	714	1,347	1,033	5,098	5,157

* Sunday. *a* No record.

Daily discharge, in second-feet, of Hudson River at Fort Edward, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,001	3,481	2,879	*3,237	12,486	4,924	*175	1,927	1,044	827	1,620	5,586
2	1,957	3,221	4,242	4,932	11,899	4,924	827	1,401	*956	827	1.266	*5,611
3	1,957	3,221	4,362	5,261	10,776	*3,422	827	1,719	190	827	1,406	7,697
4	1,957	*1,810	*3,019	5,701	11,626	4,921	30	1,332	1,445	827	*302	4,421
5	1,957	2,961	4,462	5,701	9,646	5,094	1,216	*1,087	827	827	1,462	4,421
6	2,053	2,447	3,215	7,376	*3,015	4,674	931	1,256	715	827	834	4,183
7	*1,401	2,447	3,859	10,566	7,351	4,419	821	1,087	827	*20	1,226	4,661
8	2,217	2,447	3,741	*11,360	8,246	4,440	*1,215	1,350	827	1,466	1,006	4,181
9	2,217	3,221	3,471	14,316	5,836	4,539	1,288	1,579	*827	1,216	1,119	*7,281
10	2,217	3,889	4,208	11,636	8,246	*1,367	1,255	1,740	1,211	1,216	2,203	2,454
11	2,217	*2,062	*3,259	11,636	6,608	3,859	827	1,729	1,211	1,258	*875	2,061
12	2,217	4,136	3,879	11,636	6,608	3,201	1,260	*1,053	1,211	1,238	2,203	2,806
13	2,217	7,369	3,659	10,776	*4,450	2,924	841	2,271	827	1,366	2,203	2,656
14	*1,571	16,615	3,723	10,776	5,361	2,921	1,467	2,565	1,579	*872	1,883	2,388
15	2,217	17,747	3,759	*9,202	6,378	2,981	*803	3,019	1,293	1,818	1,947	2,138
16	2,217	18,499	3,571	10,776	7,348	2,268	2,171	3,233	*686	1,504	1,691	*965
17	2,217	18,975	3,095	12,946	5,993	*795	1,248	3,347	1,233	1,306	2,947	2,275
18	2,217	*13,045	*1,302	17,076	6,987	2,941	1,220	2,989	1,233	1,450	*1,133	1,826
19	2,217	15,531	3,479	23,626	5,961	1,677	934	*1,420	1,112	1,246	2,040	1,940
20	2,217	9,340	3,479	31,495	*3,015	1,957	1,360	2,242	1,112	1,224	1,901	1,920
21	*1,401	9,141	4,830	34,899	7,342	2,407	1,268	1,250	1,211	*872	4,863	2,138
22	5,858	7,611	4,942	*34,470	5,967	1,915	*30	1,534	1,175	1,611	7,074	2,138
23	7,312	7,013	4,942	43,900	6,336	1,979	1,306	977	*912	1,040	10,213	*1,795
24	7,577	6,259	4,942	36,061	5,111	*20	1,338	940	1,612	1,118	6.482	1,590
25	6,991	*5,609	*2,911	30,945	3,677	2,607	2,033	901	1,661	1,106	*3,260	3,170
26	6,991	4,694	4,742	26,635	4,912	2,191	1,467	*95	1,557	1,251	6,268	2,637
27	5,862	4,232	4,742	23,536	*415	1,178	3,441	928	1,329	1,773	-----	3,136
28	*2,041	4,045	4,466	18,480	4,366	2,181	3,263	928	1,435	*804	-------	2,887
29	5,212	--------	4,882	*14,250	4,319	1,241	*175	1,487	1,180	2,703	-------	2,887
30	4,287	--------	4,942	14,210	3,372	1,069	1,987	1,531	*865	2,447	-------	*2,637
31	3,571	--------	4,942	--------	3,460	-------	1,656	1,791	-------	1,647	-------	2,637
Mean	3,211	7,074	3,934	16,914	6,358	2,834	1,248	1,652	1,110	1,243	2,670	3,198

* Sunday.

HUDSON RIVER AT MECHANICSVILLE, NEW YORK.

A record of the flow of Hudson River at Mechanicsville has been kept by the Duncan Company since December, 1888. The record includes two daily readings of the depth of water on the crest of the dam and a continuous record of the water wheels in the adjoining paper mill. The accompanying tables give the daily mean flow at Mechanicsville, computed by Mr. R. P. Bloss, the engineer of the Duncan Company. A record is kept of the length and height of the flashboards at all times, with the dates of their setting and removal.

The flow over the dam has been computed by the Francis formula for the Merrimac dam, $Q=3.01\ LH^{1.53}$, L being 794 feet. The same formula has been used in all cases, whether flashboards are on or off.

The flow through the water wheels has been taken from the rating tables of the manufacturers. The working head on the wheels varies from 15 to 17 feet, depending on the condition of the flashboards on the dam. A test made by Mr. Bloss of a 39-inch Hercules wheel in the mill, which has been in use about eight years, shows the actual discharge to be substantially the same as that given in the manufacturers' tables when running at the speed of greatest efficiency. When running at higher speeds the discharge may be several per cent less.

A current-meter measurement of the flow below the dam was made at the Mechanicsville tollbridge October 20, and showed a discharge of 1,871 second-feet. The result is somewhat uncertain, however, owing to slack water. No water was flowing over the dam, and the calculated turbine discharge was 1,977 second-feet.

The flow of Hudson River at Mechanicsville has been calculated by George W. Rafter, member American Society of Civil Engineers, using the East Indian Engineers' formula for flow over dam.[1] This formula gives a somewhat greater discharge than that obtained by using the Francis formula for the Merrimac dam.

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[1] Rept. State Engineer and Surveyor of New York, 1895, p. 105; also Water-Supply and Irrigation Paper U. S. Geol. Survey No. 24, p. 78

Daily discharge, in second-feet, of Hudson River at Mechanicsville, New York, for 1898.

[Drainage area, 4,500 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6,252	4,340	5,011	20,306	*13,474	9,490	3,179	3,005	*a* 4,345	3,222	7,954	6,300
2	(*)	4,839	4,998	18,016	11,545	8,159	3,014	3,888	*a* 4,007	*2,877	7,667	6,130
3	5,319	5,034	4,927	*15,810	9,702	7,558	*3,007	6,225	*a* 4,145	2,835	6,590	5,698
4	5,276	4,114	4,909	13,890	10,820	6,292	3,007	5,72[illegible]	**a*4,340	2,780	6,500	*5,185
5	5,563	3,956	4,791	11,932	10,570	*5,808	3,364	6,031	4,547	11,210	5,890	5,994
6	5,698	(*)	(*)	10,692	11,300	5,508	2,588	5,832	4,145	20,089	*5,803	6,500
7	6,873	4,000	4,998	9,928	11,032	4,729	2,453	*5,415	4,007	9,472	5,890	6,322
8	7,592	5,286	4,875	8,787	*10,250	4,399	2,314	5,091	4,930	8,261	5,503	5,456
9	(*)	5,139	6,418	8,158	9,700	4,249	2,220	4,335	4,217	*7,872	5,872	4,150
10	6,431	5,145	7,004	*7,924	8,695	3,978	*1,163	3,926	3,813	6,960	6,238	4,675
11	6,249	5,865	9,746	7,915	7,875	3,425	2,000	3,743	*3,368	6,038	20,256	*4,345
12	5,136	7,639	20,202	7,646	8,420	*3,857	2,182	3,387	3,304	6,109	16,262	4,290
13	11,930	(*)	(*)	8,553	11,054	4,299	2,058	3,331	3,188	5,331	*14,510	3,739
14	11,424	9,732	39,231	9,815	10,585	4,945	2,080	*3,148	2,732	4,829	13,202	3,540
15	10,557	8,078	36,155	9,824	*10,161	7,662	2,184	3,362	2,597	6,888	11,385	3,850
16	(*)	7,706	31,310	12,188	9,967	6,872	2,159	3,250	2,487	*7,838	10,366	4,007
17	10,176	5,396	31,069	*12,575	10,082	5,681	*1,163	3,223	2,597	8,125	9,722	4,495
18	7,898	6,978	31,794	12,188	10,637	4,620	2,192	3,235	*2,873	7,250	8,910	*4,590
19	7,318	7,224	29,304	11,155	9,404	*4,851	2,224	3,660	2,873	6,500	8,922	4,590
20	8,401	(*)	(*)	11,157	9,412	5,593	2,175	4,507	3,365	6,508	*10,505	4,885
21	14,053	7,445	35,917	10,922	8,355	4,603	2,192	*4,495	2,975	6,418	11,167	5,035
22	10,625	7,348	33,660	10,127	*7,954	4,399	3,188	4,718	2,899	6,310	10,366	5,035
23	(*)	6,746	30,004	9,815	8,000	4,198	3,565	3,927	2,666	*6,894	9,610	6,908
24	11,873	6,149	26,754	*9,627	8,400	4,348	*3,549	5,779	3,297	7,578	8,898	8,369
25	9,866	5,915	24,034	20,440	9,491	4,097	3,928	*a*11,167	*5,231	7,178	8,685	*7,747
26	9,173	5,461	21,040	24,210	11,953	*4,024	4,665	*a*9,953	6,878	6,693	7,847	6,885
27	8,171	(*)	(*)	24,338	14,758	4,115	4,258	*a*8,125	5,706	9,382	*6,413	5,872
28	8,101	5,380	19,077	20,440	15,327	3,556	3,656	**a*8,250	4,775	11,042	5,820	4,618
29	7,727	......	19,818	18,165	*14,140	3,508	3,352	*a* 6,109	4,345	10,485	6,300	4,628
30	(*)	......	22,777	14,873	12,727	3,238	3,175	*a* 4,829	3,650	*10,059	6,300	4,828
31	4,822	......	21,805	......	10,490	......	*3,015	*a* 4,217	......	9,953	......	5,348
Mean	8,173	6,038	19,617	13,047	10,525	5,069	2,751	5,029	3,810	7,516	8,978	5,291

a Discharge August 25 to September 4 approximate, owing to irregular flashboards.
* Sunday.

Daily discharge, in second-feet, of Hudson River at Mechanicsville, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	*4,262	3,910	7,847	7,980	26,900	3,990	2,220	1,520	1,713	(*)	4,564	3,005
2	4,262	4,268	7,040	7,159	27,617	3,796	*1,047	629	1,561	4,042	8,889	3,414
3	5,209	4,268	6,403	6,955	25,551	3,601	2,128	1,213	(*)	3,453	12,020	*3,753
4	6,065	4,150	......	7,938	22,472	*2,220	......	1,153	1,293	2,850	11,899	5,545
5	9,146	*4,002	(*)	9,504	19,242	2,990	2,741	1,085	1,860	2,745	*10,346	6,678
6	8,460	4,223	16,501	9,955	15,152	2,840	1,610	(*)	1,764	2,650	11,049	5,974
7	8,355	4,048	12,266	11,719	*12,662	2,728	1,670	1,494	1,706	2,571	9,308	5,210
8	*8,350	4,275	9,077	19,708	10,960	2,805	1,211	1,616	1,680	(*)	8,140	4,558
9	8,026	3,448	8,665	*18,275	9,270	2,525	(*)	1,475	1,466	2,590	7,166	3,806
10	6,562	3,665	7,909	15,062	8,587	2,290	3,000	484	(*)	2,712	6,662	*3,265
11	5,766	3,622	7,315	15,582	7,446	(*)	3,533	1,148	1,480	2,903	6,182	3,569
12	5,250	*4,062	*11,739	16,875	7,550	2,399	3,296	993	1,598	2,874	*5,490	4,979
13	5,272	4,196	15,437	17,145	7,155	2,505	3,243	(*)	1,471	2,926	6,321	11,183
14	5,960	4,508	12,153	21,378	*7,060	2,230	3,002	1,580	1,567	2,353	5,536	14,576
15	*7,435	4,600	10,555	27,975	7,772	2,135	2,800	1,680	1,484	(*)	5,179	14,979
16	8,910	4,798	10,012	*29,730	7,346	3,078	(*)	1,501	1,549	2,177	4,858	13,452
17	10,155	5,598	9,080	31,112	5,738	3,060	2,861	1,815	(*)	2,132	5,283	*9,646
18	9,685	5,691	7,895	29,667	5,729	*2,762	3,338	979	711	1,853	4,857	9,534
19	7,339	*5,620	*9,322	29,711	5,928	2,950	2,860	1,390	1,636	1,798	*4,359	9,968
20	6,385	5,267	11,350	33,940	5,917	2,508	2,560	(*)	957	1,997	4,838	10,950
21	6,297	4,855	9,670	36,210	*5,925	2,372	2,485	1,610	941	2,185	4,729	11,048
22	*5,770	5,686	9,337	36,210	6,187	2,280	2,295	1,123	1,448	(*)	4,587	10,721
23	5,697	10,083	8,645	*37,146	5,313	2,105	(*)	1,743	1,464	2,466	4,297	9,642
24	5,522	7,501	8,657	38,283	4,756	1,878	2,240	2,460	(*)	2,698	3,964	*8,068
25	6,950	5,583	8,095	39,064	4,710	*304	2,233	1,383	1,516	2,372	3,731	8,241
26	5,775	*5,255	*7,492	41,475	4,462	1,878	2,188	1,463	2,116	2,304	*3,472	7,821
27	5,438	6,450	6,895	40,664	4,117	2,241	2,021	(*)	6,000	2,128	4,027	5,832
28	4,545	10,326	6,615	38,300	*3,985	2,290	2,140	1,756	5,127	2,216	3,495	5,435
29	*4,290	......	7,835	33,908	4,125	2,368	1,686	1,738	4,413	(*)	3,439	4,889
30	4,345	......	8,765	*30,292	3,787	2,512	(*)	1,739	4,870	3,198	3,318	4,075
31	4,066	......	7,602	......	3,918	......	2,055	1,477	......	3,815	......	*2,585
Mean	6,437	5,141	9,316	24,607	9,591	2,539	2,402	1,417	2,054	2,616	6,066	7,303

* Sunday.

Daily discharge, in second-feet, of Hudson River at Mechanicsville, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,612	4,163	5,623	(*)	16,713	4,288	*2,364	2,977	2,365	2,102	2,531	9,107
2	3,276	3,349	12,924	10,088	15,493	4,932	2,368	2,809	*2,297	2,223	2,094	*8,316
3	3,294	3,737	10,299	10,413	14,676	*3,482	2,368	2,464	2,177	2,144	2,413	7,444
4	3,263	(*)	*3,800	11,188	14,593	7,644	2,191	2,386	2,519	2,071	*2,159	6,459
5	3,277	6,556	7,998	11,188	12,494	6,793	2,701	*2,167	2,289	1,752	1,977	10,694
6	3,602	8,140	5,932	12,267	*9,444	6,083	2,382	2,135	2,125	1,768	1,925	9,033
7	*3,000	7,204	9,312	15,149	9,741	5,554	2,109	2,266	2,031	*2,094	1,576	7,920
8	3,816	6,777	6,900	*17,520	10,924	5,329	*2,200	2,607	1,725	1,895	1,666	7,624
9	3.556	19,351	6,738	18,804	9,066	5,329	2,130	2,785	*1,248	1,888	2,028	*6,880
10	3,998	11,373	7,420	16,633	9,403	*4,430	2,007	2,752	713	1,965	2,520	6,181
11	3,698	*9,666	*6,342	14,742	10,716	5,827	1,437	2,182	1,738	1,692	*3,860	5,019
12	3,218	7,799	6,305	14,237	8,530	4,759	1,692	*2,550	1,916	2,063	4,331	4,663
13	3,159	24,539	5,563	14,362	*7,500	4,175	1,342	2,541	1,801	1,947	3,820	4,988
14	(*)	41,285	5,761	13,554	7,626	3,911	2,002	2,691	1,118	*1,931	3,805	4,856
15	3,067	25,354	5,363	*11,988	7,750	4,033	*2,263	3,292	1,433	2,123	3,315	4,250
16	3,158	22,593	4,411	13,588	9,390	4,054	2,292	4,299	*1,820	2,061	3,136	*4,250
17	3,180	19,527	4,719	15,918	7,549	*3,700	2,185	5,773	2,063	2,233	2,911	4,195
18	3,139	*16,547	*3,675	22,761	8,241	4,269	2,189	4,617	1,904	2,013	*3,036	4,265
19	4,668	14,173	4,935	33,150	7,500	3,617	1,991	*4,014	2,087	1,978	3,287	3,909
20	16,115	12,825	15,344	40,131	*9,450	2,941	1,580	3,955	2,032	1,954	3,829	4,129
21	*18,307	11,555	11,058	42,908	10,953	2,774	1,565	3,154	1,412	*1,977	5,292	3,953
22	11,307	10,060	7,999	*42,300	9,141	2,968	*2,180	2,834	1,581	2,017	9,332	4,004
23	10,176	13,310	8,324	43,546	8,029	3,141	2,299	2,510	*1,704	1,955	10,120	*4,210
24	9,853	10,188	9,399	41,940	7,354	*1,877	2,271	2,351	1,822	2,253	9,321	5,239
25	9,295	*9,301	*10,686	38,575	6,345	2,868	2,092	1,831	1,978	2,195	*8,796	3,763
26	8,449	7,042	8,226	33,983	5,758	3,210	2,690	*1,708	1,953	2,167	9,483	6,536
27	6,913	5,390	7,541	28,578	*4,651	3,713	4,082	1,702	2,002	2,203	11,027	4,700
28	(*)	5,252	7,626	25,618	6,454	2,787	3,898	1,814	2,422	*2,320	11,694	4,679
29	6,145		7,626	*25,741	5,333	2,361	*2,836	2,192	2,145	2,583	11,347	4,459
30	5,808		8,014	19,510	4,042	2,530	3,951	2,142	*2,135	3,287	9,670	*4,593
31	4,453		9,075		3,857		3,248	2,278		3,124		4,535
Mean	5,841	12,484	7,740	22,614	8,992	4,093	2,352	2,703	1,886	2,128	5,077	5,331

* Sunday.

CROTON RIVER AT OLD CROTON DAM, NEW YORK.

Records of the yield of the Croton watershed have been prepared by the engineers of the aqueduct commission. Tables of the monthly discharge of the river, in second-feet, for the years 1870 to 1898, inclusive, were printed in the Twentieth Annual Report, Part IV, page 83, and in the Twenty-first Annual Report, Part IV, page 75, is a table of the rainfall and run-off of the watershed for the years 1868 to 1899, inclusive. The following table, furnished by Mr. W. R. Hill, chief engineer of the aqueduct commission, is the record for 1900. The figures of rainfall are those obtained at Boyds Corners, in Croton Basin.

Estimated monthly discharge of Croton River at old Croton dam, New York, for 1900.

[Drainage area, 338 square miles.]

Month.	Discharge.	Total.	Run-off.		Rainfall.
			Per square mile.	Depth.	
	Second-feet.	*Acre-feet.*	*Second-feet.*	*Inches.*	*Inches.*
January	537	33,020	1.59	1.83	4.18
February	2,179	121,032	6.45	6.71	7.97
March	1,724	106,013	5.10	5.88	5.06
April	553	32,915	1.64	1.83	2.16
May	716	43,991	2.12	2.45	6.40
June	357	21,254	1.06	1.18	2.17
July	78	4,774	.23	.27	4.28
August	77	4,716	.23	.27	1.75
September	107	6,357	.32	.36	3.27
October	174	10,674	.51	.59	4.73
November	346	20,573	1.02	1.14	4.91
December	639	39,258	1.89	2.18	2.58
The year	624	444,577	1.85	24.69	49.46

DELAWARE RIVER AT LAMBERTVILLE, NEW JERSEY.

This station, which was established July 23, 1897, by E. G. Paul, is described in Water-Supply Paper No. 35, page 62. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 77. During 1900 the following measurements of discharge were made by Mr. Paul:

May 22: Gage height, 5.10 feet; discharge, 17,750 second-feet.

September 27: Gage height, 2.95 feet; discharge, 1,824 second-feet.

Daily gage height, in feet, of Delaware River at Lambertville, New Jersey, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	(*a*)	(*a*)	5.40	4.25	4.45	3.30	2.65	3.40	2.95	2.90	2.80	4.15
2	(*a*)	(*a*)	12.00	4.20	4.35	3.40	2.50	3.15	3.05	2.50	2.75	4.05
3	(*a*)	(*a*)	10.70	4.30	4.25	3.45	2.60	3.00	2.75	2.55	2.85	3.95
4	(*a*)	7.00	7.95	4.40	4.20	3.65	2.90	3.05	2.90	2.65	3.20	3.95
5	(*a*)	6.85	6.80	4.50	4.05	3.80	3.10	3.05	2.70	2.80	3.25	4.40
6	(*a*)	5.75	6.20	4.40	4.00	3.70	3.40	2.70	2.70	2.55	3.20	4.90
7	(*a*)	5.30	6.05	4.30	3.95	3.55	3.80	3.25	2.60	2.75	3.20	5.40
8	(*a*)	5.45	5.80	4.40	3.90	3.35	3.65	2.70	2.65	2.70	3.15	4.95
9	(*a*)	5.60	6.00	4.60	3.80	3.30	3.65	2.60	2.90	2.75	3.20	4.60
10	(*a*)	6.95	5.60	4.55	3.80	3.55	3.55	2.65	2.85	2.75	3.10	4.45
11	(*a*)	6.55	5.45	4.45	3.90	3.85	3.50	2.80	3.00	2.75	2.90	4.20
12	5.65	5.60	5.20	4.30	3.80	3.80	3.35	2.55	3.25	2.60	2.75	3.95
13	4.35	7.46	4.90	4.35	3.80	3.50	3.35	2.55	3.10	2.50	2.55	3.90
14	3.95	11.40	4.60	4.40	3.80	3.45	3.20	3.05	3.00	3.15	2.70	4.40
15	3.70	9.70	4.55	4.50	3.70	3.95	3.30	3.05	2.85	2.95	2.60	(*a*)
16	3.60	8.10	4.50	4.45	3.60	3.95	3.10	2.80	3.45	3.00	2.85	(*a*)
17	3.85	6.65	4.20	4.30	3.60	3.85	3.35	2.85	3.25	2.80	2.85	(*a*)
18	3.80	5.95	4.20	4.75	4.00	3.70	3.25	2.80	3.00	2.60	3.10	(*a*)
19	3.70	5.25	4.10	6.60	4.80	3.45	3.30	2.95	3.00	2.40	2.85	(*a*)
20	4.45	5.05	5.15	7.15	5.35	3.45	3.35	3.15	2.70	2.35	2.80	(*a*)
21	7.70	4.90	5.90	6.50	5.40	3.25	3.30	3.10	2.55	2.60	2.75	(*a*)
22	7.75	6.05	6.30	6.00	5.05	3.20	3.50	2.95	2.65	2.65	2.85	(*a*)
23	6.20	9.65	5.65	5.85	4.60	3.05	3.35	2.90	2.85	2.25	3.10	(*a*)
24	5.75	8.70	5.30	5.95	4.25	3.15	3.45	2.80	2.85	2.40	3.40	3.40
25	5.25	7.10	5.15	5.95	4.15	3.20	3.35	2.65	2.80	2.40	3.15	3.60
26	5.00	6.10	5.00	5.70	4.05	3.15	4.35	3.10	2.90	2.50	3.75	3.50
27	5.20	5.25	4.85	5.25	3.95	3.00	4.10	3.05	2.95	2.50	3.50	3.80
28	(*a*)	4.90	4.95	4.95	3.75	2.90	3.85	2.95	2.90	2.85	4.10	4.05
29	(*a*)	......	4.60	4.80	3.60	2.70	3.65	2.80	2.65	2.80	4.75	4.05
30	(*a*)	......	4.50	4.65	3.60	2.70	3.60	2.85	2.95	2.85	4.40	(*a*)
31	(*a*)	......	4.35	......	3.45	......	3.50	3.10	......	2.95	......	4.00

a Frozen.

TOHICKON CREEK AT POINT PLEASANT, PENNSYLVANIA.

The stream is described in the Twentieth Annual Report, Part IV, page 98, which also contains (pages 98–103) the figures for monthly flow for the years 1890 to 1898. Figures for daily flow for 1899 were published in Water-Supply Paper No. 35, page 64. In the Twenty-first Annual Report, Part IV, pages 83 to 85, will be found the monthly flow for 1899 and diagrams of the discharge from 1883 to 1899, inclusive. The following tables give the figures for daily flow since 1883, when the station was established, from which the diagrams were constructed. Daily records of gage heights were not kept during 1900. The average monthly discharge, which will appear in the Twenty-second Annual Report, Part IV, has been computed by Mr. John E. Codman, hydrographer of the water department of the city of Philadelphia, from the rainfall and the monthly flow of Neshaminy and Perkiomen creeks.

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1883.

[Drainage area, 102.2 square miles.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1		3	90	49	18	11	7	20	41
2		6	55	46	19	5	9	15	41
3		10	39	43	20	4	18	23	41
4		28	33	31	21	3	12	17	110
5		24	26	43	22	4	12	21	100
6		11	26	37	23	2	13	18	100
7		11	30	41	24	2	456	18	100
8		11	30	61	25	5	189	21	100
9		13	36	81	26	5	99	24	100
10		7	35	122	27	8	95	220	100
11		12	151	81	28	6	69	165	260
12		7	118	41	29	5	356	85	250
13	4	9	79	41	30	5	687	49	240
14	7	5	54	41	31		179		230
15	7	7	43	41					
16	1	18	29	41	Mean	5	77	53	86
17	2	15	20	41					

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1884.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	331	406	384	359	29	10	589	35	29	7	150	159
2	473	395	376	333	26	10	372	41	18	6	125	159
3	515	395	368	400	20	8	247	30	18	5	102	139
4	445	396	360	279	20	6	216	52	18	5	205	48
5	354	396	419	217	20	5	2,309	100	11	5	313	44
6	354	396	392	155	20	7	1,507	103	5	4	253	256
7	467	1,989	365	92	19	8	863	76	7	2	81	1,560
8	2,593	2,412	362	80	18	9	612	42	7	2	64	309
9	3,492	1,270	359	408	17	10	256	32	7	2	21	164
10	2,749	1,270	356	373	129	35	131	22	7	2	21	77
11	1,579	889	1,113	338	150	35	39	20	9	1	22	50
12	590	399	1,871	305	103	34	25	20	6	1	23	662
13	590	1,743	1,148	223	75	33	31	19	2	1	19	651
14	502	2,103	425	141	349	33	31	11	2	1	12	178
15	390	585	410	160	204	33	31	10	3	1	12	1,112
16	390	434	395	300	93	33	31	8	3	1	12	387
17	390	621	380	258	54	33	26	5	3	0	12	159
18	377	1,218	365	216	36	34	22	5	3	0	12	108
19	361	1,000	1,114	173	34	34	22	4	4	0	10	73
20	361	1,862	1,390	109	49	33	15	4	4	0	13	251
21	382	1,314	414	46	67	31	15	4	2	0	25	315
22	409	1,204	400	42	59	22	15	7	3	0	25	323
23	409	2,008	380	38	43	9	10	12	3	2	46	363
24	409	900	1,000	44	29	4	9	11	4	4	859	211
25	409	855	425	35	24	4	9	9	5	5	211	159
26	409	739	800	28	22	4,379	7	4	4	4	106	123
27	409	623	568	21	15	1,460	5	3	2	5	68	100
28	411	507	336	15	13	1,242	7	4	2	8	52	83
29	415	392	321	15	10	1,024	11	17	2	20	201	107
30	415	-------	306	41	10	807	20	26	6	20	159	240
31	415	-------	385	-------	9	-------	22	28	-------	250	-------	2,372
Mean	703	990	580	175	57	314	242	25	7	12	108	353

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1885.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,614	75	59	1,291	50	8	1	1	8	1	84	123
2	480	73	61	1,004	62	12	2	35	7	5	635	149
3	138	72	102	518	60	15	3	696	7	3	345	164
4	138	75	119	1,013	60	10	3	1,489	7	5	131	155
5	140	58	183	3,664	55	13	109	188	2	5	73	128
6	1,599	79	218	2,411	28	12	325	50	5	3	61	132
7	949	116	231	868	37	9	107	58	5	6	55	83
8	232	135	196	203	172	6	14	210	4	7	953	121
9	176	425	174	169	186	9	5	180	6	6	1,137	172
10	167	1,463	115	146	82	10	5	120	4	5	286	543
11	82	1,885	83	118	63	10	4	54	6	10	151	258
12	1,404	738	69	118	63	9	4	29	6	3	94	110
13	423	403	59	112	63	4	3	33	7	18	69	382
14	103	283	64	76	61	2	3	61	4	12	57	809
15	293	477	149	76	29	4	3	49	1	14	41	367
16	784	697	162	76	25	6	3	29	3	12	46	144
17	1,267	724	202	76	23	8	1	25	5	11	39	144
18	216	238	180	59	23	3	1	19	2	10	35	128
19	101	218	178	42	22	7	1	17	1	6	26	103
20	94	202	170	42	16	6	1	7	1	8	33	76
21	87	192	116	40	14	6	1	11	5	44	29	63
22	91	177	69	29	14	5	0	18	1	112	23	63
23	98	163	64	29	14	4	0	17	1	66	244	53
24	101	150	51	29	19	4	1	17	4	34	720	57
25	104	116	190	29	20	1	1	14	2	17	449	50
26	97	107	592	36	25	2	1	10	2	24	363	57
27	82	90	931	39	18	4	1	8	1	27	322	66
28	90	86	1,027	43	20	5	1	13	1	24	235	80
29	96	-------	783	49	16	4	1	12	1	12	194	38
30	99	-------	783	49	15	2	1	5	1	244	147	30
31	89	-------	850	-------	12	-------	1	8	-------	202	-------	65
Mean	401	340	265	415	44	7	20	112	3	31	236	158

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1886.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	278	172	169	2,523	32	29	24	17	3	2	15	62
2	112	137	159	647	21	25	19	21	1	4	12	46
3	83	113	149	198	17	27	20	18	5	4	14	59
4	833	146	139	149	26	36	10	12	2	3	12	110
5	3,352	138	130	222	23	37	17	11	1	1	8	104
6	720	132	95	3,692	26	24	15	9	2	1	13	63
7	148	126	55	2,320	24	28	12	15	1	2	9	88
8	113	120	50	1,085	2,121	19	10	18	1	3	9	68
9	105	114	44	428	1,746	18	9	22	3	2	7	63
10	182	95	42	239	348	22	14	16	2	1	9	86
11	207	4,060	41	160	159	42	19	11	1	1	10	55
12	258	5,359	38	150	117	32	21	7	5	3	9	23
13	236	5,404	46	285	649	25	19	8	4	2	28	34
14	176	2,299	42	283	1,319	176	16	10	5	1	30	252
15	110	1,392	45	130	313	482	16	7	5	2	33	283
16	149	836	41	85	673	181	256	5	2	2	28	156
17	150	207	38	72	283	95	378	6	2	1	21	225
18	150	142	35	52	136	72	132	6	2	2	166	372
19	227	149	43	50	116	39	275	7	2	1	413	1,016
20	372	136	46	43	125	26	83	6	2	5	96	710
21	110	107	2,061	43	140	26	51	3	5	1	42	230
22	171	140	1,088	32	117	22	52	4	5	1	31	148
23	223	91	308	26	237	1,030	40	3	3	2	446	99
24	163	87	146	31	140	825	26	4	2	1	621	148
25	311	1,123	125	37	115	210	20	3	1	2	756	985
26	197	2,108	101	35	94	128	366	6	1	4	2,064	336
27	117	324	100	35	77	81	100	6	2	8	257	189
28	679	231	783	34	81	54	36	8	1	15	107	103
29	984	------	948	32	67	38	28	7	3	17	73	142
30	908	------	2,150	24	43	28	25	3	1	12	61	144
31	200	------	2,598	------	41	------	25	2	------	15	------	175
Mean	388	910	382	438	304	129	69	9	2	4	180	212

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1887.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	330	205	246	106	57	188	18	1,148	20	18	24	25
2	400	109	155	101	49	161	12	196	18	20	18	33
3	300	107	152	132	39	148	10	279	16	25	16	24
4	220	127	121	153	38	90	11	86	14	26	18	24
5	150	155	96	142	36	50	434	52	15	22	14	20
6	180	136	86	101	29	40	1,858	85	15	22	15	24
7	130	438	180	73	244	35	419	116	13	14	9	35
8	120	884	816	61	669	44	149	68	10	16	14	35
9	100	838	736	54	508	38	82	46	11	11	15	30
10	110	531	1,149	44	195	34	79	24	11	14	13	70
11	130	770	612	49	118	25	68	22	10	14	20	1,201
12	115	623	210	46	73	17	43	39	180	13	18	639
13	110	275	159	40	58	23	35	39	349	14	18	470
14	720	168	145	33	43	20	23	22	111	13	16	114
15	744	425	109	33	31	14	15	24	59	11	22	428
16	416	644	83	33	37	11	14	18	41	9	20	708
17	252	329	66	24	34	14	70	21	31	7	20	205
18	236	1,581	51	40	26	13	63	19	18	11	16	75
19	145	2,357	50	162	20	9	40	16	21	10	22	131
20	113	463	48	312	20	25	29	22	15	10	47	137
21	110	252	59	131	18	27	22	19	19	90	79	184
22	175	332	125	83	15	23	19	23	15	75	49	291
23	523	375	275	67	20	1,483	78	166	17	54	35	320
24	2,544	641	284	113	31	446	335	1,883	14	35	28	234
25	1,112	466	945	96	45	139	284	549	10	25	27	177
26	602	166	884	134	32	63	106	151	12	22	27	187
27	214	613	351	147	24	46	57	89	14	19	19	158
28	202	466	1,538	88	17	30	42	47	19	17	21	701
29	1,473	------	540	100	31	25	30	36	25	22	27	1,139
30	1,542	------	176	92	19	23	26	27	20	14	30	652
31	415	------	144	------	------	------	36	23	------	21	------	306
Mean	449	517	342	93	87	110	145	173	38	23	24	283

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1888.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,190	150	122	318	37	43	11	8	21	38	94	144
2	3,492	150	120	235	32	33	7	8	18	40	80	294
3	683	116	130	189	31	22	9	7	20	37	76	275
4	294	109	164	131	28	27	4	11	17	35	71	81
5	217	201	154	692	28	27	11	16	21	32	65	81
6	154	446	125	2,019	28	22	3	22	19	72	60	83
7	198	712	106	1,790	29	25	3	14	9	265	51	87
8	669	671	85	911	31	17	7	47	10	199	49	83
9	514	608	83	135	33	12	4	48	25	99	67	172
10	237	521	79	780	34	14	8	11	111	47	336	262
11	143	401	100	1,797	39	13	8	11	199	36	494	159
12	151	253	908	435	89	20	6	26	604	38	173	115
13	188	208	123	237	92	22	11	34	337	41	98	84
14	280	190	750	382	78	27	7	29	165	42	81	71
15	234	122	473	344	70	17	3	23	87	42	1,130	71
16	334	104	380	254	63	6	3	15	103	43	982	63
17	606	118	570	291	51	6	8	18	1,351	43	333	2,374
18	714	127	620	150	45	4	4	15	5,546	39	237	2,689
19	647	352	494	113	45	8	8	11	1,991	39	935	434
20	590	1,377	950	103	52	8	2	4	270	53	864	148
21	590	2,768	2,659	86	47	9	2	392	2,710	62	311	133
22	369	1,751	1,886	63	36	12	8	3,489	472	56	175	176
23	350	890	594	61	34	9	7	333	191	48	131	205
24	310	828	253	52	35	6	8	92	117	82	132	117
25	185	2,188	151	44	39	8	5	52	84	110	132	72
26	226	1,650	173	41	38	8	5	30	75	82	214	72
27	242	661	1,633	38	35	3	6	25	73	491	423	345
28	405	526	938	33	37	7	11	24	60	993	401	337
29	120	277	1,330	32	63	10	10	19	41	694	212	198
30	86	------	630	36	78	13	9	15	36	239	169	111
31	289	------	460	------	57	------	9	17	------	131	------	91
Mean	571	637	556	393	46	15	7	157	499	138	286	310

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1889.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	86	124	36	295	135	340	210	2,602	17	63	139	151
2	87	99	52	958	101	441	939	815	16	68	131	120
3	77	92	386	330	79	156	1,482	367	17	62	1,041	111
4	72	86	2,567	183	71	82	1,053	195	15	49	813	103
5	124	82	2,141	133	63	64	697	211	20	46	263	85
6	968	71	864	103	54	52	574	194	11	42	166	75
7	637	89	320	83	48	45	123	119	9	35	131	75
8	263	125	195	78	43	39	80	84	11	33	116	136
9	691	148	134	75	42	32	54	66	11	31	3,394	351
10	1,080	88	108	66	36	31	38	62	14	39	2,308	214
11	288	61	100	55	43	31	70	55	16	32	406	165
12	149	60	84	53	40	242	111	51	16	55	233	148
13	104	60	79	64	40	308	77	83	44	96	963	111
14	99	61	92	67	44	63	141	2,115	160	314	1,339	103
15	87	45	97	64	44	110	2,156	2,177	155	248	331	248
16	81	70	84	61	38	565	787	406	532	111	166	171
17	1,530	514	75	56	37	263	188	164	2,019	68	119	560
18	742	819	88	54	34	383	82	98	3,028	51	102	606
19	230	683	105	49	16	161	262	69	920	44	1,623	337
20	112	228	113	49	363	82	1,975	59	367	43	1,041	241
21	418	143	214	44	911	50	422	49	201	97	508	158
22	397	94	951	42	450	39	139	41	163	129	816	119
23	263	66	623	71	186	33	88	37	115	104	302	106
24	211	51	266	54	95	28	69	39	85	97	163	92
25	258	74	158	29	68	29	48	33	459	72	457	74
26	313	73	114	424	68	807	41	35	524	57	557	150
27	778	45	97	2,126	357	610	58	37	260	2,958	724	225
28	1,096	37	112	1,439	744	214	65	33	140	1,648	2,768	100
29	440	------	124	582	244	368	91	22	93	392	645	75
30	187	------	104	241	118	215	844	19	70	194	234	69
31	191	------	87	------	80	------	4,714	20	------	147	------	55
Mean	389	149	341	264	151	189	570	334	317	207	733	172

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1890.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	51	114	766	176	41	51	14	22	34	23	75	28
2	53	84	349	197	34	50	125	17	30	18	64	35
3	57	95	124	126	34	33	436	12	27	810	52	62
4	51	155	92	378	24	33	687	15	21	783	48	87
5	62	239	87	721	461	37	147	18	17	194	48	87
6	98	131	83	191	282	38	71	53	18	96	42	74
7	102	75	71	143	297	107	47	32	12	294	38	74
8	87	2,512	71	182	153	66	36	27	14	281	37	140
9	76	2,000	64	778	115	41	45	25	12	163	35	134
10	57	293	71	758	78	32	23	21	17	91	37	60
11	48	176	563	241	60	22	18	16	10	67	45	44
12	45	141	978	128	53	91	12	22	15	49	107	45
13	49	117	440	99	47	485	12	19	97	25	89	142
14	45	420	1,182	84	117	352	12	14	438	54	63	141
15	1,110	806	1,993	68	1,037	118	16	13	612	75	48	51
16	1,586	192	588	61	480	65	18	11	797	73	43	64
17	422	124	228	54	146	46	19	10	624	935	112	243
18	160	107	166	48	88	38	20	14	179	405	249	1,044
19	108	94	132	48	65	36	17	27	81	143	100	239
20	169	693	151	42	214	31	12	478	43	118	89	154
21	265	414	1,290	36	292	31	12	290	32	104	64	121
22	109	146	2,942	42	117	34	11	130	32	79	54	90
23	120	107	1,908	44	70	35	4	159	32	469	85	88
24	109	115	422	39	53	44	9	57	22	2,624	82	68
25	78	186	214	36	42	42	11	38	24	944	41	80
26	50	219	436	42	1,278	27	317	36	24	358	31	173
27	62	154	264	51	1,967	20	122	405	27	183	26	193
28	71	482	1,695	56	416	17	68	261	23	122	21	191
29	64	......	919	50	154	15	43	95	23	103	33	106
30	97	......	206	43	92	25	34	119	22	128	27	73
31	160	......	161	......	67	......	29	45	......	115	......	68
Mean	181	371	602	165	270	68	79	81	112	320	63	135

Daily discharge, in second-feet of Tohickon Creek at Point Pleasant, Pennsylvania, for 1891.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	61	1,726	202	125	24	19	8	172	276	10	27	56
2	1,397	1,105	148	178	20	18	7	91	123	11	30	38
3	1,421	779	110	814	21	13	8	60	92	10	20	33
4	243	614	85	406	61	11	7	38	78	8	17	681
5	150	213	93	178	51	12	7	31	326	15	17	1,418
6	116	180	93	125	40	13	6	31	598	15	18	330
7	148	210	82	104	34	12	6	31	249	11	21	915
8	104	637	116	91	33	14	5	31	116	20	16	464
9	85	516	713	77	29	26	13	23	68	16	7	231
10	57	972	1,500	68	22	24	9	21	53	10	16	129
11	767	386	601	118	25	15	12	16	49	9	20	99
12	2,331	204	718	797	25	13	5	19	49	11	29	82
13	354	152	1,184	273	15	12	4	16	42	18	27	73
14	179	130	627	133	18	7	7	14	36	12	29	69
15	127	97	238	102	18	14	3	43	30	10	24	63
16	94	975	158	82	24	12	7	47	23	10	21	60
17	185	782	228	75	20	26	3	54	26	7	58	63
18	748	820	113	73	27	15	34	587	31	18	136	74
19	267	663	97	62	29	16	299	672	24	5	98	71
20	188	241	255	51	27	35	120	167	67	95	61	46
21	141	751	2,858	45	21	23	62	77	67	70	46	39
22	2,451	1,071	1,219	45	23	30	41	57	18	127	42	41
23	1,146	383	1,004	45	18	28	28	214	18	212	128	410
24	364	190	506	51	16	23	29	3,159	18	100	386	1,670
25	250	248	241	49	12	22	31	2,700	13	52	108	1,400
26	250	418	158	38	20	14	25	516	13	86	84	668
27	234	405	119	32	19	21	23	237	13	93	75	819
28	204	272	105	28	21	17	17	596	15	49	65	291
29	466	......	95	28	15	6	571	357	15	39	54	184
30	1,269	......	79	27	20	9	611	345	7	33	59	887
31	1,091	......	79	......	16	......	515	415	......	29	......	351
Mean	545	540	446	144	25	17	81	349	85	39	58	379

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1892.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	148	157	1,645	113	40	76	59	21	20	15	8	160
2	1,090	145	831	100	47	60	46	37	16	8	9	98
3	1,177	205	433	100	159	43	249	31	12	11	8	71
4	262	237	348	105	108	45	455	33	10	14	6	62
5	158	180	283	95	70	64	164	21	15	17	9	59
6	108	140	218	86	60	73	78	24	19	14	9	57
7	120	134	237	73	55	58	44	9	13	7	6	49
8	156	119	1,421	61	57	43	31	15	13	8	7	157
9	150	175	1,447	57	51	90	26	15	16	7	8	380
10	122	129	625	47	43	555	20	15	12	9	57	118
11	100	102	390	49	39	287	19	16	5	11	301	105
12	79	57	207	37	42	108	18	57	9	14	113	78
13	2,863	71	130	35	39	61	16	101	10	11	64	54
14	3,158	79	97	33	39	46	17	38	13	6	48	283
15	2,580	72	84	133	143	41	14	28	17	8	803	623
16	660	77	68	177	125	32	12	23	13	8	2,962	300
17	260	86	66	90	86	31	10	13	15	6	522	158
18	261	74	86	57	57	29	11	14	12	8	669	119
19	1,618	53	87	42	55	17	12	11	16	6	896	97
20	880	35	65	35	340	22	7	9	17	7	509	80
21	352	73	65	44	401	23	6	11	27	4	370	85
22	161	109	65	95	529	15	5	10	11	8	88	74
23	146	112	65	191	458	15	8	10	18	5	64	85
24	131	105	271	131	250	17	9	8	25	4	51	125
25	121	92	727	71	177	16	8	9	13	4	48	184
26	119	156	574	57	132	20	8	12	227	6	40	246
27	129	190	1,036	46	1,333	26	5	80	59	11	35	154
28	193	121	1,115	46	522	21	5	92	33	10	180	201
29	277	87	413	50	184	14	8	75	22	6	676	168
30	226	-------	194	50	112	14	9	30	19	5	195	103
31	166	-------	135	-------	86	-------	12	30	-------	5	-------	68
Mean	580	116	433	77	188	65	45	29	24	8	292	148

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1893.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	474	489	78	78	279	35	16	8	49	11	51	122
2	1,406	803	97	68	348	33	15	12	41	11	48	102
3	301	1,366	108	51	832	21	15	9	32	15	48	191
4	138	1,118	108	58	2,994	20	25	4	25	12	1,094	1,420
5	104	948	108	50	1,102	19	12	3	21	10	1,288	478
6	100	1,166	103	41	872	37	13	9	17	12	489	197
7	131	1,113	87	49	413	95	12	5	22	17	184	171
8	140	742	103	140	207	53	12	4	35	12	123	141
9	140	320	985	145	124	39	9	10	21	10	101	137
10	160	2,597	2,200	132	89	37	9	5	13	12	79	141
11	204	1,735	800	249	81	32	11	4	18	11	71	215
12	160	437	2,400	156	71	21	9	6	23	11	62	142
13	236	462	856	106	62	37	6	5	13	12	54	101
14	203	846	575	358	58	14	6	6	15	30	60	153
15	138	905	600	1,687	65	13	12	3	26	47	103	186
16	165	1,113	380	701	330	17	12	3	834	49	130	1,260
17	170	672	251	238	919	16	12	3	531	39	90	1,593
18	118	248	191	165	613	15	13	3	131	31	60	383
19	95	237	165	135	301	13	9	4	75	22	53	178
20	63	201	162	515	87	9	7	345	55	20	48	132
21	64	162	197	1,903	71	9	5	409	55	23	46	117
22	72	136	246	448	57	170	6	79	54	15	496	97
23	105	114	266	185	54	217	6	36	34	39	312	79
24	93	92	295	135	49	58	4	1,814	16	68	120	89
25	61	87	318	102	46	25	3	503	25	59	81	131
26	59	87	254	97	42	42	3	119	27	46	62	143
27	65	87	158	237	40	38	4	58	17	79	55	109
28	53	73	114	289	33	25	7	44	18	506	1,244	82
29	83	-------	97	160	31	21	9	499	20	279	479	81
30	312	-------	92	118	33	21	7	198	17	116	188	83
31	511	-------	83	-------	33	-------	4	92	-------	66	-------	75
Mean	197	655	402	293	333	40	10	139	76	55	244	275

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1894.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	73	125	216	64	47	267	20	7	4	13	522	37
2	76	113	148	62	41	189	16	6	4	16	189	242
3	75	89	297	62	35	142	12	8	3	11	1,193	430
4	61	65	790	54	33	125	10	25	3	12	707	163
5	74	88	1,065	254	34	91	12	30	2	13	719	97
6	114	119	1,174	141	34	75	29	24	2	11	966	73
7	131	156	1,102	92	58	64	47	35	3	7	282	58
8	109	115	488	79	53	61	31	18	4	9	545	126
9	87	651	258	71	50	49	22	8	5	12	439	606
10	70	1,113	220	73	42	40	17	5	20	1,674	224	284
11	52	911	188	73	28	34	16	5	31	885	168	635
12	46	383	153	128	29	27	11	5	33	127	115	3,342
13	46	140	131	1,168	16	23	7	5	25	125	83	1,811
14	49	140	109	1,283	17	23	10	6	23	186	71	377
15	49	119	92	800	19	20	7	6	20	116	61	195
16	64	107	102	223	17	19	3	8	21	68	65	143
17	64	113	93	144	17	15	6	8	23	47	79	119
18	51	928	71	103	16	15	10	11	3,510	39	104	97
19	51	1,606	67	79	17	14	8	11	3,556	34	104	83
20	46	1,257	64	71	616	10	6	8	1,306	32	73	75
21	41	723	61	71	8,650	12	11	8	245	27	73	66
22	43	379	71	303	4,310	7	68	9	83	23	97	61
23	45	208	534	321	904	7	49	9	50	21	93	58
24	51	118	351	132	1,827	6	25	9	41	29	75	57
25	89	151	143	101	1,577	13	21	10	29	725	63	46
26	98	151	122	81	450	36	14	6	23	477	61	42
27	75	151	100	68	228	29	10	6	19	168	49	44
28	68	231	76	70	1,386	26	8	11	20	99	44	83
29	68	......	70	58	2,252	19	5	4	36	67	46	109
30	107	......	79	47	506	19	4	4	28	52	39	143
31	137	......	79	......	267	......	6	4	......	649	......	113
Mean	71	373	275	209	760	49	17	10	306	186	245	316

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1895.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	62	138	1,296	122	107	36	61	7	4	3	15	22
2	62	156	1,064	117	86	33	96	6	3	3	23	54
3	80	180	706	210	157	39	61	8	5	3	23	176
4	89	163	495	239	47	32	57	310	6	3	29	86
5	127	119	352	131	42	26	579	145	2	2	16	51
6	50	193	248	99	39	57	648	29	4	3	22	38
7	381	104	197	89	40	58	240	16	5	3	21	25
8	628	71	1,116	1,404	37	47	100	9	6	3	17	20
9	418	54	943	3,857	35	26	54	12	4	4	12	18
10	498	92	494	1,760	35	29	35	10	3	3	10	20
11	2,942	168	451	616	31	23	27	9	3	3	9	18
12	1,109	168	317	146	25	20	21	229	3	5	15	14
13	262	108	383	1,131	29	26	18	41	3	15	13	17
14	204	92	1,519	1,191	39	22	12	27	3	26	12	11
15	146	70	437	528	155	12	15	25	3	27	13	8
16	146	51	200	271	93	10	18	17	3	25	12	6
17	169	40	166	117	63	9	12	17	3	19	11	7
18	169	35	192	88	44	10	11	8	3	14	15	7
19	112	49	343	75	31	11	10	6	3	14	22	7
20	80	58	430	62	33	11	8	10	3	11	15	6
21	88	148	328	51	33	9	8	9	3	5	15	14
22	79	246	328	49	35	10	25	5	3	7	11	420
23	89	255	362	47	32	8	20	7	3	8	12	242
24	107	255	334	43	33	7	14	6	3	7	9	91
25	107	245	525	41	34	9	12	5	3	6	9	54
26	1,632	245	576	41	23	14	11	5	3	6	16	46
27	515	266	299	42	81	16	11	4	3	6	63	60
28	184	902	229	59	351	41	9	4	3	5	78	68
29	141	......	189	76	120	45	7	5	3	5	38	57
30	97	......	132	92	53	50	11	4	3	5	27	64
31	102	......	114	......	50	......	7	4	......	8	......	109
Mean	351	167	476	426	62	25	71	32	3	8	20	59

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1896.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	327	55	498	297	20	35	11	113	3	167	23	177
2	93	90	192	236	23	31	10	56	3	59	19	104
3	59	83	50	193	18	28	10	35	4	27	20	78
4	39	58	48	101	21	18	7	27	5	27	22	65
5	39	138	59	71	26	10	5	17	10	29	1,851	59
6	28	6,515	59	72	25	12	13	22	1,665	24	1,249	51
7	17	1,720	57	81	25	11	16	12	319	20	273	61
8	16	487	44	85	19	9	38	12	95	17	180	72
9	13	201	42	72	13	12	13	10	44	10	279	289
10	9	174	44	57	11	11	104	9	29	16	131	242
11	7	225	35	53	12	9	76	12	23	16	109	98
12	7	156	40	51	13	7	34	9	14	29	133	71
13	8	91	51	11	4	4	22	10	10	1,130	136	59
14	13	180	51	51	11	9	15	47	10	430	103	56
15	13	327	41	40	12	28	10	16	10	215	73	53
16	6	206	71	33	11	20	12	7	16	103	55	44
17	6	107	77	33	7	24	10	8	21	63	47	52
18	6	90	54	36	7	28	9	8	328	48	44	57
19	5	85	2,028	25	11	23	6	8	112	38	46	44
20	5	75	3,343	21	12	17	6	9	49	28	42	49
21	5	75	1,205	40	10	8	9	7	35	29	36	51
22	4	70	742	49	14	14	2,417	5	23	33	36	42
23	6	62	449	40	20	16	704	3	19	28	36	44
24	151	47	193	31	16	11	304	6	20	55	35	44
25	239	51	98	35	17	15	87	7	13	76	37	35
26	136	69	371	39	23	21	46	6	11	54	42	39
27	70	88	596	39	18	18	47	5	8	38	35	39
28	59	229	311	35	48	10	163	5	8	31	45	39
29	46	851	2,444	26	137	13	184	5	14	31	856	35
30	28	......	1,238	20	143	15	2,182	3	156	30	439	31
31	31	......	527	......	97	......	410	3	......	27	......	27
Mean	48	435	486	67	27	16	225	16	102	94	214	71

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1897.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	31	73	58	46	20	70	10	64	17	3	6	86
2	49	97	65	40	2,587	40	9	49	14	3	1,400	57
3	157	79	54	31	954	44	7	43	31	3	616	49
4	330	65	75	15	376	66	6	38	42	4	131	60
5	404	49	142	42	207	76	6	103	21	4	63	1,765
6	256	430	523	70	114	71	5	75	17	5	44	670
7	89	2,312	296	71	80	52	4	110	14	5	34	216
8	71	882	119	56	60	61	5	84	11	6	29	131
9	65	311	102	1,454	47	2,389	6	33	11	7	41	97
10	53	175	135	957	58	906	6	28	11	3	63	79
11	49	109	152	227	60	240	5	19	10	3	61	65
12	49	68	191	119	57	111	4	22	10	3	60	338
13	49	78	210	93	3,683	75	6	20	5	3	60	285
14	49	89	150	75	1,987	53	35	15	6	3	42	1,751
15	44	65	147	101	973	50	35	8	7	8	37	3,125
16	31	73	135	160	354	48	22	50	7	9	42	848
17	23	246	89	137	144	46	14	36	7	5	59	234
18	80	404	79	109	90	49	879	34	6	3	64	150
19	117	320	220	74	74	44	230	32	4	6	53	105
20	133	122	927	54	54	37	177	22	6	3	43	79
21	1,221	203	380	44	61	33	201	16	6	3	32	71
22	551	329	150	39	73	30	922	12	4	4	33	68
23	157	659	125	39	56	23	477	17	4	9	33	66
24	73	397	514	37	62	18	193	745	8	8	33	93
25	171	151	513	31	128	15	83	123	12	11	35	193
26	181	111	146	33	124	15	64	69	10	15	36	101
27	119	87	97	33	57	12	413	42	10	12	1,106	119
28	109	65	76	26	46	14	1,817	36	9	12	385	86
29	87	......	61	24	35	14	1,292	21	5	21	148	76
30	97	......	54	19	25	9	321	20	4	9	112	79
31	73	......	47	......	113	......	116	25	......	13	......	79
Mean	160	287	194	142	411	157	238	65	11	7	163	362

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	133	110	82	251	151	65	4	7	7	5	113	364
2	131	99	67	131	103	53	5	13	7	3	60	271
3	90	98	70	98	79	44	4	8	7	5	46	201
4	49	95	79	82	71	35	3	10	8	5	37	1,230
5	49	90	79	80	73	31	5	28	5	5	31	2,932
6	36	89	68	83	109	31	6	96	5	7	31	683
7	55	87	64	111	404	27	3	44	5	5	27	466
8	87	80	61	103	2,940	14	3	39	14	3	31	139
9	87	73	53	73	1,711	15	3	39	14	4	28	87
10	87	73	49	65	398	15	3	326	9	6	1,503	79
11	87	65	43	68	229	16	2	574	9	6	1,697	71
12	144	450	43	73	337	15	4	167	7	6	357	65
13	239	634	47	63	557	15	3	74	7	9	146	53
14	216	327	43	60	246	20	3	40	7	4	107	49
15	452	253	39	338	1,201	16	3	35	8	6	89	51
16	696	198	39	289	847	16	5	32	6	8	60	46
17	251	138	39	154	789	11	5	25	7	8	60	35
18	107	132	39	89	299	9	6	17	6	17	378	23
19	87	154	39	71	145	9	5	134	5	23	3,451	27
20	375	4,160	39	68	125	9	7	88	4	23	896	472
21	748	1,737	57	64	117	10	17	64	4	24	279	531
22	367	860	376	61	91	9	20	39	6	79	136	237
23	2,890	427	469	53	69	5	13	27	8	70	811	2,134
24	680	231	304	569	297	5	7	23	13	52	518	536
25	226	159	283	544	573	5	11	21	15	66	283	251
26	279	115	175	323	767	5	11	22	5	224	210	131
27	320	97	131	238	495	7	11	14	7	495	185	107
28	439	97	242	525	266	7	11	6	10	171	194	89
29	370	......	393	810	158	4	5	11	9	68	248	79
30	133	......	1,078	322	119	4	8	11	7	94	341	73
31	259	......	433	......	89	......	8	5	......	169	......	114
Mean	328	397	162	195	447	17	7	66	8	54	412	375

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pennsylvania, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	144	158	793	178	35	15	14	4	18	46	52	34
2	136	125	600	131	31	9	11	399	13	40	181	34
3	154	118	601	97	31	9	19	267	9	27	121	44
4	204	151	708	79	31	10	12	113	93	25	921	49
5	1,172	184	2,819	68	31	9	10	52	42	23	366	44
6	1,360	210	1,109	61	27	8	10	28	28	18	121	39
7	1,400	189	520	73	23	7	8	22	19	20	73	39
8	503	142	277	1,328	23	7	8	17	16	23	58	39
9	503	180	217	389	23	5	7	15	287	20	53	31
10	413	183	203	160	20	8	6	254	210	17	40	23
11	124	110	418	108	28	6	7	417	203	17	35	27
12	158	90	1,225	92	35	6	5	182	499	16	42	44
13	169	119	1,702	87	27	7	7	66	163	13	51	95
14	186	102	416	79	31	5	11	38	58	11	53	101
15	311	65	709	70	31	3	9	28	46	10	47	60
16	432	157	934	153	20	5	5	19	36	9	46	49
17	569	416	348	393	17	5	7	14	18	9	47	44
18	488	782	502	144	20	4	7	12	18	9	45	39
19	258	767	2,492	84	23	3	8	11	23	9	38	39
20	177	695	938	68	20	2	8	8	708	9	34	85
21	116	914	308	61	17	2	3	8	545	9	33	101
22	84	1,414	1,051	58	17	7	5	6	404	9	33	65
23	79	1,582	1,006	53	20	2	3	7	239	14	49	53
24	526	1,000	449	49	17	2	3	7	61	16	57	879
25	2,032	541	220	49	17	7	3	3	42	18	44	913
26	392	616	624	45	15	7	4	2	1,522	18	35	203
27	230	3,222	633	41	12	12	4	359	604	11	30	97
28	145	1,058	779	39	9	5	4	317	158	11	31	79
29	166	......	1,307	39	12	17	6	62	78	10	36	65
30	169	......	520	39	14	27	7	34	51	12	39	53
31	184	......	239	......	15	......	4	27	......	17	......	49
Mean	419	546	797	144	22	7	7	90	271	17	94	113

NESHAMINY CREEK, PENNSYLVANIA, BELOW THE FORKS.

This station, which was established in 1884, is described in the Twentieth Annual Report, Part IV, pages 103 and 104. The same report contains also (pages 104 to 108) the figures for monthly flow for the years 1890 to 1898, inclusive, as well as diagrams of discharge for the same period. Water-Supply Paper No. 35 contains, on page 65, a table of daily discharge for 1899. The results by months and a diagram of the daily discharge for that year are given on page 86 of the Twenty-first Annual Report, Part IV. The following tables give the daily discharge of this stream from 1884 to 1900, inclusive.

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1884.

[Drainage area, 139.3 square miles.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	24	116	15	5	13	55	18	13	14	20	5	4	5	157
2	......	19	101	11	5	14	44	19	9	18	21	5	6	5	175
3	......	27	56	10	6	12	26	20	10	16	16	4	6	9	200
4	......	25	57	10	6	8	20	21	8	13	18	4	5	10	363
5	......	235	436	12	8	16	23	22	7	15	18	5	5	5	959
6	......	905	462	8	8	18	235	23	5	16	17	5	5	3	940
7	......	146	105	6	6	19	1,907	24	5	14	17	5	5	441	937
8	......	76	69	6	5	15	192	25	6	15	17	5	4	110	811
9	......	48	48	4	5	15	98	26	2,271	17	17	4	4	47	710
10	12	36	38	4	5	11	74	27	331	17	13	4	4	29	684
11	12	27	34	4	5	7	56	28	80	14	10	4	4	24	693
12	14	27	31	4	5	7	841	29	56	22	13	5	7	180	693
13	17	22	28	4	4	6	414	30	31	29	20	5	11	124	1,053
14	15	17	25	4	4	7	166	31	......	36	18	......	12	......	1,161
15	12	19	22	3	3	8	2,354								
16	10	18	22	4	3	6	336	Mean	139	62	61	6	5	39	534
17	12	14	17	4	3	5	173								

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1885.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	666	139	74	334	46	19	7	3	9	1	29	117
2	215	128	284	222	52	22	4	4	6	1	722	97
3	125	142	343	137	55	14	4	723	4	1	207	93
4	120	146	492	1,761	47	15	4	2,377	3	8	91	88
5	130	156	1,053	450	44	15	3	94	5	6	55	76
6	1,886	150	948	206	38	9	4	39	7	5	44	109
7	823	137	456	154	63	10	41	17	4	6	38	122
8	342	138	208	168	474	13	28	18	3	6	190	138
9	252	1,714	137	181	222	13	10	17	4	5	746	109
10	204	4,484	80	120	141	11	7	16	5	4	179	216
11	151	1,067	84	117	114	11	7	16	2	7	106	157
12	1,377	631	78	121	78	10	4	15	4	2	82	76
13	355	260	65	115	66	8	3	11	5	42	71	667
14	190	156	114	93	57	6	4	11	5	67	70	1,803
15	220	131	136	87	44	6	4	7	4	28	57	457
16	653	3,454	169	88	44	9	3	9	4	16	44	213
17	1,026	2,423	160	80	44	10	5	6	4	11	43	167
18	233	209	84	80	37	7	3	7	3	8	38	151
19	268	133	85	67	34	5	3	6	4	5	35	144
20	249	96	69	50	32	9	4	6	3	7	28	111
21	173	89	60	47	28	8	4	6	4	63	27	97
22	190	85	52	46	28	6	5	9	2	103	23	104
23	242	82	48	42	31	4	3	7	4	54	325	96
24	236	76	46	42	31	4	3	4	3	31	670	97
25	227	81	42	50	26	6	2	4	2	16	543	84
26	182	87	78	55	29	7	2	6	3	11	378	99
27	197	54	138	55	26	5	2	8	2	11	267	134
28	255	33	126	54	20	5	2	7	1	11	164	116
29	231	......	111	58	20	9	2	5	2	10	136	77
30	220	......	161	54	21	9	2	5	1	44	134	63
31	192	......	298	......	22	......	2	8	......	54	......	114
Mean	382	589	203	171	65	9	6	112	4	21	185	200

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1886.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	209	452	165	1,637	59	64	38	36	8	4	14	46
2	109	415	154	391	48	49	35	33	8	3	13	48
3	83	380	143	270	51	53	32	32	6	3	10	59
4	141	425	132	252	48	53	29	24	7	4	9	89
5	2,478	350	121	423	49	45	26	20	4	3	10	64
6	413	300	109	4,734	41	39	28	18	5	2	9	46
7	195	250	97	1,198	51	35	22	26	6	2	7	57
8	265	200	94	513	2,346	36	20	33	5	2	7	87
9	599	175	92	371	749	35	19	46	6	2	10	68
10	601	150	88	303	227	45	182	31	4	2	11	74
11	574	5,767	78	231	168	49	149	24	4	4	11	85
12	417	5,132	77	207	140	37	48	18	4	2	10	64
13	346	4,195	89	293	218	29	32	19	3	2	85	105
14	322	830	77	319	566	194	27	16	4	2	74	342
15	307	508	84	207	232	291	44	13	5	2	27	345
16	300	528	75	168	615	100	294	12	10	2	27	393
17	285	217	70	157	242	95	297	16	7	2	16	279
18	272	173	66	139	159	108	100	11	7	2	26	649
19	285	204	79	133	164	67	136	15	4	3	37	2,228
20	287	199	93	120	167	39	90	11	4	2	26	671
21	372	202	902	108	155	34	58	9	6	3	17	278
22	660	146	477	99	131	31	75	6	5	2	16	190
23	580	127	216	93	173	732	62	6	4	3	111	133
24	375	122	141	90	134	315	48	6	4	3	203	203
25	330	694	132	85	113	149	31	7	3	3	160	662
26	321	1,103	122	93	108	276	60	8	6	4	770	212
27	390	189	128	86	89	111	598	6	3	11	124	175
28	1,744	177	439	81	96	73	114	6	4	28	64	145
29	3,735	......	456	76	85	63	73	4	2	38	52	228
30	1,269	......	1,389	65	67	45	42	9	2	25	50	178
31	615	......	1,870	......	59	......	41	9	......	15	......	229
Mean	609	843	266	431	244	110	92	17	5	6	67	272

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1887.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	323	239	296	204	115	208	42	144	21	47	37	40
2	580	156	262	202	105	137	41	149	24	33	34	39
3	434	220	335	228	96	104	34	218	22	33	28	26
4	344	203	195	222	87	101	30	139	17	31	27	29
5	254	204	162	177	83	53	132	88	23	23	22	23
6	221	165	186	147	76	39	1,570	73	19	22	25	55
7	193	612	324	124	160	107	223	73	20	18	19	48
8	181	742	719	121	310	158	135	65	18	18	23	40
9	138	625	545	111	244	84	150	50	23	20	18	29
10	181	337	828	107	148	54	942	44	18	21	24	176
11	181	767	405	107	118	44	146	108	14	21	52	1,648
12	159	552	221	92	91	35	89	236	492	19	47	400
13	153	189	213	81	77	31	66	67	229	14	28	199
14	740	223	196	77	69	26	53	44	83	19	21	153
15	940	597	160	78	56	23	47	41	54	17	33	610
16	420	504	154	80	56	28	40	41	43	14	28	607
17	230	370	139	69	55	24	56	36	28	13	29	210
18	300	1,344	129	210	48	35	58	92	26	18	23	277
19	210	1,703	120	359	47	50	39	71	27	13	26	303
20	160	430	110	118	38	34	40	40	23	18	31	249
21	130	321	109	134	34	29	35	30	26	398	51	411
22	220	406	413	108	33	411	38	37	24	139	44	447
23	590	376	551	294	32	3,159	462	64	22	63	37	289
24	2,891	630	437	663	41	412	1,047	379	20	43	31	248
25	628	314	691	203	53	179	484	288	21	36	29	169
26	490	294	432	275	86	119	177	84	20	34	27	175
27	532	1,210	255	205	44	102	282	45	20	34	26	145
28	400	454	2,185	153	39	81	134	42	26	29	29	1,597
29	1,661	......	521	191	25	62	147	39	41	31	61	913
30	900	......	246	154	33	51	121	32	74	27	38	364
31	408	......	235	......	32	......	141	31	......	32	......	435
Mean	490	507	380	176	82	199	226	93	51	42	32	334

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1888.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,890	233	160	376	77	65	19	10	12	68	131	178
2	2,786	235	145	306	72	42	13	11	13	75	124	152
3	505	230	139	262	72	39	15	11	15	65	114	140
4	388	285	114	211	72	36	13	9	15	50	106	135
5	323	1,553	95	295	63	31	13	7	12	47	97	131
6	267	2,111	162	2,227	51	31	15	7	9	191	93	139
7	310	798	77	428	51	29	13	7	9	212	87	136
8	636	389	101	254	54	22	10	17	224	130	84	120
9	404	308	95	206	48	25	14	21	376	74	91	118
10	261	310	88	631	48	24	22	14	134	57	171	132
11	251	313	602	1,394	78	21	21	11	129	52	347	135
12	432	283	1,571	341	129	23	14	78	474	53	137	118
13	682	230	338	271	103	17	11	206	280	68	105	80
14	493	220	375	242	75	15	10	154	174	69	100	178
15	356	220	432	197	61	17	9	22	88	63	1,821	248
16	287	235	564	781	58	19	11	20	84	53	588	131
17	342	287	743	557	57	14	12	15	1,052	69	301	3,759
18	455	362	565	200	48	10	11	9	3,099	63	209	1,821
19	480	587	367	171	52	16	10	7	401	63	877	431
20	477	2,112	1,001	160	61	20	11	6	227	68	560	311
21	288	2,675	3,126	154	56	20	11	29	1,710	69	258	230
22	199	579	1,455	125	40	14	8	1,500	319	54	193	253
23	206	411	350	119	36	65	10	153	185	60	166	365
24	251	265	264	119	40	57	11	55	151	101	153	354
25	172	3,619	248	97	40	14	9	36	132	132	150	302
26	151	938	449	88	45	15	9	15	135	82	245	209
27	186	368	1,387	80	43	11	65	19	125	406	671	351
28	175	228	783	80	42	8	125	20	92	688	345	553
29	195	191	1,485	72	95	15	24	15	72	459	218	329
30	226	-------	578	68	130	24	19	14	64	209	196	127
31	232	-------	489	-------	91	-------	19	13	-------	151	-------	135
Mean	558	709	592	350	64	25	18	80	327	129	291	380

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1889.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	139	183	101	87	214	312	94	1,760	53	185	244	324
2	140	140	114	558	182	293	346	1,083	58	179	216	275
3	131	154	484	250	154	158	649	1,047	51	155	616	263
4	116	159	3,197	198	138	120	905	761	53	133	526	238
5	197	144	1,364	156	122	122	598	705	44	126	254	203
6	940	120	503	139	108	116	247	480	38	117	212	197
7	490	214	296	120	105	95	168	595	41	123	186	188
8	260	328	215	111	89	88	135	296	50	106	180	207
9	552	188	169	111	80	96	113	228	41	94	2,879	333
10	776	116	142	96	80	97	94	321	44	94	1,044	109
11	275	102	133	92	72	93	124	239	57	91	461	176
12	200	110	131	88	71	143	158	174	108	87	364	182
13	166	124	131	92	77	120	490	152	777	267	1,422	223
14	157	133	137	84	108	141	332	746	381	208	1,179	270
15	145	118	138	72	134	89	3,386	2,046	835	401	276	338
16	144	396	130	65	86	172	425	188	463	213	296	228
17	800	738	115	61	59	118	237	226	2,560	137	253	288
18	449	1,116	115	68	50	301	173	186	2,947	113	253	443
19	227	294	115	60	41	108	180	163	618	98	2,965	378
20	148	177	116	51	822	61	3,950	152	429	92	868	299
21	970	125	263	59	781	57	401	136	376	116	547	250
22	497	92	937	68	301	54	263	133	281	138	888	214
23	286	88	475	62	180	43	208	132	216	133	409	184
24	255	97	253	61	127	40	169	149	198	172	324	168
25	387	110	204	48	100	40	148	130	990	137	668	156
26	394	99	169	689	215	562	132	110	564	102	458	142
27	1,130	89	146	2,258	738	400	201	105	384	3.749	1,171	222
28	872	87	143	1,121	538	148	231	89	242	967	3,528	211
29	361	-------	141	501	403	92	174	72	201	388	415	128
30	213	-------	122	284	330	80	528	65	184	274	407	121
31	214	-------	89	-------	141	-------	5,531	49	-------	232	-------	116
Mean	356	208	348	257	214	145	658	410	443	304	783	228

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1890.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	107	135	722	346	115	95	30	38	46	28	145	52
2	110	114	347	351	87	80	33	41	31	32	135	72
3	108	157	306	250	68	53	135	27	27	391	130	91
4	101	163	197	610	64	53	566	20	25	188	123	137
5	108	192	178	626	114	48	107	31	26	88	102	144
6	130	147	282	272	138	65	56	21	26	67	90	102
7	128	111	229	228	191	65	44	27	20	135	90	116
8	113	2,848	141	270	132	43	42	19	18	129	89	192
9	97	974	132	666	175	35	29	28	21	133	85	190
10	90	293	149	639	96	35	27	17	18	78	79	103
11	92	250	581	280	75	112	19	16	19	83	116	81
12	80	228	560	219	76	1,150	17	16	26	75	140	85
13	84	212	282	180	78	667	15	13	29	64	114	165
14	84	526	1,203	159	70	272	17	10	29	77	95	106
15	1,591	601	1,309	149	142	279	30	10	55	74	85	74
16	800	237	544	139	223	225	22	14	180	64	75	83
17	281	192	323	119	87	75	19	27	147	564	118	276
18	187	189	290	105	62	70	60	27	61	188	231	848
19	150	339	261	96	49	60	33	27	50	130	120	193
20	281	1,101	315	88	165	51	19	26	38	136	84	355
21	298	331	1,939	86	264	65	19	222	31	136	85	182
22	144	197	2,990	85	94	76	21	670	29	146	81	106
23	170	266	1,512	71	63	56	20	118	20	585	73	115
24	159	213	500	74	52	41	17	50	20	2,400	68	105
25	155	266	404	97	47	48	21	38	19	783	72	120
26	110	278	473	101	192	43	415	37	27	341	68	165
27	119	210	320	96	1,986	39	180	163	40	240	66	201
28	119	357	1,419	104	309	29	59	48	33	198	52	189
29	101	....	635	87	168	27	113	56	23	203	70	173
30	162	....	367	61	126	27	54	54	29	204	52	157
31	182	....	313	....	102	....	34	58	....	167	....	130
Mean	201	397	620	222	181	133	73	63	39	262	98	165

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1891.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	128	1,585	370	379	51	34	16	77	164	27	41	91
2	1,953	773	242	252	41	35	17	80	128	22	37	74
3	844	739	212	931	57	27	20	89	101	17	39	50
4	275	588	289	362	83	26	24	53	85	17	29	347
5	371	263	269	247	57	30	20	39	555	18	35	994
6	605	200	196	206	56	27	15	36	1,939	22	43	199
7	527	334	202	184	57	28	16	30	341	26	37	920
8	376	623	266	155	41	38	22	21	203	26	39	443
9	308	786	994	152	36	37	26	18	154	26	39	205
10	253	981	1,291	137	40	28	22	33	129	26	35	167
11	1,377	423	443	226	34	26	20	33	106	21	54	142
12	1,594	306	689	402	38	22	22	20	93	19	75	167
13	354	261	1,662	226	39	20	17	20	84	23	75	99
14	185	225	538	164	31	18	19	17	77	17	57	99
15	147	193	275	140	30	23	21	40	63	12	39	100
16	140	1,410	303	131	51	22	19	56	54	19	39	105
17	283	1,156	242	136	47	25	17	38	51	19	48	97
18	805	640	213	134	28	126	16	38	45	19	98	94
19	279	350	201	114	31	58	127	299	39	17	87	93
20	223	360	266	104	33	41	91	86	34	328	60	61
21	191	906	3,446	93	26	36	40	47	31	194	48	57
22	3,257	1,135	789	93	31	42	29	27	27	155	42	76
23	768	415	1,053	93	36	38	26	43	27	340	91	1,495
24	356	332	512	86	31	29	26	3,276	27	121	261	1,630
25	930	334	358	77	26	73	24	1,264	27	63	123	1,040
26	642	569	288	55	26	20	19	278	31	48	94	5,218
27	506	553	248	55	30	19	14	182	27	101	109	650
28	430	368	239	66	30	15	19	335	22	109	239	261
29	1,084	....	222	62	37	16	150	208	27	58	105	299
30	1,679	....	196	67	34	16	214	267	31	52	81	1,070
31	935	....	182	....	31	....	122	248	....	52	....	674
Mean	703	600	525	182	39	31	40	235	157	65	73	366

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1892.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	999	191	2,582	179	79	118	39	69	15	5	6	149
2	1,870	179	554	167	107	102	82	51	14	6	6	106
3	743	174	329	179	133	103	297	51	12	5	6	102
4	293	159	259	174	114	99	519	35	11	4	7	80
5	242	149	269	154	86	92	144	20	10	4	7	77
6	194	144	221	144	73	111	73	23	13	4	5	68
7	200	135	207	133	73	107	53	20	13	4	5	59
8	192	129	1,359	121	55	79	42	18	8	5	6	68
9	180	131	942	119	50	93	34	17	6	6	8	101
10	178	122	389	110	55	140	31	17	6	5	32	93
11	144	120	309	99	55	130	31	21	7	4	99	68
12	146	115	257	96	50	80	31	60	7	5	43	51
13	3,584	125	214	92	50	58	31	52	8	5	19	60
14	2,364	121	155	102	59	53	31	25	96	6	19	417
15	767	93	159	186	437	48	48	17	17	6	734	559
16	408	81	149	193	215	39	31	19	15	5	2,346	236
17	363	81	130	108	127	34	31	15	15	5	234	162
18	444	81	125	97	84	36	22	18	11	8	605	112
19	2,172	77	135	99	144	36	31	17	10	8	643	85
20	731	82	144	87	459	31	24	15	10	5	184	130
21	382	93	135	93	341	32	16	13	10	4	114	220
22	322	115	114	152	419	32	14	10	10	4	86	97
23	280	124	117	185	492	29	14	11	9	5	89	132
24	250	108	386	161	297	26	15	12	9	5	56	214
25	257	103	502	109	177	72	16	16	13	6	45	122
26	280	159	409	94	165	54	16	21	19	7	39	241
27	332	184	900	90	756	75	15	22	10	5	54	119
28	331	125	1,026	88	376	109	15	19	7	5	241	101
29	286	117	440	88	187	69	19	19	4	5	611	106
30	273	-------	251	88	154	37	191	16	3	4	243	115
31	233	-------	209	-------	142	-------	101	13	-------	5	-------	120
Mean	627	125	431	126	194	71	66	24	13	5	220	127

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1893.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,357	385	463	133	362	57	23	14	59	26	61	175
2	1,678	568	599	116	318	57	23	11	54	21	59	154
3	227	741	481	102	646	57	25	10	48	23	59	217
4	150	692	281	109	3,154	46	21	7	39	24	1,281	1,938
5	125	540	710	98	571	54	18	7	35	21	1,759	316
6	125	484	199	85	894	73	18	7	28	20	352	274
7	100	1,590	169	98	420	154	17	9	29	22	221	211
8	90	714	326	153	512	75	20	11	34	21	188	253
9	130	307	2,337	140	652	51	21	9	31	30	241	186
10	135	2,727	2,394	177	404	45	20	7	27	27	179	305
11	120	869	943	380	188	39	23	7	27	24	139	325
12	150	398	2,436	198	176	36	22	6	31	24	124	186
13	140	861	920	153	159	39	19	6	31	23	115	144
14	140	1,299	683	544	149	41	17	5	31	70	115	258
15	130	1,136	895	2,448	144	39	15	6	53	77	303	205
16	135	858	358	467	273	36	15	8	749	34	234	1,323
17	140	495	302	290	617	36	18	9	258	28	131	999
18	176	625	273	229	223	35	19	12	107	25	120	330
19	168	371	251	198	161	33	15	11	76	21	109	325
20	175	395	236	742	135	27	15	174	56	20	94	148
21	165	484	244	1,012	117	24	14	254	48	21	101	170
22	154	404	244	831	108	29	12	63	41	18	330	160
23	154	385	232	293	105	284	9	29	36	199	213	146
24	154	309	272	235	105	90	9	1,692	32	263	135	144
25	149	258	285	213	89	42	11	197	29	119	99	152
26	154	179	232	221	72	39	11	80	39	64	91	154
27	147	194	184	418	72	45	10	43	33	40	112	120
28	136	242	156	362	72	35	8	31	29	481	1,500	102
29	164	------	139	232	77	35	14	1,078	33	206	996	119
30	215	-------	133	205	77	29	9	214	30	104	210	133
31	321	-------	133	-------	63	-------	8	90	-------	88	-------	124
Mean	242	661	565	363	358	56	16	132	72	70	322	316

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1894.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	107	115	198	128	97	368	68	32	7	40	428	115
2	109	110	227	110	86	285	43	19	8	47	196	268
3	100	90	882	97	98	247	37	400	8	41	1,371	315
4	89	58	936	111	95	233	34	145	6	45	640	161
5	98	60	776	189	80	231	36	48	6	71	860	133
6	130	58	777	142	68	280	165	31	6	65	866	124
7	136	57	698	112	76	315	177	56	5	43	245	110
8	116	60	416	115	80	235	75	61	857	34	342	229
9	105	1,063	313	114	68	194	51	28	1,247	41	464	616
10	97	757	291	113	57	161	40	14	102	1,715	313	257
11	88	517	277	146	43	144	34	16	108	380	258	629
12	88	267	243	363	39	130	36	15	73	173	198	1,824
13	88	164	380	1,521	39	127	34	67	36	164	179	853
14	76	164	355	833	42	127	29	82	28	250	175	241
15	73	130	171	490	45	116	26	24	28	172	165	300
16	88	250	178	303	39	97	101	23	23	110	149	257
17	92	114	171	239	36	92	212	20	19	106	170	228
18	82	1,630	144	198	36	94	60	15	1,001	90	227	194
19	78	1,990	144	174	36	87	31	11	3,197	78	176	172
20	81	1,185	141	166	685	77	31	16	797	72	145	159
21	79	603	136	188	9,012	72	31	22	245	63	150	147
22	83	399	179	418	4,036	69	23	22	148	59	170	149
23	88	366	571	291	823	60	21	11	111	59	154	145
24	88	287	279	186	3,779	51	26	15	91	60	152	125
25	96	204	194	159	1,523	51	29	13	81	200	143	135
26	80	105	182	141	532	82	27	14	81	233	125	135
27	75	147	159	122	277	89	22	14	62	125	120	135
28	88	200	131	114	2,893	60	22	10	46	93	112	135
29	67	-------	149	109	2,036	45	19	8	48	82	103	130
30	108	-------	164	105	553	65	19	7	40	79	96	130
31	188	-------	152	-------	443	-------	44	7	-------	790	-------	111
Mean	95	37	323	250	895	143	52	41	284	180	296	279

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1895.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	155	156	1,217	160	192	46	528	27	8	6	27	15
2	98	98	1,019	249	145	42	148	20	8	6	31	27
3	117	106	584	367	118	82	74	18	9	4	30	76
4	98	147	533	231	98	95	59	1,225	10	5	15	50
5	98	201	475	163	87	95	664	526	11	5	17	45
6	156	189	265	142	88	157	616	94	8	5	16	51
7	357	176	321	124	88	126	202	54	7	5	17	40
8	891	176	1,531	2,542	82	56	115	43	7	6	12	25
9	818	176	694	3,234	74	41	92	34	6	7	11	50
10	579	188	594	584	72	38	73	29	6	7	9	56
11	2,289	188	605	359	63	41	49	20	6	7	8	27
12	830	176	273	280	56	48	44	71	6	8	7	16
13	550	176	723	661	65	134	48	70	6	16	9	8
14	349	188	1,632	755	76	145	40	40	6	29	8	6
15	295	178	396	338	78	62	35	29	5	34	8	6
16	295	177	292	253	71	44	39	22	6	27	9	6
17	295	175	240	204	59	36	48	22	7	22	7	6
18	150	182	376	182	53	34	48	17	8	19	7	7
19	150	201	625	168	47	31	39	13	7	15	13	10
20	164	242	526	152	41	28	26	19	7	13	9	10
21	188	323	287	136	65	25	19	20	7	8	10	9
22	191	385	363	130	88	26	32	14	6	7	9	89
23	166	385	253	130	71	31	39	13	5	6	7	81
24	150	258	292	118	48	29	39	10	5	5	8	43
25	120	242	445	107	41	25	36	9	5	5	7	27
26	2,053	287	450	101	39	49	28	9	5	5	11	23
27	479	368	247	127	165	89	24	13	5	5	34	32
28	203	903	213	261	225	202	21	13	4	5	28	37
29	178	-------	190	159	105	106	18	11	6	6	18	32
30	178	-------	160	187	63	78	25	10	6	6	15	24
31	178	-------	149	-------	48	-------	31	10	-------	9	-------	573
Mean	412	237	515	417	84	68	106	81	7	10	14	49

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1896.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	186	39	960	286	81	24	27	71	11	155	28	299
2	83	45	463	286	65	22	22	48	8	60	30	193
3	69	51	99	260	51	22	24	37	8	38	33	115
4	72	51	57	217	63	22	24	35	10	31	36	115
5	55	63	57	172	59	17	19	30	75	29	1,305	100
6	32	8,707	101	154	39	17	17	24	673	33	579	90
7	48	2,535	127	164	44	20	22	25	214	29	220	90
8	36	600	111	154	41	17	87	30	65	24	106	120
9	23	635	88	135	30	18	57	31	32	26	289	307
10	19	624	85	129	23	66	86	22	22	24	119	252
11	19	383	82	129	25	46	71	17	20	19	115	154
12	15	228	102	125	38	31	29	25	15	44	154	130
13	14	187	91	125	42	24	22	23	14	1,480	169	125
14	14	282	79	120	34	196	20	28	17	345	135	100
15	15	379	92	110	31	236	17	74	14	206	102	95
16	15	274	81	93	31	73	17	36	13	129	88	90
17	15	121	77	82	31	52	17	22	593	100	88	95
18	19	119	118	93	31	138	16	17	765	74	85	95
19	19	110	5,408	92	31	72	13	17	290	62	80	80
20	23	109	1,994	81	31	35	13	17	169	51	73	75
21	31	88	715	135	31	29	13	14	57	53	66	75
22	27	90	414	147	31	26	1,373	11	40	51	69	60
23	32	85	309	97	31	29	499	10	33	43	72	55
24	565	75	250	88	31	31	166	14	26	61	72	54
25	377	84	211	97	31	36	92	14	26	63	72	52
26	142	85	349	97	31	54	68	10	24	59	68	50
27	59	66	403	88	31	50	77	10	19	53	64	50
28	53	70	257	85	110	32	97	14	17	37	143	50
29	59	1,542	2,061	81	135	43	180	15	21	33	869	45
30	43	......	760	81	61	43	561	12	308	38	385	40
31	36	......	389	......	86	......	155	13	......	40	......	30
Mean	71	611	528	133	46	50	126	25	120	112	190	106

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1897.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	88	41	88	93	76	445	45	221	43	17	80	105
2	88	41	115	77	1,610	115	42	184	41	13	1,354	94
3	121	41	169	71	439	84	42	115	41	13	287	91
4	209	41	290	65	239	124	41	105	37	13	108	118
5	351	41	190	131	179	273	37	105	32	17	81	1,305
6	233	1,094	360	166	135	130	32	97	31	17	71	396
7	125	2,973	208	125	111	84	29	85	31	15	42	204
8	125	840	144	99	92	103	29	77	31	15	36	155
9	107	334	144	1,750	80	4,677	31	80	31	12	61	144
10	80	166	160	606	75	774	31	83	27	10	74	136
11	72	135	160	272	97	224	27	86	28	13	60	126
12	72	115	220	205	96	216	27	83	30	15	55	336
13	57	110	220	166	2,215	228	36	63	28	15	49	314
14	41	94	171	144	755	202	75	54	29	15	39	2,436
15	48	72	215	208	800	159	61	64	27	15	37	2,696
16	48	63	149	218	235	144	36	289	24	14	40	492
17	41	54	129	164	190	137	31	160	23	11	41	318
18	41	48	135	145	150	131	31	67	22	13	41	245
19	41	41	179	125	140	124	140	54	19	15	41	197
20	93	48	700	107	126	117	356	63	19	15	40	175
21	1,856	131	328	88	164	112	367	66	21	15	40	175
22	369	529	209	88	165	97	3,083	64	22	14	41	173
23	139	1,826	170	88	117	76	1,256	53	24	14	39	162
24	97	301	469	88	127	73	630	1,075	27	14	39	154
25	73	105	327	80	711	85	391	209	27	59	36	154
26	48	89	189	84	185	74	181	119	23	85	36	154
27	48	63	154	84	110	53	491	93	21	48	1,033	154
28	36	63	139	72	84	59	2,119	73	21	27	238	171
29	31	......	129	66	74	56	900	60	21	22	142	166
30	31	......	125	66	77	48	298	50	21	19	124	154
31	36	......	115	......	628	......	214	49	......	16	......	539
Mean	156	339	210	191	331	307	358	130	27	20	147	395

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	377	164	164	249	193	115	29	32	24	12	65	436
2	340	164	160	150	162	105	29	251	17	8	39	300
3	340	164	160	176	147	105	21	65	14	6	31	288
4	233	164	164	159	138	97	15	41	14	7	24	1,777
5	135	164	154	164	129	117	15	105	13	7	19	3,059
6	125	164	144	164	140	110	23	119	14	7	17	511
7	105	164	144	164	362	69	25	36	14	6	25	304
8	101	164	139	199	3,153	62	22	22	16	8	27	218
9	92	189	131	131	846	62	22	22	20	7	24	147
10	88	213	127	122	378	55	26	32	17	7	933	144
11	97	294	122	120	303	45	15	397	12	9	852	135
12	188	566	115	133	349	43	16	99	13	10	239	125
13	257	530	109	123	483	48	17	57	11	14	165	115
14	215	258	106	115	254	51	17	36	9	13	125	105
15	633	228	97	195	1,473	45	16	32	8	10	125	105
16	553	313	88	136	1,060	45	22	27	10	7	85	105
17	264	105	88	125	983	48	19	22	14	8	161	105
18	166	130	90	105	386	42	14	228	11	8	373	93
19	139	387	87	105	329	31	17	1,615	7	14	3,529	85
20	493	5,076	77	105	349	34	14	278	6	13	552	1,006
21	654	1,205	108	93	439	48	58	113	6	24	268	293
22	398	691	196	81	258	31	66	65	7	49	202	480
23	2,985	445	349	77	213	28	36	45	9	49	828	1,670
24	476	330	273	294	258	34	22	36	11	27	484	408
25	313	273	164	400	280	34	18	31	13	24	355	203
26	554	221	166	254	250	36	20	31	12	59	269	149
27	462	200	175	189	242	31	22	31	14	176	242	129
28	267	182	246	645	209	34	22	27	14	87	445	115
29	215	......	391	782	170	34	19	22	11	40	322	110
30	176	......	1,232	574	157	29	17	26	13	28	464	90
31	164	......	420	......	138	......	14	29	......	81	......	161
Mean	374	469	199	211	459	55	23	128	12	27	376	418

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	527	213	611	349	67	31	15	27	15	36	144	54
2	453	213	569	280	73	31	13	248	15	31	154	51
3	97	213	540	243	67	27	9	1,262	28	31	162	48
4	71	213	686	221	61	19	10	104	41	27	1,257	51
5	405	173	3,687	201	53	17	14	43	32	22	252	54
6	2,105	119	913	176	50	17	13	23	19	38	145	48
7	1,298	97	593	255	47	13	10	15	15	59	107	41
8	306	97	377	1,047	45	13	13	15	15	53	85	41
9	277	105	388	362	46	15	14	14	13	36	81	36
10	213	97	343	245	38	19	14	488	43	27	81	36
11	213	80	510	204	64	19	13	2,577	38	22	81	36
12	213	72	959	186	89	17	10	151	80	19	85	36
13	213	72	1,318	176	73	17	10	71	68	19	85	65
14	228	72	407	166	53	15	10	48	23	22	77	80
15	203	72	1,172	159	48	15	8	36	15	19	72	60
16	189	89	813	193	48	15	8	27	15	19	68	45
17	457	319	242	301	43	15	9	22	15	22	68	36
18	252	553	722	177	54	15	9	19	13	123	68	31
19	145	574	2,490	149	68	15	8	19	41	113	56	36
20	115	974	742	139	57	15	6	17	430	57	51	57
21	105	1,373	382	129	36	15	6	14	166	41	48	72
22	105	1,373	1,765	115	36	15	6	19	138	32	41	57
23	100	1,402	976	105	45	15	6	19	65	27	77	41
24	1,117	849	405	105	51	13	6	19	41	27	147	792
25	1,927	446	414	105	48	11	6	19	41	22	90	401
26	333	809	490	105	36	13	11	13	578	22	74	125
27	242	3,950	417	101	31	13	23	11	204	22	72	89
28	213	815	1,398	92	31	13	27	13	89	17	63	72
29	213	......	2,417	88	27	14	22	13	63	24	63	72
30	213	......	588	73	22	15	325	14	48	17	63	63
31	213	......	443	......	27	......	68	15	......	24	......	48
Mean	411	551	895	208	49	16	23	174	80	34	130	89

Daily discharge, in second-feet, of Neshaminy Creek, Pennsylvania, below the forks, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	60	173	2,675	105	64	47	31	36	17	15	11	39
2	63	194	1,434	105	52	41	27	31	11	11	11	34
3	48	182	725	110	40	41	22	27	10	8	13	31
4	57	188	431	110	44	41	22	22	10	14	15	711
5	80	2,302	209	105	40	37	52	19	10	10	15	635
6	88	533	205	105	33	31	59	15	9	10	15	153
7	88	521	224	102	36	26	42	15	8	9	15	123
8	88	1,330	228	97	40	27	51	15	8	8	13	102
9	88	1,244	213	96	41	39	54	15	8	11	10	59
10	88	339	201	84	44	45	43	15	8	15	13	54
11	97	322	176	76	45	41	27	14	8	13	13	54
12	219	379	154	84	43	43	27	14	6	10	13	54
13	2,095	2,235	135	87	41	38	31	78	5	10	11	48
14	310	566	115	84	35	31	29	23	5	118	8	41
15	374	358	105	78	31	33	24	16	7	52	9	41
16	251	340	105	76	30	33	22	15	58	31	9	41
17	250	191	147	82	26	36	20	15	27	27	8	36
18	213	142	176	101	107	36	18	15	16	19	8	26
19	250	142	154	470	3,990	31	18	13	10	15	8	22
20	295	173	1,972	860	2,449	31	14	10	10	15	9	22
21	2,588	139	457	583	277	31	10	9	10	15	9	22
22	841	3,163	214	230	134	24	10	14	8	15	8	22
23	288	1,865	175	147	139	26	21	10	6	15	9	22
24	183	930	139	116	216	24	27	13	8	14	9	22
25	160	463	173	115	137	22	37	15	10	13	9	19
26	153	338	115	99	156	19	250	11	8	11	840	15
27	219	355	101	85	115	1,221	94	14	6	10	223	19
28	237	375	189	68	82	860	43	13	6	10	71	22
29	147	......	146	64	61	104	23	85	6	13	48	22
30	105	......	116	64	54	48	232	88	11	13	41	22
31	119	......	105	......	53	......	73	22	......	10	......	290
Mean	327	696	378	153	279	102	47	23	11	18	50	91

PERKIOMEN CREEK AT FREDERICK, PENNSYLVANIA.

Measurements of this creek were begun on August 20, 1884. The station is described in the Twentieth Annual Report, Part IV, pages 89 and 90, followed by tables of monthly flow for the years 1890 to 1899, inclusive. Water-Supply Paper No. 35 contains tables of the daily discharge for the entire period from 1884 to 1899, inclusive. Diagrams of daily discharge, constructed from these tables, were published in the Twenty-first Annual Report, Part IV, pages 79 and 80, and figures for the monthly flow for 1899 on page 78 of that report. The following records of daily discharge for 1900 are furnished by Mr. John E. Codman, hydrographer of the water department of Philadelphia.

Daily discharge, in second-feet, of Perkiomen Creek at Frederick, Pennsylvania, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	52	168	360	148	84	52	29	84	41	36	41	58
2	53	178	1,648	158	80	55	24	64	31	36	36	55
3	43	178	1,212	148	102	55	34	54	29	36	31	44
4	35	188	371	138	110	46	62	45	36	31	31	270
5	32	3,606	190	133	84	52	71	51	31	26	36	565
6	30	772	342	123	60	52	71	47	29	58	36	197
7	38	284	368	115	56	46	52	36	29	47	41	107
8	36	1,505	219	98	63	49	38	36	26	36	41	75
9	43	1,370	203	93	67	44	31	36	31	33	38	67
10	41	198	188	93	75	23	36	34	31	34	43	58
11	64	198	193	88	63	43	36	24	22	37	32	58
12	2,071	198	208	135	58	63	64	36	14	31	46	52
13	460	3,112	208	163	52	54	52	41	23	26	67	43
14	123	772	208	183	56	52	38	31	36	39	42	43
15	106	284	219	101	63	55	26	26	47	63	31	43
16	135	203	255	98	58	54	24	26	58	67	31	38
17	138	198	260	145	58	51	22	31	44	52	29	36
18	101	188	260	362	58	46	24	122	33	46	24	36
19	126	168	267	1,212	585	46	41	198	31	46	20	36
20	2,342	158	699	315	693	49	41	93	31	46	24	41
21	1,147	146	415	195	246	49	24	63	33	41	31	41
22	358	2,501	273	178	129	46	18	54	31	36	36	36
23	249	1,984	255	173	98	46	18	41	33	36	31	44
24	196	615	267	158	88	37	255	31	38	31	31	55
25	185	442	193	138	102	34	690	31	36	26	41	63
26	203	375	178	115	102	38	1,505	68	33	26	150	63
27	188	389	168	93	80	41	245	80	36	26	222	47
28	178	360	158	84	67	46	116	58	36	26	123	47
29	168	....	133	84	71	41	71	52	36	26	58	47
30	158	....	118	84	67	36	52	46	36	31	58	36
31	158	....	128	....	58	....	135	43	....	41	....	207
Mean	299	741	321	178	117	47	127	54	33	38	50	84

[Continued in Water-Supply and Irrigation Paper No. 48.]

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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 Bighorn Range and Bighorn 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 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, N. Y., 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.

Part II of the Nineteenth Annual contains a paper on "Principles and conditions of the movements of ground water," by F. H. King, and one on "Theoretical investigation of the motion of ground waters," by C. S. Slichter.

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.

1901.

Twenty-first Annual Report of the United States Geological Survey, 1899–1900, Part IV, Hydrography, 1900; octavo, 768 pp.

Contains a "Report of progress of stream measurements for the calendar year 1899," by F. H. Newell; "Preliminary description of the geology and water resources of the southern half of the Black Hills and adjoining regions in South Dakota and Wyoming," by N. H. Darton; and "The High Plains and their utilization," by W. D. Johnson.

Bulletins can be obtained only by prepayment of cost, as noted above. Money should be transmitted by postal money order or express order, payable to the Director of the United States Geological Survey. Postage stamps, checks, and drafts can not be accepted. Correspondence should be addressed to **The Director, U. S. Geol. 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. Underground waters of southeastern Nebraska, by N. H. Darton, 1898.
13. Irrigation systems in Texas, by W. F. Hutson, 1898.
14. New tests of pumps and water lifts used in irrigation, by O. P. Hood, 1898.

15, 16. Operations at river stations, 1897, Parts I, 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 Bighorn Mountains, by Elwood Mead, 1899.

24, 25. Water resources of the State of New York, Parts I, II, by G. W. Rafter, 1899.

26. Wells of southern Indiana (continuation of No. 21), by Frank Leverett, 1899.

27, 28. Operations at river stations, 1898, Parts I, 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 Porto Rico, by H. M. Wilson, 1900.
33. Storage of Water on Gila River, Arizona, by J. B. Lippincott, 1900.
34. Geology and water resources of southeastern S. Dak., by J. E. Todd, 1900.

35–39. Operations at river stations, 1899, Parts I–V, 1900.

40. The Austin dam, by Thomas U. Taylor, 1900.

41, 42. The windmill: its efficiency and use, Parts I, II, by E. C. Murphy, 1901.

43. Conveyance of water in irrigation canals, etc., by Samuel Fortier, 1901.
44. Profiles of rivers, by Henry Gannett, 1901.
45. Water storage on Cache Creek, California, by Albert E. Chandler, 1901.
46. Reconn. of Kern and Yuba rivers, Cal., by F. H. Olmsted and M. Manson, 1901.

47–52. Operations at river stations, 1900, Parts I–VI, 1901.

Other papers are in various stages of preparation. 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. [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 made for 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

THE DIRECTOR, UNITED STATES GEOLOGICAL SURVEY, WASHINGTON, D. C.

DEPARTMENT OF THE INTERIOR

WATER-SUPPLY

AND

IRRIGATION PAPERS

OF THE

UNITED STATES GEOLOGICAL SURVEY

No. 48

OPERATIONS AT RIVER STATIONS, 1900.—Part II

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 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; also 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.

 (Continued on third page of cover.)

DEPARTMENT OF THE INTERIOR

WATER-SUPPLY

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OF THE

UNITED STATES GEOLOGICAL SURVEY

No. 48

WASHINGTON
GOVERNMENT PRINTING OFFICE
1901

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

OPERATIONS AT RIVER STATIONS, 1900

A REPORT OF THE

DIVISION OF HYDROGRAPHY

OF THE

UNITED STATES GEOLOGICAL SURVEY

PART II

WASHINGTON
GOVERNMENT PRINTING OFFICE
1901

CONTENTS.

OPERATIONS AT RIVER STATIONS, 1900.

PART II.

MEASUREMENTS AT RIVER STATIONS.[1]

WISSAHICKON CREEK NEAR PHILADELPHIA, PENNSYLVANIA.

This station is described in the Twentieth Annual Report, Part IV, page 94, followed by tables of monthly flow for 1897 and 1898. In Water-Supply Paper No. 35, page 74, will be found the figures for the daily discharge for 1899, ending with June 5, when the observations were discontinued temporarily, and were not again resumed until July 1, 1900. The figures for monthly flow for 1899 and diagrams of daily discharge for the entire period of observation (1897 to 1899, inclusive) will be found in the Twenty-first Annual Report, Part IV, pages 81 and 82. The following tables contain the figures for the daily discharge from which the diagrams were constructed, as well as those for 1900, diagram for which is not yet plotted.

Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pennsylvania, for 1897.

[Drainage area, 64.6 square miles.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	84	62	162	76	41	68	65
2	....	87	72	148	102	25	432	65
3	....	74	63	139	74	24	132	65
4	....	137	60	131	55	29	77	74
5	91	168	56	134	59	32	65	276
6	83	117	56	128	67	30	46	136
7	75	75	53	120	67	29	45	86
8	71	132	57	108	53	29	48	75
9	71	1,384	32	119	52	28	54	75
10	73	228	32	117	52	27	75	75
11	74	152	32	160	36	26	57	75
12	77	141	54	110	49	32	53	93
13	345	131	50	101	68	33	45	93
14	182	121	59	90	35	30	35	296
15	140	105	43	550	32	29	39	833
16	117	112	51	497	32	28	28	162
17	98	103	41	158	35	24	32	133
18	86	111	36	108	35	24	34	111
19	84	97	90	97	35	24	40	103
20	79	100	64	93	35	25	35	98
21	77	103	96	82	30	26	33	94
22	99	88	2,817	79	29	31	39	105
23	91	84	187	88	31	30	42	94
24	85	81	268	388	41	28	40	84
25	204	74	139	142	33	74	30	80
26	89	73	121	97	34	89	51	73
27	77	70	131	91	33	39	211	75
28	72	68	763	85	36	30	98	75
29	69	67	336	78	49	29	68	77
30	110	67	223	80	45	29	65	82
31	216	....	184	79	....	27	....	111
Mean	95	148	204	147	47	32	71	127

[1] Continued from Water-Supply and Irrigation Paper No. 47.

Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pennsylvania, for 1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	118	113	118	143	98	94	44	29	24	19	46	129
2	91	110	115	110	89	93	34	30	24	19	29	107
3	80	113	119	101	73	86	35	68	24	18	24	103
4	74	118	115	93	77	84	35	79	24	18	26	354
5	70	116	110	101	79	80	34	164	23	19	24	923
6	71	108	110	101	79	79	34	108	23	18	23	182
7	75	98	110	101	111	79	34	64	23	16	27	142
8	71	93	103	100	744	77	33	64	22	17	33	125
9	64	93	94	91	256	79	32	66	20	17	29	110
10	68	93	93	87	136	78	32	84	22	16	170	101
11	67	104	96	87	125	74	31	158	22	15	248	93
12	97	146	96	87	125	70	30	125	20	17	82	93
13	136	143	91	87	235	68	30	118	21	19	63	93
14	105	108	91	93	118	68	29	83	21	21	65	93
15	215	108	87	93	281	60	29	76	20	24	75	86
16	177	96	84	87	242	64	30	79	21	25	70	80
17	105	93	86	79	323	70	28	108	21	18	79	79
18	78	93	84	75	139	66	26	416	20	20	125	75
19	75	120	82	75	131	61	28	859	19	29	918	84
20	132	1,512	79	79	155	62	30	123	19	28	176	294
21	223	338	89	79	230	61	32	65	19	37	104	143
22	134	210	101	75	125	55	64	55	19	61	89	129
23	751	158	105	75	110	55	64	44	28	35	140	531
24	193	140	113	108	128	55	32	40	33	26	141	166
25	140	133	113	122	128	54	30	55	25	22	118	122
26	205	130	93	107	146	54	48	42	25	47	118	115
27	201	128	84	98	116	46	243	42	26	70	100	98
28	128	124	104	225	113	125	79	26	21	60	100	80
29	125	....	157	235	107	79	50	27	20	44	168	84
30	118	....	357	107	107	60	34	70	19	31	129	101
31	113	....	138	....	100	....	31	67	....	48	....	143
Mean	139	176	110	103	162	71	43	111	22	28	118	163

Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pennsylvania, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	141	119	285	191	89	45	18	147	227	273	129	96	......
2	106	106	245	175	96	42	19	118	350	603	129	90	......
3	106	110	233	175	103	42	20	116	466	340	123	73	......
4	120	204	236	173	93	33	21	115	436	202	115	68	......
5	412	204	1,059	159	80	21	22	106	779	521	106	75	......
6	574	113	365	151	80	......	23	106	630	328	106	96	......
7	573	113	241	166	87	......	24	259	359	232	106	96	......
8	220	113	204	451	87	......	25	925	250	202	106	75	......
9	194	113	186	205	75	......	26	184	245	216	106	64	......
10	154	113	198	152	75	......	27	142	1,285	198	106	64	......
11	140	113	198	140	105	......	28	133	423	434	101	54	......
12	132	113	198	140	108	......	29	136	......	813	98	50	......
13	118	113	540	140	90	......	30	136	......	260	95	59	......
14	144	113	208	137	87	......	31	136	......	218	......	54	......
15	149	113	346	129	87	......							
16	140	113	359	142	87	......	Mean	207	271	326	146	81	......
17	232	149	186	142	87	......							

Daily discharge, in second-feet, of Wissahickon Creek near Philadelphia, Pennsylvania, for 1900.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	15	47	16	64	18	22	18	13	59	39	25	11	24
2	17	24	15	40	17	24	19	9	152	17	19	12	22
3	20	20	15	17	15	24	20	10	80	17	19	14	21
4	17	16	18	15	15	247	21	18	43	14	21	13	21
5	17	16	15	14	17	219	22	21	27	14	21	12	21
6	17	17	13	14	18	47	23	114	22	12	21	11	21
7	17	20	10	12	14	31	24	114	26	13	20	10	21
8	20	17	9	27	14	38	25	19	31	13	17	11	21
9	17	17	8	54	16	38	26	116	22	10	17	367	20
10	17	15	13	47	15	38	27	83	47	10	14	86	20
11	16	12	13	23	10	52	28	26	40	13	12	26	20
12	40	98	9	15	15	62	29	17	40	13	15	20	20
13	54	31	8	16	18	41	30	176	32	37	17	25	20
14	32	31	9	274	14	24	31	219	27		15		20
15	15	24	12	92	13	31							
16	13	18	278	54	11	30	Mean	42	35	26	34	29	42
17	15	18	85	35	11	26							

SCHUYLKILL RIVER ABOVE PHILADELPHIA, PENNSYLVANIA.

This river is described in Water-Supply Paper No. 35, page 74. Records of the height of the river at Fairmount dam have been kept for many years, but measurements for computing the daily discharge were not made until 1898. The first of the following tables does not represent the total flow of the stream, but the amount wasted over the flashboards at the dam, to which must be added the pumpage from the river, the leakage, and the quantity used for power at Fairmount. The second table is an estimate of the total monthly yield, in cubic feet, including the foregoing items. The figures were furnished by Mr. John E. Codman, hydrographer for the water department of the city of Philadelphia.

Daily discharge, in second-feet, of Schuylkill River above Philadelphia, Pennsylvania, for 1900, being amount wasted over flashboards at Fairmount dam.

Day.	Jan.	Feb.	Mar.	Apr.	May.	July.	Dec.
1			5,526	1,027			
2			19,061	880			
3			13,197	613			
4			7,318	207			425
5		15,673	5,122	148			2,041
6		8,103	3,814	260			2,041
7		3,077	3,814	260			1,362
8		3,890	3,146	378			644
9		5,618	2,277	378			68
10		3,441	2,076	260			
11		1,712	2,076				
12	7,013	1,348	1,551				
13		14,009	1,027	238			
14		15,905	1,027	238			
15		8,531	1,027				
16		5,706	752				
17		3,359	369	18			
18		2,489	369	35			
19		2,076	477	1,697	4,103		
20	1,222	1,095	4,243	1,404	6,243		
21	3,579	1,349	9,731	497	923		
22	2,198	14,183	3,641	411			
23	1,275	21,798	2,477	519		80	
24	944	12,626	2,689	369		54	
25	685	8,235	2,300	130		119	
26	675	4,742	1,699		211	2,861	
27	450	4,642	2,088		211	2,525	
28	225	2,076	2,088			923	
29	156		1,524				
30	953		1,348				
31			1,188				

NOTE.—The amount wasted over the flashboards on June 28 was 1,088 second-feet, on August 13 it was 79 second-feet, and on November 27 and 28 it was 43 and 18 second-feet, respectively.

Total monthly yield of Schuylkill River above Philadelphia, Pennsylvania, for 1900.

Month.	Yield.	Month.	Yield.
	Cubic feet.		*Cubic feet.*
January	6,610,500,000	July	2,856,566,000
February	33,771,128,000	August	2,040,927,000
March	14,666,146,000	September	1,229,059,000
April	5,730,472,000	October	1,372,271,000
May	5,073,978,000	November	1,579,652,000
June	2,743,671,000	December	3,429,617,000

NORTH BRANCH OF SUSQUEHANNA RIVER AT WILKESBARRE, PENNSYLVANIA.

This station, which was established by E. G. Paul March 30, 1899, is described in Water-Supply Paper No. 35, page 76. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 88. A bench mark was established September 26, 1900, being the extreme west end of the stone doorsill of the north entrance to the Coal Exchange Building, at 32.99 feet above datum of the gage. During 1900 two measurements of discharge were made by Mr. Paul, as follows:

May 20: Gage height, 5.60 feet; discharge, 6,772 second-feet.
September 26: Gage height, 2.20 feet; discharge, 961 second-feet.

The measurement of September 26 was made at Retreat, Pennsylvania, 10 miles below Wilkesbarre.

Daily gage height, in feet, of North Branch of Susquehanna River at Wilkesbarre, Pennsylvania, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.80	7.40	10.40	6.90	6.10	3.80	3.00	3.20	3.10	2.30	2.70	10.50
2	6.20	6.80	17.75	7.50	5.80	3.70	2.80	3.20	3.00	2.30	2.60	9.20
3	6.40	6.30	14.55	9.80	5.50	4.20	2.70	3.00	3.10	2.30	2.60	8.10
4	6.80	6.50	11.80	11.20	5.30	3.90	2.90	2.90	3.00	2.30	2.50	7.40
5	7.00	8.40	9.90	11.10	5.20	3.70	2.90	2.90	2.90	2.30	2.70	9.20
6	7.00	8.50	8.40	9.40	5.00	3.80	3.40	2.90	2.80	2.20	2.80	11.90
7	6.90	7.90	8.20	9.60	4.80	3.70	3.90	2.90	2.70	2.10	3.00	11.30
8	6.80	7.80	8.10	11.70	4.70	3.60	3.60	2.90	2.70	2.10	2.90	9.90
9	6.50	14.45	7.70	12.20	4.60	3.60	3.40	2.90	2.60	2.20	2.90	8.90
10	6.10	9.20	8.40	10.90	4.50	3.80	3.20	2.80	2.60	2.20	2.90	8.20
11	5.80	9.80	9.00	9.20	4.50	3.90	3.10	2.80	2.70	2.20	3.00	7.50
12	5.90	9.20	7.80	7.90	4.80	4.30	2.90	2.70	2.70	2.20	3.10	6.60
13	5.60	9.20	6.80	7.30	4.90	4.30	3.00	2.70	2.70	2.20	3.30	6.20
14	5.90	12.10	6.30	7.70	4.80	4.80	3.00	2.60	2.50	2.20	3.50	6.10
15	5.60	13.65	5.70	8.10	4.70	4.30	3.00	2.60	2.40	2.20	3.50	*a*10.30
16	5.50	11.80	5.70	7.80	4.70	4.00	3.00	2.60	2.50	2.30	3.40	9.80
17	5.50	9.20	9.00	7.60	4.90	3.80	2.90	2.50	2.40	2.40	3.30	9.20
18	5.20	7.70	8.10	10.03	5.00	3.60	2.90	2.50	2.30	2.40	3.20	8.70
19	5.10	8.90	8.30	12.45	5.10	3.50	2.80	2.40	2.20	2.50	3.20	9.20
20	5.80	10.70	8.50	12.40	5.60	3.40	3.10	2.50	2.20	2.70	3.10	9.60
21	14.65	9.80	10.85	11.10	5.20	3.30	3.20	2.50	2.10	2.60	3.10	9.40
22	16.85	11.40	9.70	10.00	5.00	3.20	3.10	2.50	2.20	2.60	3.20	9.00
23	13.50	16.10	9.20	9.50	4.80	3.50	3.00	2.80	2.20	2.70	3.60	......
24	10.30	14.75	8.40	11.30	4.60	3.30	2.90	3.00	2.20	2.90	4.00	......
25	8.50	11.00	9.90	10.70	4.50	3.30	2.90	2.90	2.20	2.80	4.30	......
26	7.80	8.80	8.70	9.50	4.30	3.20	4.00	2.60	2.20	2.80	4.70	......
27	7.90	7.00	8.10	8.40	4.10	3.20	3.70	2.70	2.30	2.70	16.75	......
28	6.20	8.50	7.10	7.50	4.00	3.10	3.40	2.80	2.20	2.70	20.75	......
29	9.20	......	7.00	6.90	3.90	3.10	3.20	2.80	2.20	2.70	14.65	......
30	9.00	......	6.80	6.50	3.80	3.10	3.30	3.10	2.30	2.70	11.80	11.40
31	8.70	......	6.50	......	3.70	......	3.30	3.10	......	2.60	......	11.40

a Ice backed water at gage.

NORTH BRANCH OF SUSQUEHANNA RIVER AT DANVILLE, PENNSYLVANIA.

This station, which was established March 25, 1899, by E. G. Paul, is described in Water-Supply Paper No. 35, page 77. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 89. A bench mark was established, being the extreme south end of the stone doorsill at the east entrance of the city filtering plant, at 31.7 feet above datum of the gage. During 1900 two measurements were made by Mr. Paul, as follows:

May 20: Gage height, 4.60 feet; discharge, 10,515 second-feet.
September 25: Gage height, 1.60 foot; discharge, 822 second-feet.

Daily gage height, in feet, of North Branch of Susquehanna River at Danville, Pennsylvania, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	(a)	(a)	7.55	5.60	5.35	3.00	2.30	2.40	2.20	1.70	2.00	8.75
2	(a)	(a)	15.25	5.80	5.05	2.90	2.30	2.40	2.20	1.70	2.00	7.15
3	(a)	(a)	13.10	6.75	4.80	2.90	2.30	2.30	2.20	1.70	2.00	5.90
4	(a)	(a)	10.65	8.40	4.55	3.50	2.20	2.20	2.20	1.70	2.00	5.50
5	(a)	(a)	9.25	9.30	4.40	3.30	2.20	2.20	2.20	1.70	2.00	7.10
6	(a)	(a)	7.10	8.45	4.25	3.10	2.30	2.10	2.10	1.70	2.00	8.80
7	(a)	(a)	7.10	7.40	4.15	3.00	2.70	2 50	2.10	1.70	2.00	9.65
8	(a)	(a)	7.30	8.70	4.05	2.90	2.90	2.20	2.00	1.70	2.00	8.55
9	(a)	9.70	6.85	9.75	4.00	2.90	2.90	2.10	1.80	1.70	2.00	7.50
10	(a)	9.90	6.75	9.45	3.95	2.90	2.70	2.10	1.90	1.70	2.00	6.85
11	(a)	7.60	7.50	8.25	3.85	3.10	2.50	2.00	1.80	1,70	2.10	6.30
12	(a)	7.80	7.20	7.10	3.90	3.10	2.50	2.00	1.80	1.70	2.10	5.55
13	(a)	9.40	6.40	6.30	4.10	3.30	2.40	1.90	1.80	1.70	2.20	5.20
14	(a)	9.60	5.65	6.10	4.20	3.30	2.30	2.00	1.80	1.70	2.40	5.00
15	(a)	11.20	5.20	6.30	4.00	3.90	2.30	2.00	1.80	1.80	2.40	5.00
16	(a)	10.40	4.90	6.65	4.00	3.50	2.30	1.90	1.80	1.80	2.60	6.80
17	(a)	8.30	4.70	6.35	3.80	3.20	2.30	1.90	1.70	1.80	2.50	(a)
18	(a)	7.30	4.90	7.00	3.90	3.00	2.30	1.90	1.70	1.80	2.50	(a)
19	(a)	5.70	5.05	9.75	3.90	3.00	2.30	1.80	1.70	1.80	2.50	(a)
20	(a)	5.00	5.10	10.55	4.40	2.90	2.30	1.80	1.70	1.80	2.50	(a)
21	9.40	4.70	7.95	9.85	4.40	2 80	2.20	1.90	1.70	1.70	2.50	(a)
22	12.70	5.95	8.80	8.95	4.10	2.70	2.40	1.90	1.70	1.70	2.50	(a)
23	11.95	12.15	7.95	8.10	3.90	2.60	2.30	1.80	1.60	1.90	2.60	(a)
24	9.70	13.50	7.40	8.35	3.70	2.60	2.20	1.80	1.60	2.10	2.70	(a)
25	7.80	11.05	7.40	9.30	3.60	2.70	2.10	2.30	1.60	2.30	2.90	(a)
26	6.80	8.95	7.65	8.40	3.60	2.60	2.30	2.10	1.70	2.20	3.90	7.05
27	6.45	6.85	6.95	7.40	3.40	2.50	3.00	2.20	1.70	2.10	8.45	8.60
28	6.30	5.45	6.50	6.65	3.20	2.50	2.80	2.10	1.70	2.10	16.60	7.55
29	5.80	......	5.85	6.10	3.20	2.40	2.60	2.00	1.70	2.10	12.65	6.95
30	5.80	......	5.90	5.65	3.10	2.40	2.40	2.00	1.70	2.00	10.20	6.55
31	(a)	......	5.65	......	3.00	......	2.40	2.00	......	2.00	......	6.30

a River frozen.

WEST BRANCH OF SUSQUEHANNA RIVER AT ALLENWOOD, PENNSYLVANIA.

This station, which was established by E. G. Paul March 23, 1899, is described in Water-Supply Paper No. 35, page 78. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 90. A bench mark was established on September 24, 1900. It consists of a copper bolt set in the capstone of the wing wall on the lower side of the west end of the bridge, and is 33.19 feet above datum of the gage. During 1900 two measurements of discharge were made by Mr. Paul, as follows:

May 19: Gage height, 3.2 feet; discharge, 4,812 second-feet.
September 24: Gage height, 1.8 feet; discharge, 511 second-feet.

Daily gage height, in feet, of West Branch of Susquehanna River at Allenwood, Pennsylvania, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.50	3.20	7.55	5.00	4.30	3.90	2.10	1.90	2.00	1.30	2.10	5.75
2	5.50	3.20	9.60	5.30	4.20	3.90	2.30	1.80	1.90	1.30	2.10	5.40
3	5.70	3.40	7.70	5.40	4.20	3.90	2.60	1.80	1.90	1.20	2.10	5.00
4	5.80	3.40	7.00	5.80	4.00	4.00	2.50	1.80	1.80	1.20	2.10	5.80
5	5.90	3.50	6.00	5.90	3.80	4.10	2.30	1.70	1.80	1.20	2.10	5.90
6	5.90	3.60	5.40	6.20	3.50	3.90	2.30	1.70	1.70	1.20	2.00	6.40
7	5.90	3.80	5.80	6.40	3.30	3.60	2.20	1.70	1.70	1.20	1.90	6.70
8	4.70	4.50	5.90	6.20	3.39	3.50	2.20	1.60	1.70	1.20	1.90	6.00
9	3.70	5.00	6.10	7.30	3.20	3.40	2.20	1.60	1.60	1.80	1.90	5.50
10	3.90	5.30	6.40	6.00	3.20	3.30	2.30	1.50	1.60	2.20	1.90	4.90
11	4.20	5.60	6.90	5.70	3.20	3.20	2.50	1.40	1.60	2.20	1.90	4.60
12	4.50	5.30	6.20	5.30	3.20	3.00	2.70	1.50	1.50	2.10	1.90	4.20
13	4.40	6.00	5.40	4.90	3.50	3.00	2.90	1.50	1.50	2.10	1.90	4.00
14	4.20	7.70	5.00	4.80	3.40	3.00	2.80	1.40	1.40	2.10	1.90	3.80
15	4.00	7.30	4.00	4.80	3.40	3.00	2.60	1.40	1.40	2.10	1.90	3.60
16	4.00	6.50	4.00	4.60	3.30	3.00	2.60	1.40	1.40	2.10	1.80	3.30
17	4.00	6.20	3.90	4.70	3.20	2.90	2.50	1.40	1.30	2.10	1.80	3.20
18	4.20	5.40	3.80	6.00	3.20	2.80	2.40	1.40	1.30	2.20	1.80	3.20
19	4.50	5.60	3.70	7.00	3.50	2.70	2.20	1.40	1.30	2.10	1.70	3.10
20	5.30	5.90	6.20	6.90	3.50	2.70	2.00	1.40	1.30	2.00	1.70	3.10
21	13.20	6.00	7.10	6.30	3.30	2.60	2.00	1.40	1.30	1.90	1.70	3.10
22	12.20	8.20	6.90	6.20	3.20	2.50	1.90	2.30	1.30	1.90	1.90	3.00
23	8.50	10.15	6.60	6.00	3.00	2.40	1.90	2.30	1.30	2.10	2.40	3.00
24	6.50	7.85	6.10	6.30	3.00	2.40	1.90	2.30	1.30	2.20	3.00	3.00
25	6.30	6.50	5.90	6.00	3.00	2.30	1.90	2.30	1.30	2.40	5.00	3.00
26	6.10	5.00	5.50	5.60	3.00	2.30	1.90	2.30	1.30	2.50	7.70	3.00
27	5.30	5.00	5.20	5.30	3.40	2.30	2.20	2.20	1.30	2.60	15.75	3.00
28	4.60	4.80	5.10	4.80	3.20	2.20	2.20	2.20	1.30	2.40	10.05	3.00
29	4.60	......	5.00	4.60	3.00	2.20	2.20	2.10	1.30	2.40	8.25	3.00
30	4.50	......	4.90	4.40	3.00	2.10	2.20	2.10	1.30	2.30	6.60	3.00
31	3.20	......	4.80	......	3.20	......	2.00	2.00	......	2.20	......	......

JUNIATA RIVER AT NEWPORT, PENNSYLVANIA.

This station, which was established March 21, 1899, by E. G. Paul, is described in Water-Supply Paper No. 35, page 79. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 91. The bench mark is the extreme east end of the stone doorsill of the south entrance of Butz's store, on the right bank, and is 28.83 feet above datum of the gage. During 1900 two measurements of discharge were made by Mr. Paul, as follows:

May 17: Gage height, 3.40 feet; discharge, 1,778 second-feet.
September 22: Gage height, 2.80 feet; discharge, 418 second-feet.

Daily gage height, in feet, of Juniata River at Newport, Pennsylvania, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.10	3.70	5.90	4.50	4.10	3.30	3.30	3.00	3.30	2.80	3.00	4.40
2	4.10	3.40	12.90	4.50	4.10	3.30	3.20	3.00	3.20	2.90	3.00	4.10
3	4.60	3.40	8.00	4.50	4.00	3.40	3.10	3.00	3.20	3.00	3.00	3.90
4	5.00	3.50	6.00	4.40	3.90	3.70	3.10	3.00	3.10	3.00	3.00	3.90
5	5.00	3.80	5.50	4.50	3.80	3.60	3.10	3.00	2.90	2.90	2.90	5.50
6	4.70	4.40	5.40	4.60	3.70	3.40	3.10	3.00	2.90	2.90	2.90	7.00
7	5.20	4.10	6.00	4.50	3.70	3.40	3.10	2.90	2.90	2.90	3.00	6.30
8	4.00	4.20	6.40	4.40	3.70	3.30	3.10	2.90	2.80	2.90	3.00	5.20
9	4.20	5.10	5.60	4.40	3.60	3.40	3.10	2.90	2.80	2.90	3.00	4.60
10	4.10	5.60	5.40	4.40	3.60	3.50	3.10	2.80	2.80	2.90	3.00	4.50
11	4.10	4.80	5.10	4.40	3.50	3.40	3.10	2.80	2.80	2.90	2.90	4.30
12	4.80	4.60	5.10	4.30	3.50	3.30	3.10	2.80	2.80	3.00	2.90	4.20
13	4.60	5.40	4.90	4.30	3.50	3.30	3.10	2.80	2.80	3.00	2.90	4.00
14	4.20	9.40	4.80	4.30	3.50	3.30	3.00	2.80	2.80	3.00	2.90	3.80
15	3.90	7.60	4.70	4.30	3.50	3.30	3.00	2.80	2.80	3.00	3.00	3.70
16	3.50	5.90	4.60	4.10	3.50	3.30	3.00	2.80	2.80	3.00	3.00	3.70
17	4.10	5.30	4.10	4.00	3.40	3.30	3.00	2.80	2.80	3.00	3.00	3.60
18	3.80	4.90	4.10	4.00	3.40	3.30	3.00	2.80	2.80	3.00	3.00	3.30
19	4.20	4.10	4.10	4.40	3.50	3.30	2.90	2.80	2.80	3.00	3.00	3.50
20	4.90	4.20	4.40	4.70	3.70	3.30	2.90	2.80	2.80	3.00	3.00	3.70
21	10.60	4.40	6.50	4.50	4.00	3.30	2.90	2.80	2.80	3.00	3.00	3.80
22	10.20	11.70	6.50	4.50	3.70	3.30	2.90	2.80	2.80	3.00	3.00	3.80
23	7.20	11.10	5.70	4.50	3.70	3.30	2.90	2.80	2.80	2.90	3.10	3.60
24	6.00	8.20	5.70	4.70	3.60	3.30	3.20	2.80	2.80	3.70	3.10	3.40
25	5.20	5.90	5.60	4.70	3.50	3.20	3.10	3.30	2.80	3.40	4.00	3.80
26	5.00	4.50	5.40	4.70	3.50	3.20	3.10	3.30	2.80	3.30	6.30	3.50
27	4.80	4.40	5.10	4.40	3.20	3.60	3.10	3.70	2.80	3.30	11.60	3.30
28	4.40	4.60	5.00	4.30	3.30	3.40	3.10	3.40	2.80	3.20	8.00	3.20
29	4.40	....	4.80	4.20	3.30	3.30	3.00	3.30	2.80	3.20	5.70	3.20
30	4.20	....	4.60	4.20	3.30	3.30	3.00	3.70	2.80	3.10	4.80	3.20
31	4.10	....	4.50	....	3.30	....	3.00	3.60	....	3.00	....	3.20

SUSQUEHANNA RIVER AT HARRISBURG, PENNSYLVANIA.

Gage-height observations were established at this station by E. Mather, president of the Harrisburg water board, in 1890. Discharge measurements were first made by E. G. Paul on March 31, 1897, from the Walnut street bridge. The station is described in Water-Supply Paper No. 35, page 80. The datum of this gage is the low-water mark of 1803, which is recorded on a large rock above the bridge. During 1900 three measurements were made by Mr. Paul, as follows:

May 16: Gage height, 2.42 feet; discharge, 17,621 second-feet.
September 21: Gage height, 0.08 foot; discharge, 2,655 second-feet.
September 28: Gage height, −0.04 foot; discharge, 2,357 second-feet.

Daily gage height, in feet, of Susquehanna River at Harrisburg, Pennsylvania, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.83	2.91	4.00	4.16	4.00	2.58	1.17	1.25	1.00	0.04	0.83	7.00
2	1.66	1.83	13.12	4.00	3.75	2.50	1.08	1.00	1.00	.04	.83	5.83
3	4.50	3.91	12.33	4.16	3.50	2.33	1.00	1.00	.83	.04	.75	5.25
4	4.91	4.00	9.50	4.41	3.33	2.17	1.08	.92	1.17	.06	.75	4.50
5	4.83	4.66	7.91	5.33	3.08	2.50	1.33	.75	.92	.04	.75	5.00
6	5.25	4.33	6.91	6.00	2.83	2.67	1.17	.67	.83	.04	.66	7.25
7	5.50	5.50	6.00	5.41	2.83	2.50	1.33	.67	.58	.04	.66	7.41
8	5.33	5.00	6.16	5.08	2.75	2.17	1.17	.58	.58	.08	.66	7.08
9	4.91	4.00	6.50	6.16	2.50	2.17	1.42	.50	.58	.04	.75	6.00
10	4.58	4.83	5.83	6.75	2.50	2.08	1.42	.58	.50	.04	.58	5.25
11	4.50	5.75	5.66	6.50	2.42	2.00	1.33	.50	.42	.04	.66	4.75
12	5.50	5.50	6.25	5.58	2.33	2.00	1.17	.33	.33	.04	.50	4.08
13	4.91	5.66	5.75	5.00	2.42	1.92	1.08	.33	.17	.25	.58	3.83
14	5.25	7.66	4.66	4.50	2.42	1.92	1.08	.25	.25	.83	.75	3.60
15	5.25	8.00	4.50	4.33	2.50	2.00	1.00	.17	.25	.83	.66	2.91
16	5.25	8.25	4.00	4.50	2.40	2.17	1.00	.17	.25	.75	.66	2.85
17	4.66	7.41	3.66	4.41	2.33	2.17	1.00	.25	.25	.58	.83	2.25
18	5.00	6.00	3.16	4.33	2.33	2.00	1.08	.17	.17	.66	.91	2.08
19	4.83	4.75	3.00	5.08	2.25	1.83	.92	.17	.08	.66	.75	2.08
20	4.00	3.91	3.00	7.08	2.50	1.83	.92	.17	.12	.58	.91	2.08
21	4.25	2.16	3.91	7.33	2.92	1.82	.83	.33	.08	.50	.91	2.00
22	10.66	3.58	6.87	6.83	2.17	1.75	.75	.42	.07	.50	.91	2.16
23	12.00	9.50	6.83	6.08	2.83	1.75	.75	.83	.06	.50	.83	2.41
24	9.16	11.16	6.00	5.83	2.58	1.58	.75	.50	.04	.50	1.00	2.16
25	7.25	9.75	5.75	6.00	2.42	1.42	.75	1.25	.04	1.00	1.08	2.33
26	6.08	6.83	5.83	6.25	2.25	1.33	.83	1.00	.02	1.08	1.66	2.41
27	5.00	5.50	5.50	5.75	2.17	1.33	1.50	1.17	.00	1.00	5.91	2.00
28	4.50	4.50	5.25	5.08	2.00	1.33	1.25	1.50	−0.04	1.25	13.04	2.66
29	4.08	......	4.83	4.58	2.00	1.33	1.25	1.33	−0.04	1.16	12.33	2.91
30	3.33	......	4.50	4.17	2.00	1.17	1.42	1.00	+0.04	1.00	8.91	2.58
31	2.50	......	4.41	......	1.92	......	1.25	1.08	......	.91	......	2.50

MISCELLANEOUS DISCHARGE MEASUREMENTS IN PENNSYLVANIA.

During the year 1900 the following measurements of the Pennsylvania Canal and of Lehigh River were made by E. G. Paul:

Miscellaneous discharge measurements in Pennsylvania during 1900.

Date.	Stream.	Locality.	Discharge.
1900.			*Sec.-feet.*
May 16	Pennsylvania Canal	Harrisburg	376
May 18	do	do	369
September 21	do	do	360
May 18	do	Steelton	192
September 23	do	do	161
May 18	do	Highspire	152
September 23	do	do	150
September 26	do	Nanticoke	328
September 27	Lehigh River	Easton, Glendon Bridge	303

PATAPSCO RIVER AT WOODSTOCK, MARYLAND.

This station, which was established August 6, 1896, by E. G. Paul, is located at the county bridge on the road from Woodstock to Granite, Maryland, 1½ miles below the junction of the North Branch. It is described in Water-Supply Paper No. 35, page 83, where will also be found the gage heights for 1899. The discharge measurements for 1899 were published in the Twenty-first Annual Report, Part IV, page 94. During 1900 the following measurements were made by Mr. Paul:

June 29: Gage height, 3.6 feet; discharge, 165 second-feet.
September 29: Gage height, 3.6 feet; discharge, 152 second-feet.

Daily gage height, in feet, of Patapsco River at Woodstock, Maryland, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov. *a*
1	3.90	3.85	6.50	4.00	3.90	3.60	3.60	3.25	5.30	3.55	3.45
2	3.90	3.75	4.90	4.15	3.90	3.55	3.65	3.30	5.30	3.55	3.45
3	3.95	3.70	4.55	4.15	4.00	3.60	3.60	3.25	5.40	3.55	3.50
4	3.95	3.40	4.40	4.15	3.95	3.65	3.45	3.15	5.30	3.50	3.50
5	3.90	4.40	4.35	4.10	4.00	3.75	3.55	3.15	4.85	3.35	3.50
6	3.85	3.90	4.40	4.15	4.00	3.65	4.00	3.10	5.20	3.35	3.50
7	......	3.85	4.40	4.15	4.05	3.65	3.85	3.00	5.20	3.30	3.45
8	4.05	4.10	4.40	4.10	3.90	3.75	3.55	3.00	5.25	3.35	3.50
9	3.85	4.25	4.25	4.15	4.10	3.85	3.55	3.00	5.25	3.55	3.45
10	3.85	4.05	4.30	4.15	3.95	3.30	3.55	3.05	5.25	3.55	3.45
11	3.85	4.05	4.20	4.35	4.00	3.65	3.45	3.05	5.25	3.55	3.45
12	5.25	4.10	4.25	4.35	3.90	3.55	3.35	3.00	5.35	3.55	3.85
13	3.95	7.65	4.20	4.35	4.00	3.60	3.35	3.05	5.35	3.35	3.55
14	3.85	5.15	4.25	4.20	3.85	3.60	3.25	3.00	5.40	3.30	3.45
15	3.80	4.30	4.25	4.10	3.90	4.00	3.15	3.00	5.55	3.75	3.45
16	3.85	4.15	4.35	4.15	4.00	(*b*)	3.05	3.00	5.30	3.65	3.45
17	3.95	......	......	4.20	4.00	(*b*)	3.00	3.10	5.40	3.55	3.45
18	3.95	3.85	4.10	4.10	3.90	(*b*)	3.05	3.00	5.10	3.45	3.40
19	3.90	3.95	4.00	4.10	4.30	(*b*)	3.05	3.10	5.10	3.25	3.45
20	4.50	3.95	4.20	4.15	4.20	(*b*)	3.05	5.20	5.05	3.40	3.45
21	5.60	4.00	6.60	4.25	4.10	(*b*)	3.00	6.10	5.05	3.30	3.45
22	4.15	8.70	4.90	4.10	3.75	(*b*)	3.50	5.95	5.05	3.45	3.50
23	4.05	4.95	4.35	4.15	3.75	(*b*)	3.20	5.75	5.05	3.45	3.40
24	4.05	4.55	4.35	4.20	3.70	(*b*)	3.55	5.65	5.15	3.45	3.50
25	4.00	3.90	4.30	4.05	3.75	(*b*)	7.15	5.55	5.00	3.50	3.30
26	3.90	4.30	4.10	4.00	3.80	(*b*)	6.35	5.40	5.10	3.45	3.40
27	3.85	4.15	4.30	3.90	3.90	(*b*)	5.75	5.40	5.05	3.50	3.40
28	3.85	4.35	4.20	3.90	3.80	(*b*)	4.50	5.70	4.95	3.45	3.35
29	3.85	......	4.20	3.80	3.80	(*b*)	4.50	5.40	4.20	3.45	3.45
30	3.85	......	4.40	4.00	3.65	(*b*)	4.45	5.45	3.50	3.45	3.40
31	3.85	......	4.20	......	3.35	......	5.05	5.40	......	3.45	......

a No record for December. *b* June 16 to 30, no readings; gage broken.

NORTH BRANCH OF POTOMAC RIVER AT PIEDMONT, WEST VIRGINIA.

This station, which was established January 27, 1899, by E. G. Paul, is located at the highway bridge connecting Luke, Maryland, with Piedmont, West Virginia. It is described in Water-Supply Paper No. 35, page 84, where will be found gage heights and discharge measurements for 1899. During 1900 the following measurements were made by Mr. Paul:

February 22: Gage height, 3.75 feet; discharge, 735 second-feet.
June 20: Gage height, 4.40 feet; discharge, 1,249 second-feet.
September 12: Gage height, 1.8 feet; discharge, 34 second-feet.

Daily gage height, in feet, of North Branch of Potomac River at Piedmont, West Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.70	3.00	3.55	4.60	3.15	3.30	3.00	2.95	2.10	2.85	2.10	3.55
2	2.70	3.05	4.50	4.80	3.10	3.25	2.85	2.75	2.00	2.45	2.10	3.45
3	2.70	3.10	4.10	4.65	3.10	3.25	2.70	2.65	2.00	2.20	2.25	3.25
4	2.70	3.10	4.00	4.50	3.10	3.05	2.70	2.60	2.00	2.10	2.65	5.80
5	2.70	3.35	4.30	4.25	3.00	2.90	2.70	2.40	2.00	2.20	2.70	5.65
6	2.80	3.60	4.25	4.15	2.95	2.85	2.60	2.30	1.95	2.20	2.50	4.70
7	2.90	3.70	5.80	4.15	2.90	2.85	2.70	2.30	1.90	2.20	2.40	4.25
8	3.00	5.30	5.00	4.30	2.90	3.15	3.00	2.20	1.90	2.10	2.30	4.00
9	3.30	5.40	4.55	4.20	2.95	3.15	2.85	2.20	1.90	2.05	2.40	3.80
10	3.50	4.65	4.40	3.95	3.20	2.95	2.70	2.10	1.90	2.00	2.50	3.60
11	3.50	4.40	4.30	3.75	3.05	2.80	2.60	2.05	1.80	2.00	2.50	3.40
12	4.70	4.05	4.15	3.70	3.00	2.70	2.45	2.00	1.80	2.00	2.60	3.40
13	4.25	5.90	4.10	3.65	2.90	2.70	2.60	2.10	1.80	2.00	2.60	3.40
14	3.90	5.50	4.10	3.55	2.80	3.15	2.65	2.00	1.80	3.05	2.50	3.30
15	3.90	4.80	4.00	3.40	2.80	3.20	2.55	2.00	1.80	3.20	2.50	3.30
16	3.90	4.35	3.80	3.40	2.80	3.95	2.35	2.10	1.80	2.65	2.40	3.20
17	4.40	4.15	3.70	3.40	2.80	7.55	2.30	2.40	1.90	2.45	2.40	3.05
18	4.10	4.05	3.70	3.55	2.70	5.85	2.25	2.25	1.90	2.40	2.40	3.15
19	4.15	3.70	4.00	3.75	3.40	4.95	2.35	2.25	1.90	2.25	2.40	3.20
20	5.80	3.65	5.95	3.65	3.95	4.45	2.90	2.45	1.90	2.20	2.50	3.25
21	5.70	3.60	5.35	3.50	3.55	3.95	2.75	2.20	1.80	2.10	2.60	3.25
22	4.75	3.75	4.75	3.50	3.35	3.65	2.55	2.20	1.80	2.10	3.20	3.05
23	4.35	4.00	4.60	3.65	3.20	3.50	2.45	2.65	1.80	2.15	3.00	3.00
24	4.10	3.70	4.60	3.85	3.15	3.35	2.40	2.45	1.80	2.35	2.90	3.05
25	3.95	3.60	4.50	3.65	3.05	3.25	3.20	2.40	1.80	2.80	3.35	3.05
26	3.80	3.40	4.25	3.50	3.00	3.25	4.05	2.45	1.80	2.50	7.95	3.05
27	3.55	3.40	4.35	3.40	2.95	3.05	4.40	2.45	1.85	2.35	5.20	2.90
28	3.40	3.40	4.15	3.40	2.90	2.90	3.20	2.30	1.90	2.30	4.45	2.90
29	3.30	......	4.00	3.30	3.30	3.55	3.00	2.20	1.95	2.20	4.05	3.45
30	3.20	......	4.75	3.25	3.25	3.15	3.00	2.15	2.70	2.20	3.75	3.05
31	3.10	......	4.60	......	3.10	......	3.25	2.10	......	2.20	......	3.30

SOUTH BRANCH OF POTOMAC RIVER NEAR SPRINGFIELD, WEST VIRGINIA.

The station on the South Branch at Springfield was originally (April, 1894) established at the railroad bridge 2 miles south of that town, by C. C. Babb, but was discontinued in 1896. The present station, which was established by E. G. Paul, January 26, 1899, is located on the iron highway bridge one-fourth of a mile from Grace Station and 1 mile from Springfield. It is described in Water-Supply Paper No. 35, page 85, where will also be found the gage heights and discharge measurement for 1899. During 1900 the following measurements were made by Mr. Paul:

February 23: Gage height, 7.7 feet; discharge, 3,808 second-feet.
June 20: Gage height, 7 feet; discharge, 3,435 second-feet.
September 11: Gage height, 4 feet; discharge, 144 second-feet.

Daily gage height, in feet, of South Branch of Potomac River near Springfield, West Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	(a)	(a)	9.8	7.4	4.4	4.0	5.0	3.6	3.5	4.0	3.6	5.2
2	(a)	(a)	8.4	7.0	4.3	4.8	5.0	3.4	3.4	3.8	3.6	5.0
3	(a)	(a)	6.8	6.5	4.2	4.4	5.0	3.4	3.4	3.7	3.6	5.0
4	(a)	(a)	6.8	5.6	4.2	4.4	5.2	3.4	3.4	3.5	4.0	5.0
5	(a)	(a)	6.4	5.2	4.1	4.2	5.2	3.4	3.3	3.4	4.0	5.9
6	(a)	(a)	6.2	5.2	4.1	4.2	5.0	3.2	3.3	3.4	3.8	10.6
7	(a)	(a)	7.0	5.0	4.1	4.1	5.0	3.2	3.2	3.6	3.8	12.0
8	(a)	(a)	7.8	5.0	4.0	4.0	4.7	3.2	3.1	3.6	3.6	10.0
9	(a)	(a)	9.4	4.8	4.0	4.0	4.4	3.1	3.8	3.5	3.6	5.0
10	(a)	5.8	6.0	4.6	4.0	4.0	4.4	3.0	4.5	3.5	3.6	5.0
11	(a)	6.0	7.4	4.2	4.0	3.9	4.2	3.0	4.0	3.5	3.5	4.8
12	(a)	6.4	6.8	4.2	3.9	3.9	4.0	3.0	4.0	3.3	3.4	4.7
13	(a)	6.4	6.2	4.0	3.8	3.9	3.6	3.0	3.6	3.2	3.8	4.7
14	(a)	6.8	5.7	4.0	3.8	5.6	3.2	3.0	3.4	3.2	3.2	4.5
15	(a)	7.2	5.4	3.8	3.7	5.2	3.2	3.0	3.0	3.8	3.2	4.5
16	4.2	7.0	5.0	3.5	3.6	7.6	3.2	2.9	3.0	3.7	3.1	4.4
17	4.6	6.8	4.8	3.4	3.6	13.0	3.1	2.9	2.9	3.6	3.1	(a)
18	4.8	(a)	4.6	3.4	3.6	10.2	3.1	2.9	2.9	3.6	3.1	(a)
19	4.9	(a)	5.0	3.2	3.5	9.5	3.0	2.9	2.9	3.6	3.4	(a)
20	5.0	(a)	7.8	4.4	4.0	7.0	3.0	2.9	2.8	3.5	3.4	4.2
21	9.0	(a)	11.4	5.6	3.7	5.4	3.0	2.8	2.8	3.5	3.6	4.0
22	7.0	6.4	10.8	6.0	3.5	5.1	3.4	3.2	2.8	3.5	3.8	4.0
23	6.8	7.7	9.2	6.8	3.4	5.0	3.6	3.4	3.0	3.5	3.8	3.8
24	6.2	7.4	8.4	6.2	3.4	4.9	3.8	3.4	3.0	3.4	3.8	3.7
25	5.6	(a)	7.6	6.0	3.2	4.9	3.8	3.4	3.0	3.2	4.0	3.7
26	5.2	(a)	6.5	5.6	3.1	5.2	4.6	4.2	3.0	3.2	10.2	3.6
27	(a)	(a)	6.4	5.2	3.4	5.4	5.0	4.0	3.0	3.2	12.0	3.5
28	(a)	(a)	6.1	5.0	3.4	5.6	5.4	4.0	3.4	3.2	9.8	3.5
29	(a)	-------	6.8	4.7	3.5	5.6	5.4	3.8	3.5	3.4	8.2	3.5
30	(a)	-------	7.4	4.4	3.6	5.4	4.5	3.6	4.0	3.5	6.8	3.4
31	(a)	-------	7.8	-------	4.0	-------	4.0	3.5	-------	-------	-------	3.4

a Ice.

ANTIETAM CREEK NEAR SHARPSBURG, MARYLAND.

This station was established at Myers's mill, 1 mile east of Sharpsburg, Maryland, on the road to Keedysville, Maryland, on June 24, 1897, by Arthur P. Davis. It is described in Water-Supply Paper No. 35, page 86, where will be found the gage heights for 1899. Records of discharge measurements for the year 1899 will be found in the Twenty-first Annual Report, Part IV, page 95. During 1900 the following measurements were made by E. G. Paul:

June 28: Gage height, 1.80 feet; discharge, 139 second-feet.
September 16: Gage height, 1.75 feet; discharge, 131 second-feet.

Daily gage height, in feet, of Antietam Creek near Sharpsburg, Maryland, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.50	1.60	3.80	2.50	2.10	2.00	1.70	1.40	1.60	1.40	1.70	1.55
2	1.50	1.70	3.60	2.50	2.10	1.90	1.70	1.40	1.60	1.50	1.50	1.55
3	1.50	1.60	3.00	2.40	2.00	1.90	1.60	1.50	1.40	1.40	1.50	1.50
4	1.60	1.50	2.80	2.30	2.10	2.00	1.50	1.50	1.60	1.40	1.50	2.30
5	1.60	1.50	2.70	2.30	2.00	1.90	1.70	1.40	1.70	1.50	1.50	2.40
6	1.70	1.60	2.70	2.30	1.90	1.90	1.70	1.40	1.60	1.40	1.40	2.00
7	1.70	1.50	2.75	2.40	2.10	1.90	1.60	1.40	1.50	1.40	1.50	1.60
8	1.80	2.00	2.60	2.30	2.00	1.90	1.60	1.40	1.50	1.30	1.60	1.70
9	1.90	2.20	2.50	2.30	2.00	1.90	1.70	1.45	1.40	1.50	1.60	1.70
10	1.80	2.00	2.50	2.20	1.90	1.70	1.60	1.50	1.40	1.60	1.60	1.60
11	1.80	1.90	2.50	2.20	1.80	2.00	1.50	1.40	1.40	1.60	1.50	1.60
12	1.80	2.00	2.50	2.30	1.90	1.90	1.55	1.50	1.40	1.50	1.40	1.50
13	1.70	2.70	2.40	2.30	1.80	1.80	1.50	1.50	1.50	1.50	1.70	1.50
14	1.70	2.70	2.40	2.30	1.80	1.70	1.55	1.40	1.60	2.05	1.50	1.50
15	1.80	2.40	2.40	2.20	2.00	1.70	1.60	1.70	1.60	1.90	1.70	1.40
16	1.70	2.40	2.40	2.30	1.90	1.85	1.45	1.60	1.80	1.70	1.50	1.30
17	1.70	2.20	2.30	2.20	2.00	2.10	1.50	1.60	....	1.60	1.50	1.50
18	1.70	2.10	2.25	2.30	2.00	2.20	1.50	1.60	1.40	1.40	1.40	1.40
19	1.80	2.20	2.40	2.35	2.40	2.55	1.50	1.60	1.50	1.60	1.50	1.50
20	2.10	2.20	2.90	2.30	3.10	2.10	1.60	1.70	1.50	1.60	1.50	1.50
21	2.50	2.30	3.10	2.70	2.40	2.00	1.50	1.80	1.50	1.40	1.60	1.50
22	2.00	4.15	2.80	2.30	2.20	1.90	1.40	1.80	1.40	1.50	1.50	1.50
23	1.90	3.75	2.70	2.40	2.10	1.80	1.90	1.70	1.30	1.50	1.50	1.50
24	1.80	3.05	2.70	2.30	2.10	1.70	1.85	1.70	1.40	1.80	1.50	1.40
25	1.70	3.80	2.60	2.20	2.10	1.80	1.65	1.80	1.40	1.70	1.50	1.30
26	2.30	3.30	2.50	2.20	2.00	1.80	2.00	1.70	1.40	1.50	2.50	1.60
27	2.20	3.00	2.60	2.10	1.90	1.90	1.90	1.70	1.40	1.50	2.10	1.50
28	2.00	3.00	2.50	2.10	1.90	1.80	1.80	2.00	1.40	1.40	1.80	1.50
29	1.80	....	2.50	2.10	2.00	1.80	1.55	1.90	1.50	1.30	1.70	1.50
30	1.60	....	2.60	2.00	1.90	1.70	1.40	1.80	1.60	1.40	1.60	1.40
31	1.60	....	2.60	....	2.10	....	1.40	1.70	....	1.60	....	1.50

NORTH AND SOUTH RIVERS AT PORT REPUBLIC, VIRGINIA.

These stations were established in August, 1895. They are described in Water-Supply Paper No. 35, page 86, where records of past measurements will be found. Both stations were discontinued on April 1, 1899.

NORTH BRANCH OF SHENANDOAH RIVER NEAR RIVERTON, VIRGINIA.

This station, which was established June 26, 1899, by Arthur P. Davis, is about 2 miles northwest of Riverton. It is described in Water-Supply Paper No. 35, page 88, where will be found records of discharge measurements made during 1899. During 1900 the following measurements were made by E. G. Paul:

February 13: Gage height, 3.25 feet; discharge, 645 second-feet.
June 18: Gage height, 5.30 feet; discharge, 2,923 second-feet.
September 10: Gage height, 2.60 feet; discharge, 146 second-feet.

Daily gage height, in feet, of North Branch of Shenandoah River near Riverton, Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.00	4.00	4.05	3.70	3.25	2.80	2.90	2.73	2.60	3.80	3.70	4.15
2	3.00	4.00	6.85	3.58	3.18	2.80	2.90	2.65	2.60	3.80	3.73	3.93
3	3.00	4.00	5.55	3.53	3.15	2.80	2.85	2.60	2.63	3.75	3.70	4.03
4	3.00	4.00	4.40	3.48	3.10	2.90	2.78	2.55	2.63	3.70	3.75	4.48
5	3.00	3.90	4.10	3.40	3.05	2.85	2.73	2.53	2.58	3.70	3.70	6.10
6	3.00	3.50	3.88	3.33	3.05	2.83	2.73	2.50	2.60	3.70	3.70	5.70
7	3.00	3.38	3.83	3.28	3.00	2.80	2.70	2.50	2.60	3.78	3.70	5.15
8	3.00	3.10	3.75	3.25	2.98	2.80	2.70	2.55	2.58	3.80	3.70	4.70
9	3.00	3.00	3.68	3.20	2.95	2.80	2.68	2.58	2.60	3.70	3.65	4.45
10	3.00	2.95	3.60	3.15	2.93	2.80	2.68	2.60	3.10	3.70	3.63	4.45
11	3.00	3.00	3.50	3.15	2.90	2.75	2.63	2.60	3.60	3.68	3.70	4.35
12	3.00	2.98	3.40	3.15	2.90	2.73	2.63	2.58	3.60	3.65	3.60	4.00
13	3.00	3.13	3.35	3.15	2.90	2.70	2.65	2.50	3.58	3.70	3.60	3.95
14	2.98	4.10	3.35	3.15	2.90	2.73	2.65	2.50	3.60	3.70	3.68	3.95
15	2.93	4.20	3.35	3.10	2.90	2.75	2.63	2.50	3.60	3.70	3.65	4.00
16	2.90	3.88	3.35	3.10	2.83	2.78	2.60	2.50	3.70	3.70	3.60	3.95
17	2.80	3.63	3.30	3.10	2.80	3.45	2.68	2.60	3.68	3.78	3.60	4.05
18	2.80	3.43	3.25	3.10	2.80	4.75	2.63	2.60	3.65	3.80	3.63	3.90
19	2.93	3.35	3.50	3.20	2.80	4.75	2.60	2.55	3.68	3.75	3.63	3.90
20	3.93	3.35	5.95	3.55	2.80	3.98	2.60	2.55	3.60	3.70	3.65	3.78
21	6.30	3.25	7.20	3.60	2.80	3.63	2.63	2.50	3.60	3.70	3.70	3.70
22	4.65	3.75	5.70	3.60	2.80	3.30	2.70	2.55	3.58	3.70	3.63	3.60
23	3.90	5.98	4.90	4.23	2.80	3.20	2.83	2.60	3.58	3.70	3.60	3.80
24	3.55	5.30	4.43	4.40	2.80	3.15	4.28	2.60	3.60	3.78	3.68	3.75
25	3.25	4.63	4.17	4.10	2.80	3.08	3.33	2.60	3.55	3.78	3.70	3.70
26	3.03	4.15	4.00	3.75	2.80	3.00	3.23	2.60	3.60	3.85	4.65	3.75
27	3.00	3.90	4.00	3.63	2.80	2.93	3.00	2.55	3.60	3.90	7.00	3.80
28	3.00	3.80	3.90	3.50	2.80	2.90	2.93	2.60	3.63	3.80	5.25	3.78
29	3.50	......	3.90	3.43	2.80	2.90	2.83	2.63	3.73	3.75	5.35	3.78
30	4.00	......	3.85	3.33	2.80	2.90	3.08	2.60	3.95	3.73	4.45	3.73
31	4.00	......	3.80	......	2.75	......	2.80	2.63	......	3.70	......	3.73

SOUTH BRANCH OF SHENANDOAH RIVER AT FRONT ROYAL, VIRGINIA.

This station was established by Arthur P. Davis on June 26, 1899. It is described in Water-Supply Paper No. 35, page 89, where will also be found record of discharge measurement made in 1899. During 1900 the following measurements were made by E. G. Paul:

February 14: Gage height, 5.75 feet; discharge, 1,955 second-feet.
June 19: Gage height, 7.90 feet; discharge, 5,703 second-feet.

Daily gage height, in feet, of South Branch of Shenandoah River at Front Royal, Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.55	4.95	6.40	5.90	5.30	4.95	4.80	4.60	4.10	4.30	4.50	5.30
2	5.55	4.80	10.65	5.75	5.25	4.85	4.70	4.55	4.10	4.25	4.50	5.35
3	5.60	5.00	8.80	5.70	5.15	4.80	4.60	4.45	4.10	4.25	4.40	5.15
4	5.55	5.60	7.55	5.60	5.10	4.80	4.60	4.40	4.10	4.25	4.45	5.55
5	5.50	5.20	6.90	5.50	5.00	4.80	4.60	4.40	4.10	4.40	4.55	5.80
6	5.35	5.65	6.60	5.40	5.00	4.80	4.50	4.30	4.00	4.30	4.60	7.60
7	5.10	5.40	6.35	5.40	5.00	4.70	4.50	4.30	4.00	4.40	4.50	6.75
8	5.05	5.00	6.20	5.30	4.90	4.70	4.50	4.30	4.00	4.40	4.50	6.10
9	4.95	5.00	6.10	5.20	4.80	4.70	4.40	4.20	4.00	4.30	4.50	5.95
10	5.05	....	6.00	5.20	4.80	4.60	4.40	4.20	4.00	4.40	4.40	5.85
11	4.85	5.00	5.90	5.20	4.80	4.60	4.40	4.20	4.00	4.45	4.45	5.60
12	4.95	4.95	5.80	5.10	4.70	4.50	4.40	4.20	3.90	4.45	4.45	5.45
13	5.00	5.10	5.70	5.10	4.70	4.40	4.30	4.20	3.90	4.40	4.40	5.15
14	5.60	6.35	5.60	5.10	4.70	4.70	4.30	4.20	3.90	4.25	4.40	5.10
15	5.65	7.20	5.60	5.10	4.70	5.70	4.30	4.10	4.30	4.25	4.40	5.00
16	5.00	6.50	5.50	5.10	4.70	6.25	4.30	4.10	4.65	4.30	4.30	4.90
17	4.80	6.20	5.50	5.00	4.60	7.25	4.30	4.10	4.95	4.30	4.30	4.85
18	4.80	5.95	5.50	5.00	4.50	7.95	4.20	4.00	4.65	4.40	4.30	4.80
19	5.00	5.70	5.65	5.00	4.70	7.65	4.20	4.00	4.15	4.40	4.30	4.75
20	7.20	5.55	6.55	5.40	5.30	6.85	4.20	4.00	4.15	4.30	4.30	4.70
21	10.70	5.45	9.55	5.75	5.75	6.20	4.55	4.10	4.15	4.25	4.30	4.60
22	8.35	6.25	8.35	5.90	5.55	5.80	4.90	4.20	4.15	5.05	4.40	4.60
23	7.15	8.90	7.50	6.55	5.35	5.30	4.85	4.25	4.10	6.25	4.85	4.60
24	6.50	8.65	6.60	6.70	5.25	5.35	4.65	4.30	4.20	6.95	4.95	4.60
25	6.15	7.35	6.55	6.25	5.20	5.20	4.85	4.30	4.30	6.75	5.65	4.60
26	5.80	6.85	6.45	6.30	5.35	5.10	4.95	4.30	4.35	5.60	6.65	4.60
27	5.60	6.55	6.30	5.75	5.05	5.10	5.00	4.25	4.15	6.35	8.45	4.50
28	5.55	6.20	6.25	5.55	4.90	5.20	4.90	4.20	4.05	5.05	7.30	4.50
29	5.55	....	6.15	5.40	4.85	5.05	4.85	4.20	4.00	4.65	6.35	4.50
30	5.50	....	6.00	5.40	4.80	4.90	4.80	4.10	4.20	4.55	5.85	4.50
31	5.20	....	5.95	....	5.45	....	4.70	4.10	....	4.50	....	4.50

SHENANDOAH RIVER AT MILLVILLE, WEST VIRGINIA.

This station, which was established April 15, 1895, is 4 miles above the mouth of Shenandoah River. It is described in Water-Supply Paper No. 35, pages 90 and 91. Records of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 96. During 1900 the following measurements were made by E. G. Paul:

February 24: Gage height, 5.9 feet; discharge, 12,985 second-feet.
June 19: Gage height, 4.5 feet: discharge, 9,132 second-feet.
September 15: Gage height, 0.4 foot: discharge, 500 second-feet.

Daily gage height, in feet, of Shenandoah River at Millville, West Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.25	2.10	3.00	2.55	1.80	1.50	1.30	1.15	0.60	0.60	0.80	2.00
2	1.30	1.20	4.80	2.50	1.75	1.50	1.25	1.00	.60	.70	.80	1.70
3	1.20	1.60	6.50	2.40	1.70	1.30	1.25	1.05	.60	.70	.80	1.50
4	1.15	1.55	4.80	2.25	1.60	1.30	1.20	1.00	.60	.70	.90	1.60
5	1.20	2.00	3.90	2.20	1.60	1.30	1.20	.90	.55	.60	.90	2.25
6	1.30	2.00	3.40	2.10	1.50	1.25	1.30	.85	.50	.55	.90	4.80
7	1.30	1.50	2.90	2.00	1.50	1.15	1.10	.80	.50	.50	.85	3.60
8	1.30	1.40	2.80	1.90	1.40	1.10	1.00	.75	.45	.50	.90	2.80
9	1.20	1.40	2.70	1.85	1.40	1.95	.90	.70	.45	.75	.85	3.40
10	1.15	1.40	2.60	1.80	1.40	1.00	.85	.70	.45	.60	.80	2.20
11	1.20	1.40	2.50	1.70	1.30	.95	.80	.70	.45	.55	.80	1.90
12	1.10	1.40	2.40	1.70	1.30	.90	.80	.65	.40	.50	.80	1.75
13	1.30	1.50	2.30	1.70	1.30	1.00	.80	.70	.40	.50	.80	1.60
14	1.40	1.90	2.20	1.70	1.20	.90	.75	.60	.40	.70	.75	1.50
15	1.50	3.80	2.10	1.70	1.20	1.10	.75	.60	.40	.90	.75	1.40
16	1.30	3.30	2.10	1.60	1.15	1.30	.70	.55	.50	1.10	.75	1.35
17	1.20	2.80	2.10	1.60	1.10	2.30	.70	.60	.60	.90	.70	1.30
18	1.15	2.50	2.00	1.55	1.10	2.70	.60	.60	.55	.80	.70	1.20
19	1.20	2.30	2.00	1.60	1.20	4.50	.60	.60	1.10	.80	.65	1.15
20	1.80	2.20	3.30	1.65	1.10	3.70	1.20	.60	.80	.70	.65	1.15
21	6.00	2.50	5.95	2.10	1.90	3.00	.80	.65	.70	.60	.60	1.10
22	5.90	2.45	6.20	2.40	1.90	2.60	1.00	.60	.60	.55	.65	1.00
23	4.20	4.35	4.70	2.55	1.70	2.10	1.10	.55	.55	.50	.70	1.00
24	3.30	5.90	3.90	3.00	1.60	1.90	1.40	.60	.55	.65	.70	1.00
25	2.80	4.50	3.45	3.00	1.40	1.70	2.50	.60	.50	.80	.70	1.00
26	2.50	3.80	3.15	2.70	1.25	1.55	2.80	.55	.50	2.10	1.10	1.00
27	2.25	3.40	3.00	2.50	1.50	1.45	1.70	.65	.45	.60	2.10	.95
28	2.00	2.80	2.95	2.30	1.50	1.40	1.50	.70	.50	1.25	4.50	.90
29	1.90	....	2.80	2.15	1.50	1.35	1.30	.60	.55	1.10	3.15	.90
30	1.80	....	2.70	2.00	1.40	1.30	1.30	.60	.50	.95	2.45	.90
31	1.85	....	2.60	....	1.30	....	1.20	.60	....	.90	....	.90

POTOMAC RIVER AT POINT OF ROCKS, MARYLAND.

This station was established February 17, 1895, at the tollbridge over the Potomac River at Point of Rocks. It has been described and results of measurements have been given in the various Annual Reports and in the Water-Supply and Irrigation Papers containing reports of the operations at river stations. More or less difficulty has been experienced with the wire gage, due to its stretching, and no record of this lengthening has been noted. A thorough study of the changes of the gage have been made in this office, based on measurements and on a study of the average depth of soundings, with the result that it has been found necessary to modify the gage heights in order to refer them to a common datum. This has also necessitated a revision of the rating table. In some cases it has been impossible to reduce the measurements to the known datum, and it has therefore been thought best to discard them and to publish here only such gage heights and discharge measurements as could be reduced to a common datum and on which reliance can be placed as giving a correct estimate of the discharge.

As originally placed the gage was located in the third span of the bridge from the north shore. The next year (1896) the wire became rusted and broke frequently, and a new wire gage was placed in the east side of the first span of the bridge, but it was referred to a different datum. During 1897 there was a further change in the length of the gage, which was not recorded, and therefore it has been necessary to discard the records during those two years—that is, 1896 and 1897.

On January 25, 1898, the gage wire was compared with the bench mark, and the observations since that date have been referred to this datum. The bench mark to which the gage has been referred is a copper bolt in a large capstone on the lower wing wall of the north abutment, about 10 feet from the north end of the first iron truss and 41.30 feet above the datum of the gage. The length of the cable of the wire gage is 44.22 feet. The measurements of 1895 are considered correct within themselves, but there was a difference between the datum of that gage and that of the present standard of 0.4 foot, making it necessary to deduct that amount from the gage readings of 1895 in order to reduce them to the present datum. Tables of the corrected gage heights and of the discharge measurements computed from them are published herewith.

The flood discharge of February 23, 1897, is also considered correct, and is given in the table of discharge measurements. There is no change in the published discharge measurements or the gage heights for 1898, 1899, and 1900, but they are reproduced here in order to bring together all of the records that could be reduced to one standard.

Discharge measurements of Potomac River at Point of Rocks, Maryland.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1895.	*Feet.*	*Sec.-ft.*	1898.	*Feet.*	*Sec.-ft.*
March 25	3.05	10,524	January 25	6.50	33,344
April 5	3.42	14,032	August 19	3.30	14,309
April 13	4.27	17,516	October 3	.65	1,939
April 23	2.10	7,371			
May 1	4.35	21,073	1899.		
May 7	3.10	12,484	January 28	3.80	17,330
May 17	2.35	8,918	May 20	8.15	45,986
May 28	2.45	9,189	September 5	.80	2,360
June 3	1.53	4,536	October 29	.50	1,628
June 17	1.30	4,233			
July 10	1.50	4,695	1900.		
November 6	.40	1,202	June 28	1.50	5,212
			October 2	.30	1,259
1897.					
February 23	21.70	169,913			

Daily gage height, in feet, of Potomac River at Point of Rocks, Maryland, for 1895.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	--------	6.10	3.10	3.30	1.80	2.00	1.00	0.60	0.30	0.40	0.40
2	--------	9.70	3.00	5.90	1.70	2.70	.90	.70	.30	.40	.50
3	--------	10.60	2.90	5.80	1.50	2.30	.80	.90	.30	.30	.50
4	--------	9.60	3.60	5.40	1.40	2.10	.80	.70	.30	.30	.50
5	--------	7.10	3.50	4.40	1.40	1.90	.90	.60	.30	.30	.50
6	--------	5.60	3.00	3.70	1.40	1.70	.80	.60	.30	.40	.60
7	--------	4.80	2.70	3.10	1.20	1.50	.80	.60	.30	.30	.80
8	--------	4.30	2.60	2.70	.80	1.50	.80	.50	.30	.30	.80
9	--------	4.10	3.00	2.70	1.30	1.70	1.10	.50	.30	.30	.60
10	--------	4.10	10.80	2.80	1.20	1.60	1.00	.60	.30	.40	.50
11	--------	4.00	7.90	2.80	1.10	1.50	.90	.50	.30	.40	.50
12	--------	3.60	5.80	2.70	1.10	1.50	.80	.50	.40	.50	.50
13	--------	3.60	4.50	2.70	1.20	1.30	.80	.50	.20	.40	.60
14	--------	3.60	3.80	2.80	1.20	1.20	.70	.50	.20	.40	1.60
15	--------	4.70	3.50	3.00	1.50	1.10	.70	.50	.30	.40	.60
16	--------	5.90	3.40	2.60	1.30	1.00	.60	.50	.30	.40	.50
17	1.60	8.10	3.30	2.40	1.20	1.00	.60	.40	.30	.40	.40
18	1.60	6.90	3.00	2.20	1.10	1.00	.60	.40	.30	.40	.40
19	1.60	5.40	2.70	2.20	1.10	1.10	.60	.50	.30	.40	.30
20	1.60	4.90	2.60	2.40	1.00	1.00	.60	.50	.30	.40	.30
21	1.70	4.10	2.40	2.30	.90	1.00	.60	.40	.20	.40	.30
22	1.80	3.80	2.20	2.40	1.00	1.00	.50	.40	.20	.40	.60
23	2.00	3.40	2.10	2.80	1.00	1.10	.50	.40	.30	.40	.60
24	2.00	3.20	2.00	3.80	.90	.90	.50	.50	.30	.40	1.30
25	2.00	3.00	2.00	3.30	.80	.90	.40	.50	.30	.40	1.30
26	2.10	2.90	1.90	2.60	.80	1.00	.40	.40	.30	.40	1.20
27	2.90	3.00	1.80	2.50	1.20	1.20	.40	.40	.30	.40	1.30
28	3.60	3.80	1.80	2.40	2.10	1.30	.40	.40	.30	.50	1.40
29	--------	3.20	1.80	2.40	1.60	1.20	.40	.30	.30	.50	.90
30	--------	4.30	2.20	2.20	1.50	1.10	.50	.30	.30	.40	.90
31	--------	3.50	--------	2.00	--------	1.10	.50	--------	.30	--------	1.30

Daily gage height, in feet, of Potomac River at Point of Rocks, Maryland, for 1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.90	2.80	1.90	6.10	2.60	2.20	0.90	1.50	1.20	0.70	2.70	2.10
2	2.90	1.70	1.80	5.20	2.40	2.00	.80	1.70	1.10	.70	2.50	2.10
3	3.00	2.00	1.70	4.60	2.20	1.80	.80	1.40	1.10	.60	2.30	2.00
4	3.20	1.90	1.70	4.10	2.00	1.70	.70	1.20	1.00	.70	2.20	2.50
5	3.20	1.90	1.60	3.80	1.90	1.60	.70	2.20	1.00	.80	2.00	5.10
6	3.30	2.00	1.60	3.60	1.80	1.40	.70	7.20	1.00	.80	1.80	9.20
7	3.20	2.00	1.60	3.20	2.20	1.30	.70	6.10	1.00	1.00	1.80	6.10
8	2.90	1.90	1.50	2.90	5.40	1.30	.80	3.70	1.00	1.10	1.70	4.50
9	3.00	1.90	1.50	2.40	11.05	1.20	.70	3.90	1.00	1.00	1.60	3.60
10	3.20	1.80	1.40	2.50	9.60	1.20	.70	5.60	.90	1.00	1.60	3.00
11	3.90	1.80	1.40	2.50	6.50	1.10	.70	14.00	.90	.90	2.00	2.60
12	5.80	1.90	1.50	2.40	5.20	1.10	.60	16.05	.90	.90	1.80	2.40
13	5.70	2.00	1.50	2.40	4.20	1.10	.50	9.50	.80	1.40	1.80	2.20
14	5.30	1.90	1.60	2.50	3.70	1.30	.50	8.00	.80	1.20	2.00	2.20
15	5.50	1.90	1.60	2.50	3.10	1.30	.50	7.20	.80	1.00	2.00	2.00
16	6.70	2.00	1.70	4.00	3.00	1.30	.50	6.10	.80	.80	1.80	1.80
17	8.00	2.00	1.70	9.00	3.20	1.30	.50	5.20	.80	.80	1.80	1.80
18	6.70	1.80	2.00	6.70	4.60	1.20	.50	4.30	.80	.80	1.80	2.00
19	5.60	1.70	5.80	5.10	4.40	1.50	.70	3.30	.80	1.40	2.20	2.10
20	4.90	1.70	4.60	4.20	3.50	1.40	.70	3.10	.70	9.00	3.00	2.20
21	4.70	2.80	3.50	3.50	2.30	1.30	.90	3.00	.70	5.40	3.60	2.60
22	4.60	3.80	3.50	3.20	2.90	1.30	.90	3.80	.70	5.35	3.30	3.30
23	5.00	4.10	6.60	2.90	3.10	1.30	1.10	2.80	.70	13.10	3.20	4.70
24	9.40	3.40	6.20	2.60	3.90	1.20	.90	2.30	.70	10.10	3.10	6.20
25	8.40	2.90	6.40	2.60	5.10	1.10	.80	2.00	.70	5.90	3.00	6.90
26	5.10	2.60	10.50	2.60	5.60	1.10	.90	1.80	.70	4.50	2.70	5.30
27	5.00	2.30	7.20	2.50	4.10	1.00	1.20	1.50	.90	3.80	2.60	4.30
28	5.10	2.10	5.30	3.30	3.40	1.00	1.00	1.50	.80	3.60	2.40	3.70
29	5.10	-------	4.40	3.00	3.00	.90	1.20	1.40	.70	3.40	2.20	3.20
30	3.60	-------	4.30	2.80	2.80	.90	1.40	1.30	.70	3.00	2.10	3.00
31	3.40	-------	6.20	-------	2.40	-------	1.70	1.30	-------	2.80	-------	2.70

Daily gage height, in feet, of Potomac River at Point of Rocks, Maryland, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.00	2.40	11.90	5.30	1.60	2.00	1.00	0.70	0.90	0.70	0.80	0.80
2	3.40	2.00	9.20	4.50	1.60	2.40	1.00	.70	.90	.60	1.50	.80
3	2.90	2.10	8.20	4.00	2.10	3.80	1.10	.70	.80	.60	2.50	.80
4	2.70	2.10	7.60	3.60	1.70	2.60	1.00	.90	.80	.60	2.00	.80
5	2.30	2.00	8.50	3.30	1.70	2.10	.90	1.00	.80	.60	1.80	.80
6	4.10	2.00	16.55	3.00	2.10	1.80	1.00	1.10	.70	.60	1.40	.70
7	6.90	2.00	12.90	2.80	2.00	1.60	2.00	1.10	.70	.70	1.40	.70
8	8.10	2.30	10.00	3.00	1.90	1.50	1.00	1.10	.60	.70	1.30	.70
9	6.80	2.30	8.10	3.50	1.00	1.40	1.00	1.00	.60	.70	1.20	.70
10	5.40	3.60	6.00	3.40	2.40	1.70	.90	1.00	.60	.60	1.00	.70
11	4.60	4.20	5.80	4.20	4.50	1.80	.90	.90	.60	.60	.90	.70
12	3.90	4.20	5.60	4.50	3.80	1.70	.80	.80	.80	.60	.90	.80
13	3.60	4.00	5.00	3.40	3.40	1.70	.80	.60	1.20	.60	.80	.80
14	3.40	3.90	4.80	3.20	3.20	1.60	.80	.60	1.10	.50	.80	1.20
15	3.40	3.80	4.50	3.00	2.80	1.50	.90	.60	1.00	.50	.80	3.00
16	4.00	4.00	4.60	2.80	2.50	1.50	1.10	.70	.90	.50	.80	2.10
17	5.70	4.50	4.70	2.70	2.30	1.40	.90	.70	.80	.50	.80	1.70
18	5.20	5.00	4.40	2.60	2.40	1.40	.70	.60	.70	.50	.70	1.50
19	4.70	5.20	5.20	2.50	8.55	1.30	.70	.60	.70	.50	.70	1.60
20	4.40	5.40	5.40	2.40	6.30	1.30	.70	.60	.90	.50	.70	1.50
21	4.00	6.00	5.30	2.20	5.00	1.20	.70	.60	.70	.50	.70	1.30
22	3.50	8.50	4.70	2.10	3.60	1.20	.70	.50	.80	.50	.70	1.10
23	3.30	14.80	4.20	2.00	3.00	1.10	.70	.50	.90	.50	.80	1.00
24	3.20	13.70	4.00	2.00	2.70	1.10	.60	.50	.90	.50	.80	1.20
25	3.30	9.00	3.90	2.00	2.40	1.00	.60	.50	.90	.50	.90	1.80
26	4.80	6.00	3.70	1.90	2.10	1.00	.60	.50	1.00	.50	.90	2.10
27	4.70	9.25	3.50	1.90	2.00	1.00	.60	1.20	.80	.50	.80	1.60
28	3.90	13.90	3.40	1.80	1.80	1.20	.60	1.10	.70	.50	.80	1.50
29	3.20	-------	3.60	1.70	1.70	1.10	.50	1.10	.70	.50	.80	1.60
30	2.80	-------	8.60	1.70	1.70	1.00	.80	1.00	.80	.50	.80	1.60
31	2.60	-------	7.00	-------	1.80	-------	.80	1.00	-------	.60	-------	1.60

Daily gage height, in feet, of Potomac River at Point of Rocks, Maryland, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.50	1.00	3.50	4.80	1.90	1.30	1.20	1.20	0.70	0.30	0.50	2.40
2	1.50	1.60	4.50	3.80	1.70	1.30	1.10	1.10	.70	.30	.50	1.90
3	1.40	2.00	6.60	3.40	1.60	1.30	1.00	1.00	.60	.30	.50	1.60
4	1.50	2.10	5.90	3.10	1.50	1.40	1.00	.90	.60	.30	.50	1.60
5	1.50	2.20	4.40	2.80	1.50	1.60	.90	.90	.50	.30	.50	2.00
6	1.40	1.90	4.00	2.70	1.40	1.60	1.30	.80	.60	.30	.40	4.10
7	1.40	1.80	3.60	2.60	1.40	1.50	1.00	.80	.50	.30	.40	5.90
8	1.30	1.50	3.90	2.50	1.30	1.40	.90	.70	.40	.30	.40	3.70
9	1.30	1.80	4.50	2.40	1.30	1.40	.80	.60	.40	.30	.50	3.00
10	1.20	2.30	4.00	2.30	1.30	1.30	.70	.60	.30	.30	.60	2.50
11	1.30	3.00	3.60	2.10	1.20	1.20	.60	.50	.40	.30	.50	2.10
12	1.40	2.50	3.20	2.10	1.20	1.10	.60	.50	.30	.30	.40	1.80
13	1.40	3.00	2.90	2.00	1.10	1.00	.50	.40	.30	.30	.40	1.60
14	1.50	4.50	2.80	1.90	1.10	.90	.50	.40	.40	.30	.40	1.50
15	1.80	5.30	2.70	1.90	1.10	1.30	.50	.40	.40	.90	.40	1.40
16	2.10	4.50	2.60	1.80	1.10	1.00	.40	.40	.40	.50	.40	1.40
17	1.90	3.80	2.40	1.80	1.00	1.80	.40	.40	.30	.40	.40	1.50
18	1.70	3.10	2.30	1.70	1.00	2.80	.40	.40	.30	.40	.30	1.20
19	1.60	2.60	2.40	1.70	1.20	8.50	.50	.40	.30	.30	.20	1.10
20	2.20	2.30	2.60	1.60	1.30	6.20	1.40	.40	.30	.30	.20	1.10
21	3.60	1.90	5.80	1.70	1.80	4.60	1.00	.40	.30	.30	.30	1.00
22	6.80	3.00	8.70	2.20	1.90	3.60	.90	.40	.30	.50	.40	.90
23	5.50	6.90	6.60	2.50	2.00	2.70	.80	.40	.30	.40	.40	.90
24	4.00	7.10	5.40	2.80	1.70	2.30	1.80	.40	.30	.40	.40	.80
25	3.30	5.60	5.00	3.00	1.50	2.10	1.60	.50	.30	.40	.40	.80
26	2.80	3.90	4.50	2.80	1.40	2.00	2.00	.60	.30	.40	1.20	.80
27	2.50	3.30	4.10	2.50	1.40	1.80	1.40	.70	.30	.50	3.30	.80
28	2.10	3.00	3.70	2.30	1.40	1.50	1.20	.90	.20	.50	8.20	.80
29	1.80	-------	3.50	2.10	1.30	1.40	1.00	.90	.30	.50	5.40	.80
30	1.30	-------	3.30	2.00	1.20	1.30	1.30	.80	.30	.50	3.20	.80
31	1.20	-------	3.20	-------	1.30	-------	1.30	.80	-------	.50	-------	.80

MONOCACY RIVER NEAR FREDERICK, MARYLAND.

This station was established August 4, 1896, by E. G. Paul, at the county bridge on the turnpike 4 miles northeast of Frederick, on the road leading from Frederick to Mount Pleasant, Maryland, about 2,000 feet above the mouth of Israel Creek and 3,000 feet below the mouth of Tuscarora Creek. It is described in Water-Supply Paper No. 35, page 93. Records of discharge measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 98. During 1900 the following measurements were made by Mr. Paul:

June 29: Gage height, 4.10 feet; discharge, 191 second-feet.
September 20: Gage height, 3.80 feet; discharge, 88 second-feet.

Daily gage height, in feet, of Monocacy River near Frederick, Maryland, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.40	5.10	13.45	5.40	4.70	4.40	4.00	4.00	3.90	3.90	3.70	5.20
2	5.40	5.10	12.00	5.70	4.70	4.40	4.00	3.90	3.80	3.80	3.70	4.30
3	5.40	5.10	9.50	5.50	4.70	4.40	3.90	3.90	3.80	3.80	3.70	4.30
4	5.20	5.10	8.20	5.50	4.90	4.40	3.90	3.80	3.70	3.80	4.10	7.20
5	5.00	5.20	7.30	5.50	4.80	4.40	3.90	3.70	3.70	3.80	4.10	12.10
6	4.90	5.10	7.10	5.40	4.60	4.30	3.90	3.70	3.70	3.70	4.00	6.00
7	4.80	5.30	8.00	5.30	4.50	4.20	3.80	3.70	3.70	3.70	4.00	5.50
8	4.50	6.90	7.50	5.20	4.40	4.20	3.80	3.70	3.70	3.70	4.00	5.20
9	4.50	7.55	6.50	5.10	4.40	4.20	3.70	3.70	3.70	3.70	3.90	4.90
10	4.90	6.90	6.30	5.10	4.40	4.10	3.70	3.70	3.60	3.70	3.90	4.50
11	5.00	5.30	6.30	5.00	4.40	4.10	3.70	3.60	3.60	3.70	3.90	4.30
12	10.20	5.50	5.90	5.00	4.40	4.10	3.70	3.60	3.60	3.70	3.90	4.20
13	9.20	15.10	5.70	5.00	4.30	4.10	3.70	3.50	3.60	3.70	3.90	4.00
14	5.40	12.85	5.60	5.00	4.30	4.10	3.70	3.50	3.60	3.90	3.90	4.00
15	4.90	7.00	5.50	5.00	4.30	4.40	3.70	3.50	3.60	4.10	3.90	4.00
16	4.80	6.50	5.40	4.90	4.30	4.80	3.60	3.50	3.90	4.10	3.90	4.00
17	4.60	5.90	5.40	4.90	4.30	5.00	3.60	3.60	3.90	4.10	3.90	4.00
18	4.60	5.90	5.40	5.10	4.30	5.80	3.60	3.90	3.90	3.90	3.80	4.00
19	4.90	5.80	5.40	5.20	6.50	6.00	3.70	3.80	3.90	3.80	3.80	3.90
20	9.00	5.50	13.50	5.10	7.00	5.10	4.60	3.80	3.80	3.70	3.80	3.90
21	9.50	5.50	10.20	5.00	6.50	4.90	4.60	3.80	3.80	3.70	3.80	3.90
22	7.05	17.15	9.10	5.00	5.90	4.50	3.80	4.80	3.70	3.70	3.80	4.00
23	6.50	15.00	8.20	5.50	4.90	4.40	4.10	4.70	3.60	3.80	3.90	4.00
24	6.00	10.50	6.50	5.60	4.80	4.20	5.50	4.10	3.50	3.80	3.90	4.10
25	5.70	8.50	6.10	5.40	4.70	4.20	4.80	4.70	3.50	3.80	3.90	4.10
26	5.50	7.10	6.00	4.90	4.60	4.20	4.20	4.00	3.50	3.70	9.20	4.10
27	5.10	6.50	5.90	4.80	4.50	4.20	4.20	3.90	3.50	3.70	7.30	4.10
28	4.90	6.50	5.70	4.80	4.50	4.10	4.10	5.50	3.60	3.70	7.10	4.10
29	4.60	......	5.50	4.80	4.50	4.10	4.00	5.30	3.70	3.70	6.90	4.00
30	4.50	......	5.50	4.70	4.50	4.00	4.00	4.30	4.00	3.70	6.30	......
31	4.50	......	6.50	......	4.50	......	4.00	4.00	......	3.70	......	......

ROCK CREEK AT ZOOLOGICAL PARK, DISTRICT OF COLUMBIA.

The first station on Rock Creek was established in 1892, at the request of the Commissioners of the District of Columbia. On January 18, 1897, a new station was established on the bridge of the Zoological Park. This bridge was rebuilt in November, 1900, and the gage was destroyed. A new station will be established in 1901. During 1900 one measurement was made by E. G. Paul, as follows:

April 24: Gage height, 2.75 feet; discharge, 77 second-feet.

Daily gage height, in feet, of Rock Creek at Zoological Park, District of Columbia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.45	2.43	3.30	2.75	2.60	2.45	2.35	2.35	2.15	2.40	2.10
2	2.43	2.43	3.25	2.70	2.60	2.73	2.35	2.28	2.13	2.30	2.15
3	2.43	2.38	2.88	2.70	2.60	2.60	2.35	2.30	2.10	2.20	2.15
4	2.40	2.40	2.78	2.70	2.60	2.55	2.40	2.28	2.10	2.20	2.28
5	2.38	3.03	2.75	2.68	2.60	2.50	2.38	2.25	2.10	2.20	2.35
6	2.40	2.60	2.80	2.65	2.55	2.45	2.38	2.25	2.10	2.20	2.28
7	2.40	2.53	2.85	2.65	2.55	2.45	2.38	2.23	2.10	2.15	2.25
8	2.40	2.83	2.73	2.65	2.55	2.58	2.35	2.20	2.10	2.25	2.40
9	2.40	2.95	2.70	2.63	2.60	2.45	2.33	2.20	2.10	2.25	2.48
10	2.40	2.68	2.68	2.60	2.63	2.45	2.30	2.20	2.10	2.20	2.43
11	2.43	2.60	2.65	2.60	2.58	2.40	2.30	2.20	2.10	2.20	......
12	3.60	2.68	2.70	2.80	2.55	2.35	2.30	2.15	2.10	2.20	......
13	3.03	3.88	2.70	2.75	2.53	2.45	2.30	2.18	2.10	2.23	......
14	2.88	3.00	2.70	2.68	2.50	2.48	2.30	2.15	2.10	2.35	......
15	2.58	2.80	2.68	2.65	2.50	2.68	2.30	2.15	2.13	2.35	......
16	2.53	2.75	2.70	2.65	2.50	2.65	2.30	2.15	2.65	2.30	......
17	2.80	2.70	2.78	2.70	2.50	4.30	2.30	2.15	2.40	2.25	......
18	2.80	2.70	2.80	2.70	2.50	3.45	2.30	2.15	2.20	2.20	......
19	2.83	2.70	2.80	3.10	2.90	2.78	2.30	2.10	2.17	2.20	......
20	3.08	2.78	3.75	2.80	2.73	2.70	2.40	2.10	2.15	2.20	......
21	3.13	2.73	3.18	2.73	2.55	2.58	2.40	2.18	2.15	2.20	......
22	2.88	5.20	2.85	2.80	2.50	2.55	2.48	2.28	2.15	2.20	......
23	2.80	3.35	2.80	2.80	2.50	2.50	2.40	2.23	2.15	2.20	......
24	2.75	2.90	2.78	2.75	2.45	2.50	2.73	2.25	2.15	2.25	......
25	2.68	2.90	2.73	2.70	2.50	2.50	2.48	2.48	2.15	2.23	......
26	2.60	3.08	2.75	2.70	2.50	2.48	2.35	2.28	2.15	2.18	......
27	2.58	3.05	2.80	2.70	2.45	2.48	2.38	2.20	2.15	2.15	......
28	2.68	2.78	2.80	2.65	2.45	2.43	2.30	2.20	2.45	2.15	......
29	2.48	......	2.80	2.60	2.45	2.35	2.30	2.20	2.40	2.10	......
30	2.48	......	2.80	2.60	2.45	2.35	2.30	2.20	2.60	2.10	......
31	2.55	......	2.80	......	2.40	......	2.50	2.15	......	2.10	......

APPOMATTOX RIVER AT MATTOAX, VIRGINIA.

This station was established in August, 1900, at the crossing of the Southern Railway, 27 miles southwest of Richmond. The gage rod, which is on the guard rail of the bridge, is laid off to feet and tenths, graduations being indicated by brass nails. The zero of the rod is 58.1 feet from the west end of the bridge, on the upstream side. The outer rim of the pulley is 0.9 foot from the zero of the rod; the distance from the end of the weight to the pointer on the wire rope is 48.75 feet. When the gage reading is 1 foot the water level is 45.6 feet below the top surface of the upper chord of the bridge, upstream side, and at the zero of the gage.

The river here is straight for a considerable distance above the station, but there is an abrupt bend about 100 feet below the bridge. The river is very narrow, and at the low stage at which the gage was placed the current velocity is not very well distributed, there being practically no current for several feet next to the west bank. It was possible, however, to secure a good gaging, and old residents stated that the river was at the lowest stage it had reached in fourteen years. The Mattoax railroad station is located on the west bank of the river, and J. C. Carter, the station agent, is the observer. During 1900 the following measurements were made by E. W. Myers:

August 25: Gage height, 1 foot; discharge, 196 second-feet.
November 1: Gage height, 0.85 foot; discharge, 177 second-feet.

Daily gage height, in feet, of Appomattox River at Mattoax, Virginia, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	1.25	0.73	0.80	1.10	17	......	3.75	0.90	1.00	1.00
2	......	.50	.68	.90	1.60	18	......	2.25	.85	.86	.75
3	......	.35	.88	1.40	.99	19	......	1.00	.85	.99	1.75
4	......	.33	.98	2.05	1.70	20	......	.78	.75	.96	1.50
5	......	.38	1.03	2.90	5.05	21	......	.60	.70	.93	1.45
6	......	.05	.98	2.00	6.50	22	......	.60	.65	.99	1.00
7	......	.13	.95	1.40	3.10	23	......	.60	.65	1.05	1.42
8	......	.15	.83	1.20	2.20	24	......	.73	.70	.94	3.00
9	......	.15	.88	1.10	1.90	25	......	.90	.80	.90	3.92
10	......	.17	1.68	1.15	1.55	26	0.50	.85	1.50	1.00	4.50
11	......	.17	1.20	1.10	1.04	27	.60	.60	1.05	1.90	3.00
12	......	.13	.85	1.00	1.15	28	.45	.65	.80	2.93	3.30
13	......	.03	.78	.95	1.25	29	.30	.55	.75	1.70	2.05
14	......	.06	.95	1.00	1.30	30	.55	.65	.80	1.20	2.00
15	......	.13	.95	.97	1.25	31	2.50	......	.85	......	2.35
16	......	2.53	1.00	.94	1.15						

NORTH (OF JAMES) RIVER AT GLASGOW, VIRGINIA.

This station, which was established August 21, 1895, by C. C. Babb and D. C. Humphreys, is at the East Glasgow county bridge about 1 mile above the mouth of the river. It is described in Water-Supply Paper No. 35, pages 95 and 96. Records of measurements made in 1899 will be found in the Twenty-first Annual Report, Part IV, page 107. During 1900 the following measurements were made by D. C. Humphreys:

March 5: Gage height, 2.18 feet; discharge, 1,234 second-feet.
June 26: Gage height, 1.45 feet; discharge, 600 second-feet.
August 4: Gage height, 0.71 foot; discharge, 252 second-feet.
December 19: Gage height, 1.08 feet; discharge, 398 second-feet.

Daily gage height, in feet, of North (of James) River at Glasgow, Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.98	1.20	6.35	2.04	1.40	1.30	1.25	0.78	0.41	0.95	0.90	1.60
2	.92	1.05	4.10	1.98	1.40	1.30	1.15	.75	.40	.60	.85	1.55
3	.92	1.20	3.75	1.87	1.40	1.40	1.12	.70	.40	.55	.90	1.48
4	.95	1.25	3.25	1.82	1.35	1.30	1.10	.68	.41	.53	.95	*a* 2.89
5	.92	1.40	2.90	1.72	1.32	1.10	1.10	.60	.40	.50	.92	4.30
6	.90	1.40	2.65	1.65	1.30	1.00	1.05	.55	.40	.50	.90	3.85
7	.90	1.30	2.50	1.60	1.22	1.00	1.00	.52	.40	.50	.86	3.45
8	.89	2.20	2.30	1.52	1.20	1.00	.96	.51	.38	.50	.85	3.10
9	.90	2.00	2.28	1.50	1.20	1.00	.90	.51	.34	.50	.86	2.00
10	.90	1.90	2.50	1.45	1.20	1.00	.88	.50	.30	.50	.85	1.70
11	.98	1.78	2.10	1.45	1.15	.96	.85	.50	.30	.50	.85	1.58
12	1.45	1.62	2.06	1.42	1.10	1.00	.80	.50	.30	.50	.82	1.50
13	1.75	5.50	1.95	1.40	1.10	2.00	.75	.50	.40	.50	.80	1.40
14	1.52	4.45	1.75	1.35	1.10	1.45	.75	.50	.40	.48	.80	1.32
15	1.45	3.25	1.65	1.32	1.00	1.40	.72	.50	.50	.48	.78	1.28
16	1.35	2.85	1.85	1.28	1.00	4.40	.70	.50	2.40	.45	.80	1.20
17	1.35	2.40	2.03	1.25	1.00	4.00	.70	.50	1.10	.43	.78	1.10
18	1.36	*a* 2.20	1.90	1.30	.95	4.20	.72	.50	.60	.40	.80	1.08
19	2.50	2.00	1.90	2.60	2.52	3.30	.70	.48	.50	.48	.72	1.05
20	6.02	1.92	4.45	2.52	1.48	2.60	.75	.48	.40	.46	.70	1.02
21	4.35	1.95	5.60	*a* 2.00	1.45	2.30	.95	.50	.45	.45	.75	1.00
22	3.21	6.40	3.85	1.45	1.35	1.95	1.30	.50	.52	.46	.75	1.00
23	2.75	4.80	3.10	3.00	1.25	1.75	1.50	.48	.64	1.15	.76	1.00
24	2.15	3.45	2.82	2.65	1.28	1.50	1.10	.48	.60	3.60	.76	1.00
25	1.95	2.95	2.72	2.35	2.50	1.45	.85	.50	.60	2.55	.78	.98
26	1.76	2.80	2.50	2.15	2.00	1.40	1.15	.50	.60	1.45	6.35	.98
27	1.60	2.60	2.50	2.15	1.65	1.35	1.30	.52	.60	1.20	4.10	.95
28	1.50	2.35	2.38	2.10	1.50	1.25	1.05	.50	.52	1.15	2.90	.95
29	1.55	....	2.28	2.00	1.52	1.22	.95	.50	.50	1.00	2.25	.93
30	1.35	....	2.20	1.75	1.40	1.18	.88	.48	1.25	.95	1.84	.93
31	1.45	....	2.12	....	1.30	....	.88	.45	....	.90	....	.90

a Interpolated.

JAMES RIVER AT BUCHANAN, VIRGINIA.

This station, which was established August 18, 1895, by C. C. Babb and D. C. Humphreys, is located about 20 miles above the mouth of North River and a half mile above the mouth of Purgatory Creek. It is described in Water-Supply Paper No. 35, page 97. Records of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 108. During 1900 the following measurements were made by D. C. Humphreys:

March 30: Gage height, 4.62 feet; discharge, 4,453 second-feet.
June 28: Gage height, 2.80 feet; discharge, 1,043 second-feet.
August 4: Gage height, 2.25 feet; discharge, 523 second-feet.
August 21: Gage height, 1.85 feet; discharge, 374 second-feet.
December 20: Gage height, 2.93 feet; discharge, 1,197 second-feet.

Daily gage height, in feet, of James River at Buchanan, Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.20	2.40	6.80	4.40	3.10	2.85	2.70	2.40	1.90	2.20	2.50	4.20
2	2.20	2.40	9.25	4.15	3.00	2.75	2.60	2.30	1.90	2.20	2.50	3.80
3	2.20	2.30	6.80	4.00	2.90	3.30	2.60	2.30	1.90	2.20	2.80	3.70
4	2.10	2.35	5.50	3.90	2.85	3.05	2.60	2.25	2.15	2.20	3.45	6.05
5	2.10	2.55	4.90	3.80	2.80	2.90	2.50	2.10	2.90	2.10	3.55	9.30
6	2.10	2.50	4.55	3.70	2.80	2.80	2.50	2.10	2.80	2.10	3.25	6.25
7	2.00	2.50	4.40	3.60	2.70	2.70	2.40	2.00	2.20	2.10	2.95	5.35
8	2.00	2.95	4.40	3.50	2.65	2.70	2.40	2.00	1.95	2.10	2.80	4.95
9	2.00	3.65	4.60	3.35	2.50	2.60	2.30	2.00	1.80	2.10	2.70	4.75
10	2.10	3.80	4.35	3.20	2.55	2.50	2.20	1.90	1.80	2.10	2.60	4.40
11	2.40	3.50	4.20	3.10	2.50	2.50	2.20	1.90	1.80	2.10	2.60	3.95
12	3.10	3.35	4.05	3.00	2.50	2.50	2.30	1.90	1.70	2.10	2.50	3.80
13	4.20	6.85	3.90	3.00	2.50	3.10	2.30	1.90	1.70	2.10	2.50	3.65
14	3.55	9.20	3.75	3.00	2.40	2.80	2.20	1.90	1.70	2.10	2.50	3.50
15	3.15	6.10	3.60	2.90	2.40	2.80	2.20	1.90	2.10	2.35	2.50	3.35
16	2.95	5.50	3.60	2.80	2.40	4.60	2.10	1.90	3.15	2.70	2.40	3.20
17	2.80	4.55	3.50	2.80	2.30	6.30	2.00	1.80	3.35	2.60	2.40	3.10
18	2.80	4.30	3.40	2.95	2.30	6.90	2.00	1.80	2.60	2.45	2.40	3.10
19	3.75	3.60	3.50	4.15	2.25	6.00	2.00	1.80	2.35	2.30	2.40	3.00
20	9.30	3.35	9.50	4.90	2.90	4.65	2.00	1.70	2.20	2.20	2.30	2.90
21	8.15	3.30	10.30	4.65	2.85	4.15	2.00	1.70	2.10	2.20	2.30	2.90
22	5.60	8.00	7.40	4.70	2.65	3.90	2.00	1.70	2.10	2.30	2.30	2.90
23	4.55	7.45	5.95	5.45	2.50	3.25	2.00	1.80	2.10	2.95	2.30	2.80
24	3.95	6.40	5.20	4.85	2.65	3.05	2.00	1.80	2.20	10.45	2.65	3.05
25	3.50	5.60	4.95	4.40	4.50	3.00	2.10	1.80	2.10	5.65	4.25	3.10
26	3.30	4.80	4.85	4.25	4.00	2.90	3.10	1.80	2.10	4.10	18.60	3.00
27	3.20	4.35	4.80	3.85	3.45	2.80	3.20	1.90	2.10	2.90	12.20	3.00
28	2.75	4.15	4.90	3.70	3.20	2.70	3.15	1.90	2.20	2.70	6.85	2.90
29	2.55	....	4.75	3.25	3.10	2.70	3.30	1.90	2.20	2.60	5.50	2.90
30	2.40	....	4.60	3.15	3.00	2.70	2.75	1.90	2.20	2.60	4.85	2.80
31	2.40	....	4.60	......	3.00	....	2.55	1.90	....	2.60	....	2.80

JAMES RIVER AT CARTERSVILLE, VIRGINIA.

This station, which was established January 1, 1899, by D. C. Humphreys, is located at the highway bridge crossing the James at Cartersville, a half mile from the railroad station and 50 miles above Richmond, Virginia. It is described in Water-Supply Paper No. 35, page 98, together with a number of other gages that have been installed on this river. Records of measurements for the year 1899 will be found in Paper No. 35, page 99. During 1900 the following measurements were made by D. C. Humphreys:

April 2: Gage height, 4.74 feet; discharge, 9,469 second-feet.
June 30: Gage height, 2.34 feet; discharge, 4,049 second-feet.
August 8: Gage height, 0.97 foot; discharge, 1,515 second-feet.
August 24: Gage height, 1.00 foot; discharge, 1,405 second-feet.
December 22: Gage height, 2.08 feet; discharge, 3,360 second-feet.

Daily gage height, in feet, of James River at Cartersville, Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.00	2.10	7.80	4.95	3.50	2.65	2.30	1.75	0.90	1.00	1.85	6.65
2	2.20	1.75	15.65	4.73	3.30	2.48	2.00	1.53	.85	1.00	1.70	3.88
3	2.42	1.50	12.90	4.45	3.20	2.25	2.00	1.22	.70	1.00	1.70	3.33
4	2.42	2.25	9.50	4.20	3.00	3.55	1.95	1.30	.68	1.30	3.03	9.50
5	2.42	4.35	7.55	4.00	2.90	2.60	1.95	1.15	.65	1.20	2.30	11.30
6	2.42	4.00	6.40	3.75	2.80	2.25	1.85	1.10	.60	1.10	2.25	11.15
7	2.20	3.90	5.40	3.50	2.75	2.15	1.70	1.00	.60	1.05	2.15	8.00
8	2.10	3.15	5.10	3.40	2.75	2.00	1.55	.97	.50	1.05	2.00	5.90
9	1.85	2.90	5.10	3.10	2.50	2.30	1.50	.97	.50	1.05	1.90	5.55
10	1.80	2.90	5.05	3.00	2.60	2.15	1.48	.97	.60	1.05	1.72	5.05
11	1.60	3.40	4.80	3.10	2.60	1.95	1.47	.83	.60	1.02	1.67	4.00
12	3.65	3.45	4.40	3.50	2.50	1.65	1.30	.82	.50	1.00	1.55	3.52
13	4.40	7.30	4.00	3.30	2.35	5.00	1.27	.80	.25	.90	1.53	3.30
14	4.10	9.33	3.60	3.10	2.25	3.78	1.27	.74	.45	2.30	1.52	3.15
15	4.00	12.20	3.40	3.10	2.15	5.00	1.25	.73	.46	1.55	1.48	3.10
16	3.40	8.10	3.40	2.50	2.10	3.22	1.20	.70	2.50	1.20	1.47	2.90
17	2.80	6.05	3.40	2.50	2.00	10.60	1.10	.65	3.25	.90	1.47	2.50
18	2.40	5.30	3.60	11.15	1.95	10.20	1.10	.65	2.90	1.20	1.46	2.37
19	4.30	4.50	4.20	8.20	2.40	9.00	1.10	.82	2.17	1.25	1.44	2.34
20	13.08	4.00	6.00	7.50	2.75	7.50	1.21	.65	2.00	1.15	1.40	2.30
21	13.00	3.80	10.50	7.40	2.68	5.50	1.14	.70	1.30	1.10	1.38	2.20
22	11.60	8.30	11.75	8.50	2.58	4.48	1.07	.75	1.15	1.00	1.37	2.15
23	7.50	11.80	9.30	7.73	2.50	3.85	1.17	.95	1.00	1.20	1.34	2.00
24	6.10	11.25	7.00	7.50	2.40	3.50	1.80	1.00	1.05	1.70	1.30	2.00
25	5.00	9.05	6.00	6.40	3.40	3.20	1.70	1.25	1.03	10.90	1.30	2.75
26	4.20	7.00	5.50	5.50	3.35	3.25	1.40	.95	1.02	6.98	3.40	2.50
27	3.65	6.00	5.40	5.33	4.40	3.10	2.80	.80	1.00	4.70	15.15	2.22
28	3.25	5.10	5.30	4.57	3.60	2.65	2.80	1.15	1.00	3.70	18.10	2.10
29	3.00	......	5.20	4.10	3.10	2.65	2.30	1.10	1.00	2.75	8.00	2.00
30	2.55	......	5.00	3.80	2.95	2.35	2.25	.82	1.00	2.75	7.65	2.00
31	2.35	......	5.30	......	2.73	......	1.95	1.03	......	2.40	......	2.00

JAMES RIVER AT HOLCOMB ROCK, VIRGINIA.

This station was established by the Willson Aluminum Company, of Holcomb Rock, Virginia, in 1899, in connection with measurements to determine the horsepower available at that point. During 1899 the records were fragmentary, but at the commencement of 1900 daily records were taken, which have been furnished to the Geological Survey through the courtesy of T. R. Ragland, general manager of the company. The gage consists of a copper float 8 by 8 by 8 inches, with a vertical rod 1½ inches square attached to it, the rod, which extends up through the power-house floor, being sealed to tenths of a foot. The copper float is inclosed in a 12-inch by 12-inch by 12-foot box, which rests solidly on the bottom of the river. The box is perforated, so that the water in it will always stand at the same level as the water in the river, while the float, being inclosed, is not in danger of being broken by floating timber. The fluctuations of the river are read directly from the rod, which moves up or down with the float as it responds to the variations in the height of the river. Measurements of discharge are not made at this point.

Daily gage height, in feet, of James River at Holcomb Rock, Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.40	1.70	7.90	3.60	2.30	1.90	1.65	1.00	0.60	0.60	1.35	2.40
2	1.40	1.50	9.85	3.45	2.20	1.80	1.70	1.00	.60	.60	1.30	2.25
3	1.30	1.50	7.70	3.15	2.20	3.50	1.55	.95	.60	.60	1.30	2.15
4	1.30	1.60	5.65	3.05	2.00	2.10	1.60	.95	.60	.65	1.30	4.60
5	1.10	1.80	4.75	2.75	2.00	1.80	1.45	.95	.60	.60	2.20	9.30
6	1.28	1.60	4.10	2.60	2.00	1.70	1.40	1.05	.60	.60	1.80	5.70
7	1.30	1.50	3.85	2.50	1.95	1.70	1.40	.90	.60	.70	1.60	......
8	1.25	1.85	3.95	2.40	1.80	1.60	1.30	.90	.60	.75	1.40	......
9	1.28	2.43	3.85	2.35	1.80	1.60	1.30	.90	.60	.70	1.40	3.35
10	1.23	2.50	3.60	2.20	1.80	1.65	1.20	.80	.60	.90	1.30	3.10
11	1.28	2.50	3.50	2.10	1.70	1.60	1.15	.80	.60	.80	1.35	2.75
12	1.75	5.30	3.30	2.10	1.70	1.40	1.15	.80	.60	.80	1.50	2.45
13	2.58	10.45	2.95	2.05	1.70	2.35	1.20	.85	.50	.80	1.20	2.25
14	2.65	8.60	2.80	2.00	1.75	2.40	1.10	.80	.30	1.00	1.20	2.15
15	2.30	6.45	2.60	1.80	1.60	2.05	1.10	.70	.30	1.00	1.10	2.00
16	2.03	4.85	2.65	1.80	1.60	4.50	1.00	.55	2.15	1.30	1.10	1.85
17	1.83	4.10	2.60	1.80	1.60	6.10	.90	.50	1.90	1.15	1.10	1.80
18	1.70	3.30	2.55	3.55	1.60	6.90	.90	.45	1.30	1.05	1.10	1.70
19	3.50	2.80	2.60	4.35	1.85	6.15	.90	.40	.95	1.00	1.10	1.60
20	9.85	2.55	7.95	4.70	1.90	5.35	.90	.70	.60	1.00	1.10	1.60
21	9.30	2.40	11.00	4.80	2.25	3.40	.90	.45	.50	1.00	1.00	1.50
22	6.00	8.10	8.00	5.85	1.80	2.75	.90	.60	.50	1.00	1.00	1.50
23	4.33	9.35	5.95	5.45	1.65	2.45	1.10	.75	.60	1.00	.95	1.50
24	3.45	7.05	4.90	4.60	1.80	2.40	1.10	.60	.70	10.10	.90	1.50
25	2.95	5.65	4.45	4.00	2.95	2.30	1.35	.70	.55	5.55	.90	1.50
26	2.50	4.65	4.40	3.55	3.45	1.95	1.90	.70	.60	3.05	8.25	1.50
27	2.25	3.90	4.15	3.20	2.95	1.80	1.60	.85	.60	2.35	13.00	1.55
28	2.00	3.55	4.10	2.85	2.35	1.75	1.80	.65	.60	2.00	7.30	1.60
29	1.90	......	4.10	2.50	2.20	1.70	1.60	.60	.50	1.90	4.20	1.50
30	1.55	......	3.90	2.50	2.20	1.55	1.50	.60	.50	1.55	3.25	1.50
31	1.60	......	3.70	......	1.95	......	1.35	.60	......	1.50	......	1.50

ROANOKE RIVER AT ROANOKE, VIRGINIA.

This station, which was established by D. C. Humphreys, July 11, 1896, is located at the edge of the city of Roanoke, on the Walnut street car line. It is described in Water-Supply Paper No. 36, page 107, and record of discharge measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 110. During 1900 the following measurements were made by D. C. Humphreys:

March 29: Gage height, 2.07 feet; discharge, 879 second-feet.
May 5: Gage height, 1.30 feet; discharge, 298 second-feet.
June 26: Gage height, 2.16 feet; discharge, 639 second-feet.
July 30: Gage height, 0.91 foot; discharge, 149 second-feet.
August 21: Gage height, 0.65 foot; discharge, 92 second-feet.
December 19: Gage height, 1.28 feet; discharge, 307 second-feet.

Daily gage height, in feet, of Roanoke River at Roanoke, Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.70	1.10	3.80	1.85	1.50	1.20	1.50	0.90	0.65	0.80	1.40	1.58
2	1.80	1.13	3.10	1.78	1.48	1.13	1.40	.85	.65	.95	1.50	1.55
3	1.80	1.10	2.50	1.72	1.45	1.15	1.30	.85	.65	1.00	1.65	1.50
4	1.70	1.05	2.10	1.65	1.40	1.10	1.70	.80	.65	1.10	1.75	4.43
5	1.15	1.20	2.00	1.58	1.37	1.05	1.85	.80	.65	1.15	1.45	3.70
6	.85	1.10	1.88	1.50	1.25	1.03	1.60	.75	.65	1.10	1.30	2.60
7	.80	1.15	1.77	1.45	1.22	1.03	1.40	.75	.65	1.05	1.20	2.20
8	.75	1.10	1.70	1.45	1.20	1.10	1.25	.70	.65	1.05	1.15	2.00
9	.75	1.10	1.95	1.45	1.20	1.20	1.15	.70	.65	1.00	1.10	1.85
10	.85	1.10	1.80	1.40	1.35	1.15	1.10	.65	.60	.95	1.07	1.72
11	.90	1.30	*a*1.80	1.38	1.20	1.10	1.05	.65	.60	.90	1.05	1.62
12	1.20	1.45	1.75	1.40	1.18	1.15	1.00	.65	.60	.85	1.05	1.55
13	1.50	4.60	1.75	1.40	1.15	1.40	1.00	.65	.60	.85	1.03	1.48
14	1.35	3.08	1.80	1.36	1.13	1.85	.97	.63	.60	1.80	1.03	1.40
15	1.20	2.32	1.75	1.30	1.08	1.35	.95	.63	1.10	1.35	1.00	1.38
16	1.15	1.95	1.72	1.27	1.05	1.60	.95	.60	2.00	1.15	1.00	1.34
17	1.10	1.78	1.70	1.25	1.05	2.25	.93	.60	1.30	1.05	1.00	1.30
18	1.10	1.60	1.85	1.30	1.03	2.15	.93	.60	1.00	1.00	1.00	1.31
19	1.20	1.48	2.05	3.75	*b*1.05	1.75	.90	.65	.80	.95	1.00	1.25
20	4.10	1.40	4.45	2.65	*b*1.05	1.55	.90	.65	.70	.90	1.00	1.21
21	2.50	1.35	3.53	2.90	*b*1.10	1.40	.87	.65	.65	.85	1.00	1.25
22	2.00	3.80	2.75	2.95	*b*1.10	1.30	.87	.65	.80	.85	1.00	1.29
23	1.72	2.85	2.35	2.55	*b*1.50	1.30	.90	.65	1.15	.90	1.00	1.27
24	1.55	1.40	2.15	2.25	2.40	1.30	.95	.65	.95	4.75	1.00	1.42
25	1.40	2.10	1.95	2.05	1.85	1.80	1.05	.75	.85	2.50	.95	1.40
26	1.30	1.90	2.05	1.90	1.45	2.60	1.25	.70	.80	1.95	8.20	1.35
27	1.20	1.75	2.25	1.78	1.30	1.45	1.05	.65	.75	1.75	2.90	1.30
28	1.10	1.65	2.40	1.65	1.25	2.45	1.00	.65	.70	1.55	2.20	1.28
29	1.10	-------	2.20	1.60	2.00	2.13	.95	.70	.65	1.50	1.95	1.28
30	1.08	-------	2.03	1.55	1.60	1.70	.90	.65	.60	1.45	1.75	1.24
31	1.05	-------	1.98	-------	1.35	-------	.90	.65	-------	1.40	-------	1.28

a Interpolated. *b* Estimated; repairing bridge.

ROANOKE RIVER AT NEAL, NORTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 109. The river bed is muddy and is likely to cut out in seasons of high water, and both banks are subject to overflow, sometimes covering the flood plain of the river to a depth of 10 or more feet and reaching at times a width of nearly 2 miles. The highest recorded water at this station occurred on March 23, 1899, when the gage reached a height of 30 feet and the discharge was probably 83,000 second-feet; the lowest recorded water was from September 19 to 22, 1897, when the gage read 0.00 and the discharge was probably 2,000 second-feet, making the maximum flow 41½ times the minimum flow. The drainage area above the station is 8,817 square miles, largely forest covered and including a variety of topographic forms, from the mountains of the upper part of Dan and Staunton rivers to the extensive swamps to be found along the lower part of the basin. The stream is subject to sudden rises and falls, but the period of high water lasts several days. The observer is the bridge watchman, W. M. Adams, of Kelford, North Carolina. Records of measurements will be found as follows: For 1896, Eighteenth Annual Report, Part IV, page 48; for 1897, Nineteenth Annual Report, Part IV, page 181; for 1898, Twentieth Annual Report, Part IV, page 142; for 1899, Twenty-first Annual Report, Part IV, page

111. During 1900 the following measurements were made by E. W. Myers:

February 10: Gage height, 9.70 feet; discharge, 9,361 second-feet.
April 10: Gage height, 7.10 feet; discharge 6,266 second-feet.
April 11: Gage height, 6.90 feet; discharge, 6,002 second-feet.
April 24: Gage height, 25.60 feet: discharge, 49,896 second-feet.
May 11: Gage height, 4.69 feet; discharge, 5,503 second-feet.
June 30: Gage height, 10.12 feet; discharge, 9,530 second-feet.
August 10: Gage height, 1.40 feet; discharge, 2,342 second-feet.
November 2: Gage height, 3.18 feet; discharge 3,734 second-feet.

Daily gage height, in feet, of Roanoke River at Neal, North Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.10	7.80	16.40	12.20	12.90	5.80	9.15	7.40	2.15	1.80	3.70	8.70
2	2.10	6.70	18.50	11.60	11.50	5.40	8.10	4.80	2.50	2.60	3.20	6.50
3	2.00	5.00	21.80	11.10	10.40	5.20	7.20	3.30	1.80	1.90	2.80	5.30
4	2.20	4.30	23.10	10.20	9.60	4.80	6.30	2.70	1.20	1.20	4.00	4.60
5	2.20	4.60	24.65	9.50	8.80	4.50	5.30	2.60	.70	1.25	6.40	4.70
6	3.50	6.80	23.80	9.00	8.10	4.20	4.50	2.25	.40	1.45	7.80	11.75
7	4.30	12.70	21.50	8.50	7.60	4.50	4.00	1.90	.40	1.45	9.00	20.75
8	4.30	12.70	19.00	8.10	7.20	4.50	3.70	1.60	.30	1.50	7.90	18.80
9	4.30	11.10	17.30	7.50	7.00	4.30	3.70	1.30	.30	1.90	6.50	14.60
10	4.50	9.75	17.70	7.20	7.10	4.20	3.40	1.30	.70	2.90	5.10	11.80
11	5.10	9.90	18.10	6.90	7.00	4.10	3.00	1.20	.50	3.50	4.20	9.40
12	7.00	11.10	18.30	6.90	6.60	4.20	2.90	1.00	.20	3.20	3.70	7.70
13	12.00	13.10	17.30	8.50	6.30	4.15	3.10	.90	.10	3.20	3.40	6.60
14	19.60	20.50	15.30	9.80	5.90	4.00	2.60	.80	.30	2.20	3.10	5.80
15	19.90	22.50	13.60	10.20	5.50	4.10	2.50	.60	.40	2.10	2.85	5.10
16	17.60	23.88	12.70	9.70	5.20	7.60	2.30	.40	.40	1.70	2.80	4.70
17	14.30	23.90	12.10	8.50	4.80	9.90	2.80	.40	.10	2.80	2.70	4.30
18	11.70	22.80	13.40	7.50	4.70	11.20	2.50	.60	1.80	3.90	2.50	4.20
19	10.20	19.70	14.40	7.10	4.95	17.40	2.00	.40	12.40	3.70	2.40	3.85
20	9.30	17.00	14.10	21.75	5.10	16.10	1.90	.40	9.20	2.90	2.25	3.70
21	18.05	14.70	13.40	23.40	7.80	12.90	1.60	.40	6.20	2.20	2.25	3.80
22	21.25	13.60	13.90	24.63	7.60	9.80	1.40	.40	3.80	1.70	2.20	4.40
23	23.40	14.60	15.80	25.95	6.70	8.00	1.40	.40	2.50	1.50	2.28	4.90
24	23.50	21.65	15.30	25.55	5.90	6.70	1.50	.70	1.30	1.35	2.35	5.40
25	21.60	22.30	13.50	24.20	6.00	6.30	6.00	.90	1.45	1.20	2.50	6.40
26	18.50	22.10	12.70	23.60	6.60	11.50	9.60	2.00	1.35	5.50	2.60	6.80
27	15.80	20.95	13.00	21.10	14.70	15.20	8.60	2.10	1.80	15.40	2.70	8.20
28	13.10	18.80	14.30	18.40	13.70	13.00	10.45	1.50	2.40	11.80	3.00	7.90
29	11.70	....	14.20	16.00	10.40	12.00	13.60	1.10	2.50	8.50	11.60	6.95
30	10.40	....	13.40	14.30	8.00	10.45	13.45	1.10	2.50	6.10	11.40	5.90
31	9.10	....	13.30	....	6.70	....	10.40	1.40	....	4.60	....	5.90

DAN RIVER AT SOUTH BOSTON, VIRGINIA.

This station, which was established August 27, 1900, by E. W. Myers, is located in the town of South Boston, Virginia, on the railroad bridge of the Norfolk and Western Railroad which crosses the river at that place. The gage rod is laid off on the downstream guard rail of the bridge, the graduations being indicated by brass nails driven into the rail. The zero of the rod is exactly over the center of the first span from the north end of the bridge. The distance between the zero of the rod and the outer rim of the pulley is 2.39 feet, and the distance between the end of the weight and the pointer on the wire rope is 36.44 feet. When the gage reading is 1 foot the water surface is 31.06 feet below the top of the head of the nut on the pin connecting the two tension rods with the lower chord of the bridge, this pin being on the lower side of the bridge and exactly opposite the zero of the gage. This is a very good station for the gaging of all except the very highest stages of flow. At extreme heights the river spreads out over a flood plain of considerable width. The trestle connecting the bridge with the embankment on the south side of the river is a curve of rather high degree. The bed of the stream is of coarse sand and probably shifts only slightly. R. M. Taliaferro, South Boston, Virginia, is the observer. During 1900 the following measurements were made by E. W. Myers:

August 27: Gage height, 1.00 foot; discharge, 1,046 second-feet.
October 31: Gage height, 2.20 feet; discharge, 1,576 second-feet.

Daily gage height, in feet, of Dan River at South Boston, Virginia, for 1900.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	0.62	1.50	2.00	3.00	17	8.55	2.40	1.70	3.00
2	.55	1.50	2.20	3.00	18	3.60	2.40	1.70	3.00
3	.95	1.50	2.00	3.00	19	2.00	2.00	1.70	2.90
4	.95	1.50	2.40	4.00	20	1.65	2.00	1.70	2.90
5	.60	1.40	2.10	14.10	21	1.25	1.90	1.70	3.00
6	.95	1.30	2.50	8.00	22	1.55	2.00	1.70	3.10
7	.77	1.90	2.70	4.80	23	1.30	2.00	1.60	3.10
8	.90	1.90	2.50	3.80	24	1.70	2.30	1.60	3.10
9	.37	2.40	2.50	3.50	25	1.70	7.50	1.60	3.00
10	.40	2.40	2.40	3.20	26	1.50	3.50	2.20	3.00
11	.50	2.40	2.00	3.20	27	1.60	3.50	5.60	3.00
12	.30	2.20	2.00	3.20	28	1.40	2.50	3.80	3.20
13	.40	2.20	2.00	3.20	29	1.30	2.50	3.20	3.00
14	.45	2.30	1.90	3.10	30	1.30	2.00	3.00	2.70
15	.40	2.00	1.90	2.90	31		2.00		2.80
16	4.90	2.00	1.80	2.90					

STAUNTON RIVER AT RANDOLPH, VIRGINIA.

This station, which was established August 27, 1900, by E. W. Myers, is about five-eighths of a mile southwest of Randolph station, on the line of the Southern Railway from Richmond to Danville, on the railroad bridge which crosses the river at that place. The rod is laid off on the guard rail of the bridge on the downstream side, the graduations to feet and tenths being indicated by brass tacks. The zero of the gage rod is over the center of the fifth floor beam of the second span from the north end of the bridge. The distance between the zero of the rod and the outer rim of the pulley is 3.66 feet; the distance between the end of the weight and the pointer on the wire rope is 41.13 feet. When the gage reading is 1 foot the water surface is 34.85 feet below the top surface of the fifth floor beam, directly under the zero of the gage. The river is straight for a long distance above and below the bridge, and the velocity of the current is very well distributed. It is said that the rise at this point is about 25 feet. It is not probable that the channel changes to any degree during high water. The observer at this station is Justin Field, station agent at Randolph. During 1900 the following measurements were made by E. W. Myers:

August 27: Gage height, 1.00 foot; discharge, 1,349 second-feet.
October 31: Gage height, 2.75 feet; discharge, 2,304 second-feet.

Daily gage height, in feet, of Staunton River at Randolph, Virginia, for 1900.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	1.00	1.30	2.60	3.70	17	6.90	2.05	2.30	3.00
2	1.00	1.35	2.50	3.30	18	3.30	1.70	2.30	3.00
3	.75	1.60	2.80	3.05	19	2.05	1.50	2.25	3.00
4	.70	1.50	4.40	4.75	20	1.60	1.45	2.30	3.05
5	.75	1.55	4.60	15.50	21	1.35	1.40	2.30	3.15
6	2.00	2.00	4.00	10.50	22	1.30	1.35	2.35	3.50
7	1.00	1.80	3.45	6.75	23	1.40	1.50	2.30	3.70
8	.80	1.60	3.10	5.50	24	1.35	6.00	2.25	5.70
9	.70	1.80	2.95	4.80	25	2.50	15.15	2.25	4.80
10	.50	2.00	2.75	4.35	26	2.00	6.10	3.10	4.00
11	.50	1.65	2.60	4.00	27	1.50	4.50	12.40	3.80
12	.40	1.00	2.55	3.75	28	1.40	3.70	6.50	3.50
13	.30	1.50	2.55	3.60	29	1.55	3.30	4.75	3.50
14	.30	1.55	2.50	3.40	30	1.40	3.00	4.00	3.30
15	1.00	2.05	2.45	3.30	31	....	2.75	....	3.95
16	9.10	2.50	2.35	3.20					

TAR RIVER AT TARBORO, NORTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 110. Extensive sand bars have formed in the channel during periods of extreme low water, and they modify very materially the relation between the gage height and the discharge at low stages of the river. The highest recorded flood was on February 11, 1899, when the gage height was 25 feet and the discharge was probably 19,850 second-feet. The lowest recorded flow was on November 2, 1900, the discharge being 87 second-feet, the maximum flow thus being about 218 times the minimum flow. The observer is R. H. Williams, who reads the gage once a day during ordinary stages of the river, but oftener during floods. Measurements of discharge are made at the station and occasionally at the highway bridge crossing the stream about 200 yards above, as the lower section is sometimes obstructed by rafts of logs. Records of flow during 1899 will be found in the Twenty-first Annual Report, Part IV, page 112. During 1900 the following measurements were made by E. W. Myers:

April 11: Gage height, 4.48 feet; discharge, 1,915 second-feet.
April 23: Gage height, 14.90 feet; discharge, 10.237 second-feet.
May 18: Gage height, 2.18 feet; discharge, 1,003 second-feet.
June 30: Gage height, 2.30 feet, discharge, 1,030 second-feet.
August 9: Gage height, 0.40 foot, discharge, 371 second-feet.
November 2: Gage height, —0.30 foot; discharge, 87 second-feet.
November 21: Gage height, 0.50 foot; discharge, 412 second-feet.

Daily gage height, in feet, of Tar River at Tarboro, North Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.7	4.0	10.0	8.6	5.0	2.6	2.0	1.7	0.8	−0.2	−0.3	0.8
2	3.0	3.8	10.5	9.0	4.5	2.1	1.3	1.3	.4	− .2	− .2	.7
3	2.9	3.7	12.3	9.1	4.6	2.0	1.5	1.6	.3	− .2	− .3	.6
4	2.6	3.6	13.5	8.0	4.3	1.9	1.6	1.8	.2	− .2	1.7	1.3
5	2.5	3.5	14.3	7.5	4.0	1.8	1.0	.7	.0	− .2	3.4	1.2
6	2.6	4.8	13.0	7.6	3.7	1.5	1.1	.6	.0	− .1	4.5	1.6
7	3.4	6.0	10.5	7.3	3.4	1.3	.7	.5	.0	− .2	5.1	3.7
8	3.5	5.9	8.3	6.0	3.2	1.2	.6	.2	− .1	− .2	3.8	3.0
9	3.4	5.4	7.8	5.3	3.0	1.3	.7	.1	− .1	1.2	3.4	2.1
10	4.3	5.0	9.0	5.0	3.3	1.5	.6	.0	− .1	.5	2.0	1.6
11	3.4	6.1	11.2	4.7	3.6	2.0	.4	.0	− .1	.4	1.6	1.7
12	3.3	7.8	12.2	4.5	4.0	1.8	.3	.0	− .2	.3	1.4	1.5
13	3.7	10.6	11.4	5.6	3.1	1.3	.4	.0	− .2	.4	1.3	1.2
14	9.4	12.8	9.8	8.7	2.8	1.4	.3	.0	− .2	.2	1.0	.9
15	10.5	14.5	8.0	9.8	2.5	1.0	.2	.1	− .2	.1	.6	.8
16	9.5	15.8	7.3	9.3	2.4	1.4	1.6	.3	− .2	.0	.4	.7
17	7.3	17.0	8.3	8.3	2.2	2.5	1.4	1.3	− .2	.0	.6	.6
18	6.2	18.0	9.1	7.2	2.0	3.5	.7	.5	.5	.0	.4	1.1
19	5.9	16.5	9.5	6.0	4.0	6.0	.3	1.0	1.0	.0	.2	.7
20	6.7	13.7	8.5	9.4	5.0	7.3	.2	.7	.4	.0	.7	.6
21	8.9	9.8	7.3	10.8	4.8	5.5	.1	.6	.2	− .1	.4	1.2
22	9.5	8.0	7.1	13.2	4.2	4.3	.0	.4	.0	− .1	.2	2.1
23	10.3	10.0	6.5	14.5	3.4	3.5	.0	.2	.0	− .1	.1	3.7
24	9.0	11.5	6.0	15.3	3.0	3.5	.0	.1	.0	− .2	.3	4.6
25	7.3	13.9	6.1	13.8	4.5	4.3	.0	.0	− .1	− .2	.4	4.0
26	6.4	13.7	6.3	11.0	5.9	6.5	.5	.1	− .1	− .1	.5	2.8
27	5.5	12.6	8.3	8.6	5.6	5.0	1.0	.2	− .1	− .1	.4	2.6
28	5.0	11.9	9.5	7.2	4.5	4.5	1.2	.0	− .1	− .1	.3	2.2
29	4.6	......	10.0	6.0	3.6	3.4	4.5	.0	− .1	− .2	1.3	2.0
30	4.5	......	9.1	5.4	3.0	2.6	3.0	.4	− .1	− .3	1.2	2.5
31	4.4	......	7.8	......	2.8	......	2.3	.6	......	− .3	......	3.2

NEUSE RIVER AT SELMA, NORTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 111. The maximum flood of which there is any record was on February 9, 1899, when the water reached a height of 21 feet on the gage, with a probable discharge of 12,000 second-feet. The minimum flow occurred during the very severe drought of 1897, the lowest gage height being −0.4 foot, on October 17 and 18, and the discharge 75 second-feet, making the maximum flow about 160 times the minimum flow. The drainage area above the station is 1,175 square miles. Records of flow during 1899 will be found in the Twenty-first Annual Report, Part IV, page 114. During 1900 the following measurements were made by E. W. Myers:

February 8: Gage height, 3.40 feet; discharge, 1,117 second-feet.
April 12: Gage height, 3.80 feet; discharge, 1,076 second-feet.
April 24: Gage height, 17.05 feet; discharge, 9,027 second-feet.
May 17: Gage height, 1.70 feet; discharge, 461 second-feet.
June 27: Gage height, 3.00 feet; discharge, 590 second-feet.
August 10: Gage height, 0.61 foot; discharge, 139 second-feet.
November 6: Gage height, 4.60 feet; discharge, 1,278 second-feet.
November 22: Gage height, 0.90 foot; discharge, 243 second-feet.

Daily gage height, in feet, of Neuse River at Selma, North Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	1.8	8.7	3.8	6.3	1.5	4.7	2.0	1.8	0.7	0.1	1.0
2	1.9	1.7	12.5	3.6	5.8	1.5	3.2	1.8	1.5	.7	.2	.9
3	2.1	1.5	12.8	3.5	4.6	1.4	2.0	1.6	1.0	.7	1.4	1.0
4	1.5	2.0	13.1	3.5	3.8	1.3	1.8	1.3	0.8	.6	2.4	1.4
5	1.4	2.5	8.4	3.4	3.2	1.2	1.5	1.2	.7	.5	4.2	4.3
6	1.2	3.1	7.0	3.4	3.1	1.2	1.4	1.0	.6	.4	6.0	7.1
7	1.0	3.0	6.4	3.3	2.8	1.3	1.3	.9	.6	.3	3.1	5.2
8	1.1	3.0	7.2	3.3	2.5	1.4	1.3	.9	.5	.3	2.3	3.1
9	2.1	3.3	8.4	3.2	3.4	1.6	1.2	.8	.5	.3	1.7	2.6
10	3.0	3.3	9.6	3.0	4.0	1.7	1.1	.7	.4	.4	1.5	2.0
11	5.9	7.6	9.0	5.3	3.0	1.6	1.0	.6	.4	.5	1.4	1.8
12	9.7	9.8	8.4	7.8	2.2	1.5	.8	.6	.4	.6	1.4	1.7
13	10.5	14.6	7.0	11.2	2.1	1.4	1.0	.5	.4	.7	1.3	1.6
14	11.2	17.0	5.6	8.1	2.0	1.4	1.4	.5	.4	.7	1.2	1.2
15	9.6	17.8	4.0	4.5	1.8	1.3	1.2	.4	1.5	.7	1.2	2.0
16	7.7	17.0	7.8	5.9	1.7	1.7	1.1	.8	5.5	.8	1.1	1.6
17	3.5	16.0	10.0	8.2	1.8	1.8	1.0	2.0	3.8	.8	1.0	1.5
18	3.2	12.4	8.7	10.4	3.0	1.8	.9	2.4	2.1	.7	.9	1.3
19	2.8	8.6	6.9	11.0	8.0	2.0	.8	1.0	1.0	.6	.9	1.2
20	4.2	4.0	5.1	12.3	7.2	2.1	.7	.8	.9	.5	.9	1.0
21	6.5	5.0	4.8	14.5	5.6	1.7	.6	.6	.8	.4	.8	2.2
22	5.5	6.4	4.3	17.2	3.4	2.3	.8	.6	.7	.4	.8	3.4
23	4.2	8.5	3.0	18.2	2.0	4.6	1.8	.6	.7	.4	.8	5.2
24	3.5	12.1	3.7	17.0	2.5	5.1	3.6	.7	.7	.5	.8	3.8
25	3.3	10.2	3.7	13.8	3.3	6.1	5.3	.6	.7	.5	1.0	2.7
26	3.1	8.6	4.7	8.5	2.8	5.7	8.4	.7	.7	.3	2.0	2.2
27	2.8	6.8	4.9	4.7	2.5	4.3	12.0	.7	.7	.2	4.5	1.8
28	2.8	5.1	4.7	3.8	2.2	3.2	7.8	.6	.7	.1	3.2	1.6
29	2.2	......	4.5	3.4	2.0	2.7	4.2	1.1	.7	.1	2.1	1.0
30	2.0	......	4.3	3.3	1.9	3.7	2.9	4.0	.7	.1	1.6	2.0
31	1.9	......	4.0	......	1.7	......	2.6	2.3	......	.1	......	4.3

DEEP RIVER AT CUMNOCK, NORTH CAROLINA.

This station was established June 29, 1900, by E. W. Myers. It is 300 yards northwest of the railroad station at Cumnock. The wire gage, which is graduated to feet and tenths, is nailed to the guard rail of the bridge. The water surface is 37.41 feet below the top of the lower chord at the side of the tension rod supporting the floor beam opposite the gage. The initial point of sounding is at the northwest end of the bridge. The channel is straight for several hundred feet above and below the bridge, but the current is rather sluggish during low water. The bed of the stream is muddy, with some bowlders. The observer is J. A. Rollins, a watchman at Cumnock. During 1900 the following measurements were made by E. W. Myers:

June 29: Gage height, 3.00 feet; discharge, 540 second-feet.
August 11: Gage height, 1.30 feet; discharge, 112 second-feet.
November 5: Gage height, 4.55 feet: discharge, 1,118 second-feet.
December 19: Gage height, 1.70 feet; discharge, 199 second-feet.

Daily gage height, in feet, of Deep River at Cumnock, North Carolina, for 1900.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.24	1.54	2.02	1.31	1.32	1.58	17	(*a*)	1.75	4.40	1.95	1.69	1.58
2	2.04	1.54	1.79	1.35	1.24	1.70	18	(*a*)	1.20	2.04	1.66	1.39	1.38
3	1.85	1.65	1.69	1.14	1.39	2.94	19	(*a*)	.85	1.92	1.57	1.80	1.75
4	2.95	1.37	1.47	1.21	9.19	6.96	20	1.24	1.14	1.78	1.39	1.72	1.70
5	2.14	1.35	1.34	1.10	5.43	9.99	21	.72	1.10	1.67	1.34	1.71	5.77
6	1.87	1.53	1.35	1.16	2.89	4.66	22	.96	1.12	1.45	1.38	1.80	8.23
7	(*a*)	1.34	1.44	1.00	2.26	3.17	23	1.25	1.45	1.43	1.43	1.39	4.63
8	(*a*)	1.13	1.36	1.28	1.88	2.26	24	1.88	2.34	1.53	1.50	1.44	3.31
9	(*a*)	1.18	1.27	1.50	1.83	2.13	25	1.54	1.76	1.55	1.36	1.28	3.10
10	(*a*)	1.29	1.37	1.77	1.68	1.90	26	1.50	1.46	1.56	1.28	1.82	2.95
11	(*a*)	1.30	1.37	1.82	1.60	1.72	27	4.27	1.41	1.51	1.34	1.86	2.88
12	(*a*)	1.20	1.32	1.60	1.50	1.74	28	3.39	1.34	1.55	1.14	1.55	2.24
13	(*a*)	1.27	1.37	1.46	1.40	1.85	29	2.35	1.25	1.50	1.30	1.45	2.23
14	(*a*)	1.30	1.45	1.32	1.34	1.70	30	1.90	2.35	1.21	1.33	1.80	2.35
15	(*a*)	1.43	1.50	2.11	1.33	1.50	31	1.54	2.59	......	1.40	......	9.22
16	(*a*)	1.37	8.52	2.11	1.62	1.66							

a No record.

CAPE FEAR RIVER AT FAYETTEVILLE, NORTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 115. The maximum flood of which there is any record occurred on January 12, 1895, when the river reached a height of 58 feet on the gage, and the discharge was at the rate of about 91,000 cubic feet per second. The lowest stage of flow was on October 8 and 9, 1897, when the gage height was 0.2 foot and the discharge 340 second-feet. The maximum discharge is therefore about 270 times the minimum flow. The drainage area above the station is 44.93 square miles.

Moncure station on Haw River was abandoned January 1, 1900. A measurement was made on June 28, however, when the gage read 2.68 feet; the area of the section was 611 square feet, the mean velocity 1.25 feet per second, and the discharge 769 second-feet. Discharge measurements for 1898 and 1899 will be found in the Twenty-first Annual Report, Part IV, page 115.

Moncure station on Deep River was also abandoned January 1, 1900. Measurement was made on June 27, when the gage read 3.67 feet; the area of section was 600 square feet, the mean velocity 1.14 feet per second, and the discharge 687 second-feet. Measurements for 1898 and 1899 will be found in the Twenty-first Annual Report, Part IV, page 117.

Records of flow during 1899 will be found in the Twenty-first Annual Report, Part IV, page 119. During 1900 the following measurements were made by E. W. Myers:

February 9: Gage height, 6.90 feet; discharge, 3,748 second-feet.
April 12: Gage height, 6.10 feet; discharge, 2,686 second-feet.
April 25: Gage height, 25.30 feet; discharge, 13,479 second-feet.
May 17: Gage height, 3.80 feet; discharge, 1,596 second-feet.
June 29: Gage height, 5.80 feet; discharge, 2,331 second-feet.
August 11: Gage height, 0.70 foot; discharge, 415 second-feet.
November 3: Gage height, 0.75 foot; discharge, 416 second-feet.

Daily gage height, in feet, of Cape Fear River at Fayetteville, North Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.0	5.2	12.0	9.0	8.3	3.2	5.0	2.6	5.0	0.9	0.6	2.8
2	4.9	5.0	27.0	7.7	9.7	3.2	4.3	2.8	4.5	.8	.5	2.2
3	4.3	4.6	33.7	6.9	7.3	3.0	4.0	2.2	3.8	.7	.7	2.1
4	4.4	4.4	29.0	6.7	6.9	2.8	3.5	1.8	2.5	.6	2.5	2.3
5	4.2	5.3	22.3	9.1	6.4	2.8	3.1	1.8	1.8	.9	12.5	14.0
6	4.4	7.5	15.0	10.0	5.6	2.7	3.6	1.4	1.2	1.2	10.5	15.0
7	4.2	10.0	11.7	9.2	5.3	2.7	3.1	1.4	.8	1.0	7.0	9.2
8	4.1	8.0	9.7	6.7	5.0	2.6	3.1	1.2	.7	.8	5.2	8.4
9	3.9	6.4	10.0	6.0	5.0	3.5	2.6	.9	.6	.7	4.0	6.5
10	3.9	7.0	23.0	5.8	4.9	3.9	2.2	.8	.4	.7	3.4	4.8
11	4.8	10.0	19.0	5.8	5.5	4.2	1.8	.7	.6	.9	2.9	4.0
12	9.0	20.8	17.2	5.6	5.5	4.2	1.6	.7	.5	.8	2.5	3.5
13	21.3	25.7	14.3	18.0	5.0	3.0	1.4	.7	.3	1.8	2.4	3.4
14	21.0	36.0	10.4	18.0	4.7	2.6	1.8	.7	.4	1.6	2.0	3.3
15	17.3	35.8	8.7	14.4	4.0	2.5	5.0	.8	.5	1.3	1.9	3.3
16	12.0	30.0	9.8	10.2	3.8	3.0	3.0	.6	2.1	1.4	2.0	3.4
17	9.1	24.7	19.0	7.0	3.8	2.7	2.5	.5	10.4	2.9	1.8	3.1
18	7.5	18.4	19.0	6.0	3.6	5.5	2.0	4.5	8.4	2.7	1.5	3.0
19	6.5	13.7	15.0	6.0	8.0	14.0	1.7	3.9	4.6	1.9	1.3	3.0
20	7.7	9.0	12.4	38.0	18.0	8.0	1.5	2.8	3.2	1.6	1.1	2.6
21	12.5	8.2	10.0	44.0	14.0	5.7	1.3	2.4	2.1	1.2	1.0	4.0
22	14.0	9.1	9.4	44.0	10.4	4.4	1.1	1.7	1.7	1.0	1.1	12.8
23	11.7	23.0	8.5	38.0	7.0	4.0	1.0	1.6	1.4	.9	1.1	16.0
24	8.0	23.0	7.6	33.0	5.4	12.0	.9	3.5	1.3	.8	1.1	11.4
25	7.1	17.5	7.0	26.0	5.7	17.4	3.5	2.2	1.0	.8	1.1	9.8
26	6.5	21.0	9.8	22.0	5.5	16.0	3.8	2.3	.9	.7	1.5	7.0
27	6.1	19.0	14.0	17.0	5.5	13.7	4.5	1.7	.8	.7	1.5	5.6
28	5.6	14.1	14.0	12.2	5.0	8.0	12.0	1.2	1.3	.8	2.5	4.4
29	5.7	......	11.6	10.0	4.5	5.5	9.0	.9	1.0	.6	3.2	4.0
30	5.5	......	9.8	8.3	4.0	5.0	5.8	.9	1.1	.7	3.1	4.4
31	5.3	......	9.6	......	3.7	......	4.6	1.1	......	.7	......	6.2

YADKIN RIVER AT SILOAM, NORTH CAROLINA.

On August 2, 1900, a temporary station was established on Yadkin River at Siloam, North Carolina, by Cleveland Abbe, jr., and N. C. Curtis. Many miscellaneous measurements were also made on the upper tributaries of the Yadkin in connection with the general hydrographic study of the southern Appalachian region, records of which will be found in Water-Supply Paper No. 49.

The gaging station at Siloam is located on the north bank of the river, in a clump of overhanging trees, 50 yards above Hall's ferry and one-third of a mile south of the Siloam station, on the Wilkesboro division of the Southern Railroad. The gage rod, which is graduated to feet and tenths, is securely braced in a clump of trees. The gage is referred to a bench mark on the south bank in a clump of three sycamores at the water's edge, 25 feet above the ferry landing. A notch cut on the outermost tree is 8 feet from the root, and the bench mark is the top of the knot opposite this notch. The reading of the gage on August 2, 1900, was 2.7 feet, equal to 9.6 feet on the old gage, referred to the bench mark across the river, measuring to the surface of the water. The river is said to rise not more than 9 feet in ordinary freshets, but in 1898, as shown by flood marks and according to verbal accounts, it must have risen to about 16 feet on the present gage. The initial point of sounding is on the right bank, at the outer edge of the first stake on the upstream side of the rod. The banks are high and rarely are submerged. The bed of the stream is gravel and sand, slightly shifting. The drainage area of the river at this station is 1,219 square miles. The observer is C. E. Scott, of Siloam. During 1900 the following measurements were made by N. C. Curtis:

July 11: Gage height, 2.9 feet; discharge, 1,367 second-feet.
August 3: Gage height, 2.6 feet; discharge, 1,218 second-feet.
October 31: Gage height, 3.1 feet; discharge, 1,469 second-feet.

Daily gage height, in feet, of Yadkin River at Siloam, North Carolina, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	2.00	2.10	2.50	2.60	17	2.10	(a)	2.30	2.50	2.60
2	......	2.00	2.10	2.50	2.60	18	2.10	(a)	2.30	2.50	2.60
3	2.10	2.00	2.20	2.80	2.70	19	2.10	(a)	2.30	2.50	2.60
4	2.05	2.00	2.20	2.60	2.70	20	2.10	(a)	2.30	2.50	2.60
5	2.00	2.00	2.30	2.40	2.60	21	2.60	(a)	2.30	2.60	2.70
6	1.95	2.00	2.30	2.40	2.60	22	3.05	(a)	2.60	2.60	2.70
7	1.90	2.00	2.30	2.40	2.60	23	2.95	(a)	3.10	2.50	2.70
8	1.90	2.00	2.40	2.50	2.60	24	3.00	(a)	11.20	2.50	2.70
9	1.90	2.00	2.30	2.50	2.60	25	2.90	(a)	4.50	2.80	2.60
10	1.80	2.00	2.30	2.40	2.70	26	2.75	(a)	3.60	11.30	2.60
11	1.80	2.00	2.30	2.40	2.70	27	2.70	(a)	3.40	10.80	2.70
12	1.80	2.00	2.30	2.40	2.70	28	2.00	(a)	3.20	10.60	2.70
13	1.85	2.00	2.60	2.40	2.60	29	2.00	(a)	2.60	9.00	2.70
14	2.05	2.05	2.40	2.40	2.60	30	2.00	(a)	2.60	2.80	3.10
15	2.10	2.20	2.30	2.40	2.60	31	2.00	......	2.60	......	3.20
16	2.10	(a)	2.30	2.50	2.60						

a No record.

YADKIN RIVER AT SALISBURY, NORTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 116. Owing to the inconvenient location of the railroad bridge from which the measurements were made and its height above the water, the gaging station was moved June 1, 1899, to the new iron highway bridge about 300 yards above the railroad bridge, the new gage reading the same as the old. In its new position the 10-foot mark on the rod is opposite the center of the first strut from the west end of the second span from the west end of the bridge, on the downstream side. The rod is of pine, 3 inches wide, well painted, graduated to feet and tenths, and securely nailed to the inner surface of the guard rail, the top of the rod being flush with the top of the rail. The distance between the zero of the rod and the outer rim of the pulley is 2.13 feet, and between the end of the weight and the pointer on the wire 26.75 feet. The observer is J. T. Yarbrough, keeper of the bridge. The stream here is about the same width as at the railroad bridge, and the section is a fairly good one for gaging purposes, the bottom for the greater part of the width of the stream being hard and rocky. At times the current is very materially modified by large quantities of driftwood lodging against the piers, but it is thought better results can be obtained than at the old station. Although this stream is subject to periods of comparatively low flow, the minimum run-off is large. The lowest recorded flow was 900 second-feet, occurring in September and October, 1897. The highest flood of which there is any record occurred on March 20, 1899, the gage height being 18.80 feet and the measured discharge 115,000 cubic feet per second, showing the maximum discharge to be nearly 128 times the minimum discharge.

Records of flow during 1899 will be found in the Twenty-first Annual Report, Part IV, page 120. During 1900 the following measurements were made by E. W. Myers:

February 13: Gage height, 7.43 feet; discharge, 26,682 second-feet.
April 14: Gage height, 2.50 feet; discharge, 3,962 second-feet.
May 19: Gage height, 2.45 feet; discharge, 4,042 second-feet.
May 25: Gage height, 3.82 feet; discharge, 7,930 second-feet.
August 18: Gage height, 1.95 feet; discharge, 1,447 second feet.
November 9: Gage height, 2.30 feet; discharge, 2,095 second-feet.
December 17: Gage height, 2.45 feet; discharge, 3,025 second-feet.

Daily gage height, in feet, of Yadkin River at Salisbury, North Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.50	1.50	4.60	2.60	2.70	2.37	2.90	2.35	2.10	2.60	2.30	2.70
2	1.50	1.50	9.50	2.60	2.60	2.40	2.73	2.20	1.90	2.10	2.30	2.60
3	1.60	1.50	6.90	2.50	2.50	2.30	2.55	2.10	1.90	1.90	2.30	2.50
4	1.60	1.70	4.40	2.60	2.50	2.50	2.50	2.10	1.90	1.90	2.70	3.60
5	1.60	2.80	3.50	2.50	2.40	2.50	2.45	2.20	1.90	2.00	3.05	6.63
6	1.60	2.70	3.00	2.40	2.40	2.41	2.50	1.95	1.85	2.20	2.75	4.80
7	2.00	2.50	2.90	2.30	2.40	2.44	2.30	1.95	1.80	2.10	2.40	3.55
8	2.10	2.30	2.90	2.30	2.30	2.37	2.40	1.95	1.75	2.10	2.30	3.10
9	2.20	2.30	4.30	2.30	2.40	2.55	2.35	1.95	1.75	2.30	2.30	2.80
10	2.30	2.90	4.40	2.20	2.40	2.55	2.35	1.95	1.70	2.60	2.20	2.65
11	2.50	3.90	4.20	2.20	2.30	2.40	2.25	1.90	1.85	2.20	2.25	2.50
12	4.30	4.10	3.50	2.50	2.30	2.30	2.25	1.85	1.70	2.05	2.30	2.50
13	......	6.00	3.30	2.70	2.30	2.30	2.25	1.85	1.65	2.05	2.20	2.50
14	3.90	9.10	3.00	2.60	2.30	2.70	2.50	1.80	1.65	2.10	2.20	2.50
15	3.00	6.00	2.70	2.00	2.10	2.85	2.40	2.00	1.65	2.05	2.15	2.45
16	2.50	4.10	4.50	2.40	2.10	2.65	2.22	1.85	4.10	2.20	2.15	2.47
17	2.30	3.20	6.10	2.30	2.10	4.78	2.15	1.90	4.95	2.10	2.15	2.40
18	2.30	2.80	4.60	2.30	2.40	4.54	2.00	2.00	2.80	2.00	2.15	2.35
19	2.30	2.40	4.60	9.95	2.50	4.52	1.90	1.90	2.20	2.00	2.15	2.40
20	4.90	2.30	3.70	10.60	2.40	3.47	2.00	1.85	2.00	2.00	2.20	2.40
21	5.50	2.40	4.60	6.00	2.30	2.95	2.00	1.85	2.00	1.90	2.35	2.70
22	4.90	5.60	3.80	7.00	2.10	2.65	2.45	1.90	2.00	2.00	2.30	3.30
23	3.60	6.30	3.20	6.70	2.10	3.57	2.30	2.60	2.25	2.00	2.25	3.30
24	2.60	4.30	3.00	4.50	2.10	7.00	2.65	3.05	2.10	4.55	2.20	3.30
25	2.40	3.80	2.80	3.90	4.00	4.68	2.65	2.25	2.00	6.81	2.20	3.20
26	2.90	3.50	3.90	3.50	3.20	4.40	2.55	2.30	1.90	3.45	4.08	2.90
27	2.30	2.90	3.80	3.30	2.70	4.35	3.30	2.10	1.90	2.90	7.85	2.70
28	2.20	2.90	3.40	3.10	2.30	3.45	3.05	2.00	1.90	2.60	3.90	2.60
29	2.20	......	3.00	2.90	2.30	3.55	2.55	1.90	1.90	2.50	3.20	2.55
30	2.00	......	2.90	2.70	2.10	3.50	2.30	1.90	1.75	2.30	2.80	2.55
31	1.90	......	2.80	......	2.10	......	2.20	2.05	......	2.35	......	3.25

YADKIN RIVER AT NORWOOD, NORTH CAROLINA.

This station was abandoned January 1, 1900, and no measurements have been made since that date. A description of the station and records of discharge measurements will be found in Water-Supply Paper No. 36, page 118; also in the Twenty-first Annual Report, Part IV, page 121.

CATAWBA RIVER NEAR MORGANTON, NORTH CAROLINA.

During the summer of 1900 a hydrographic investigation was made of the southern Appalachian region. For the purpose of the study, temporary stations were established on Catawba River near Morganton, on John River near Morganton, and on Linville River near Bridgewater. Many miscellaneous measurements were also made on the headwaters of the Catawba and its tributaries, as well as of other streams, records of which will be found in Water-Supply Paper No. 49.

The Morganton station was established June 19, 1900, at the highway bridge near Morganton, on the road from Morganton to Hartland. The wire gage is suspended from the bridge, and is read on a horizontal scale graduated to feet and tenths and nailed on the guard rail. The river is straight for a distance of 200 feet above and below the station. The banks are high and have never overflowed. The highest flood of the Catawba rose to the floor of the bridge at this station, a height of about 28 feet. The bed is silt and mud and shifts slightly during floods. The drainage area is 757.8 square miles. Upper Creek flows into the Catawba about 200 feet above the station. The observer is J. W. Kincaid, a farmer living about 200 yards from the station. During 1900 the following measurements were made:

June 13: Gage height, 1.33 feet; discharge, 1,393 second-feet.
June 18: Gage height, 2.50 feet; discharge, 4,030 second-feet.
July 6: Gage height, 1.30 feet; discharge, 1,164 second-feet.
August 8: Gage height, 0.60 foot; discharge, 558 second-feet.
September 24: Gage height, 0.50 foot; discharge, 525 second-feet.
November 7: Gage height, 1.50 feet; discharge, 1,374 second-feet.

Daily gage height, in feet, of Catawba River near Morganton, North Carolina, for 1900.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.53	0.97	0.60	0.50	1.25	1.35
2		1.78	.83	.55	.50	1.25	1.25
3		1.60	.78	.60	.58	2.70	1.65
4		1.48	.75	.53	1.00	1.70	2.40
5		1.43	.75	.55	1.20	1.45	2.30
6		1.30	.70	.50	1.10	1.70	1.97
7		1.23	.70	.45	.80	1.55	1.60
8		1.20	.65	.50	.85	1.25	1.45
9		1.10	.63	.45	.80	1.35	1.50
10		1.50	.60	.45	.75	1.20	1.40
11		1.00	.58	.33	.65	1.20	1.25
12		1.00	.57	.35	.60	1.20	1.20
13		1.25	.65	.33	.55	1.10	1.10
14		1.00	.65	1.55	.58	1.25	1.05
15		.95	.63	2.50	.53	1.25	
16		.90	.55	2.15	.53	1.25	
17		.87	.63	1.25	.53	1.25	
18		.87	.63	1.15	.53	1.00	
19	2.50	.83	.53	.80	.53	1.50	
20	1.60	.85	.45	.68	.53	1.25	
21	1.60	.87	.45	.63	.50	1.00	
22	3.37	.83	.65	.43	.50	1.50	
23	3.05	.80	.73	.55	8.55	.95	
24	3.87	.93	.58	.53	6.48	1.50	
25	3.60	1.23	.80	.55	4.15	1.90	
26	3.00	1.25	.60	.53	2.95	4.30	
27	2.30	2.63	.63	.53	1.80	3.20	
28	2.28	1.05	.53	.48	1.60	2.30	
29	1.95	1.10	.55	.55	1.60	1.60	
30	1.70	1.45	.60	.53	1.40	1.52	
31		1.43	.55		1.35		

LINVILLE RIVER NEAR BRIDGEWATER, NORTH CAROLINA.

This station, one of the temporary stations established in connection with the hydrographic investigations of the southern Appalachian region, was established July 3, 1900. It is located at Poole's mill, just above the ford on the road between Morganton and Marion. The gage is near the tailrace of the mill, and the gagings are made about 200 feet farther down. The bed is extremely rough and rocky, the current being swift during high water. There are no bridges across this stream, and high-water measurements are therefore difficult to obtain. The bench mark is a cross cut on the rocky cliff on the left bank of the stream. The initial point of sounding is at the end of a log sunk in the sandy right bank. The drainage area at this station is 86.2 square miles. The observer is J. A. Cooper, miller. The following measurements were made during 1900:

June 14: Gage height, 9.92 feet; discharge, 104 second-feet.
July 3: Gage height, 9.54 feet; discharge, 216 second-feet.
July 10: Gage height, 9.90 feet; discharge, 116 second-feet.
August 17: Gage height, 10.15 feet; discharge, 78 second-feet.
September 21: Gage height, 9.8 feet; discharge, 55 second-feet.

Daily gage height, in feet, of Linville River near Bridgewater, North Carolina, for 1900.

Day.	July.	Aug.	Sept.	Oct.	Day.	July.	Aug.	Sept.	Oct.
1	....	9.83	10.17	9.75	17	9.83	10.13	9.67	....
2	....	9.92	10.17	9.67	18	9.83	10.13	9.67	....
3	9.54	9.88	10.21	9.58	19	10.04	10.08	10.00	....
4	9.46	9.83	10.21	9.50	20	10.00	10.08	10.00	....
5	9.58	9.92	10.25	9.58	21	9.75	10.13	9.92	....
6	9.54	10.08	10.25	9.58	22	9.92	10.17	9.92	....
7	9.63	10.00	10.25	9.63	23	9.92	10.17	9.92	....
8	9.58	10.08	10.29	9.63	24	9.92	10.17	9.92	....
9	9.71	10.08	10.29	9.63	25	9.83	10.21	10.00	....
10	9.58	10.08	10.29	9.63	26	9.92	10.17	10.08	....
11	9.63	10.08	10.29	9.58	27	9.75	10.21	10.08	....
12	9.67	10.08	10.33	9.50	28	9.75	10.21	10.13	....
13	9.63	10.08	10.33	9.54	29	9.92	10.21	9.75	....
14	9.67	10.13	10.29	9.54	30	9.83	10.21	9.75	....
15	9.71	10.08	10.21	....	31	9.92	10.21	....	....
16	9.67	10.08	7.50	....					

JOHN RIVER NEAR MORGANTON, NORTH CAROLINA.

This station was established June 17, 1900, by H. A. Pressey and E. W. Myers, at the highway bridge on the road from Morganton to Lenoir. A wire gage is suspended from the bridge, and the readings are made on a gage rod nailed to the guard rail on the downstream side of the bridge. The river channel is straight for 200 feet above and 300 feet below the station. The banks are high and the bed is rocky and permanent in section. The drainage area at this station is 212.8 square miles. The observer is W. A. Clontz, a farmer living about a third of a mile from the bridge. The following measurements were made during 1900:

June 13: Gage height, 2.64 feet; discharge, 465 second-feet.
June 19: Gage height, 3.50 feet; discharge, 1,202 second-feet.
July 6: Gage height, 2.63 feet; discharge, 511 second-feet.
August 8: Gage height, 1.90 feet; discharge, 135 second-feet.
September 24: Gage height, 1.90 feet; discharge, 148 second-feet.
November 7: Gage height, 2.32 feet; discharge, 367 second-feet.

Daily gage height, in feet, of John River near Morganton, North Carolina, for 1900.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	....	2.10	....	1.80	2.30	2.32
2	....	2.60	2.03	....	1.83	2.30	....
3	....	2.55	2.00	....	1.93	2.50	2.32
4	....	2.58	2.15	....	2.43	....	3.38
5	....	2.70	1.90	....	2.38	2.60	3.20
6	....	2.58	1.88	....	2.28	2.35	2.85
7	....	2.45	1.93	....	2.10	2.35	2.67
8	....	....	1.90	....	2.03	2.30	2.62
9	....	2.38	1.90	....	1.93	2.25	....
10	....	2.30	1.90	1.70	1.90	2.25	2.50
11	....	2.25	1.90	1.70	1.90	....	2.35
12	....	2.25	....	1.70	1.95	2.20	2.32
13	....	2.30	1.98	1.70	1.90	2.20	2.35
14	....	2.25	1.88	1.80	....	2.15	2.30
15	....	....	1.93	2.90	1.90	2.15	2.28
16	....	2.15	1.93	....	1.88	2.10	....
17	....	2.13	1.93	2.20	1.83	2.05	2.25
18	....	2.10	1.93	2.03	1.78	....	2.20
19	3.50	2.10	(*a*)	1.95	1.73	2.12	2.18
20	3.25	2.15	....	1.90	1.73	2.15	2.22
21	2.80	2.45	....	1.90	....	2.12	3.08
22	3.28	....	....	1.90	1.88	2.10	2.92
23	3.20	2.10	....	....	14.72	2.08	....
24	....	2.28	....	1.90	5.60	2.08	2.78
25	3.75	2.35	....	1.85	3.45	....	2.68
26	3.58	2.30	....	1.83	2.98	4.55	2.48
27	3.23	2.23	....	1.83	2.70	3.00	2.32
28	3.20	2.20	....	1.80	....	2.65	2.32
29	2.95	....	....	1.83	2.45	2.52	2.28
30	2.85	2.20	....	....	2.30	2.42	....
31	....	2.13	....	....	2.30	....	2.90

a No record from August 19 to September 9, inclusive.

CATAWBA RIVER AT CATAWBA, NORTH CAROLINA.

This station was originally established in July, 1896, but was abandoned December 31, 1899. On June 13, 1900, it was reestablished as a temporary station to assist in the study of the hydrography of the southern Appalachian region. The measurements are made from the Southern Railway bridge about a fourth of a mile east of the railway station. The wire gage is suspended from the bridge and is referred to the painted gage rod, which is divided into feet and tenths and nailed to the guard rail. The initial point of sounding is on the west end of the bridge. The channel is straight above and below the station, and the current is moderately swift. The banks are high, and the bed is composed of gravel and fine sand. The observer is C. A. Reed, jr., clerk in the post-office at Catawba. During 1900 the following measurements were made by E. W. Myers:

July 3: Gage height, 3.45 feet; discharge, 3,372 second-feet.
August 14: Gage height, 2.10 feet; discharge, 914 second-feet.
November 7: Gage height, 2.95 feet; discharge, 2,083 second-feet.
December 18: Gage height, 2.59 feet; discharge, 2,139 second-feet.

Daily gage height, in feet, of Catawba River at Catawba, North Carolina, for 1900.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.15	2.80	(a)	3.55	3.70	2.85
2		2.65	2.70	(a)	3.60	3.50	2.85
3		3.35	2.55	1.80	3.65	3.10	3.40
4		3.15	2.40	1.72	3.70	4.10	4.50
5		3.10	2.40	1.75	3.70	3.20	4.10
6		3.00	2.40	1.90	4.20	3.10	3.85
7		2.90	2.40	1.85	3.90	3.10	3.45
8		2.90	2.35	1.80	3.85	2.95	3.15
9		2.80	2.30	1.78	3.80	2.75	3.00
10		2.75	2.30	1.72	3.75	2.75	2.95
11		2.65	2.30	1.70	3.75	2.75	2.95
12		2.60	2.25	1.75	3.75	2.75	2.80
13	2.35	2.60	2.25	1.75	3.70	2.75	2.85
14	2.80	2.55	2.25	1.65	3.60	2.75	2 80
15	3.15	2.50	(a)	1.85	3.60	2.70	2.70
16	4.85	2.50	(a)	5.00	3.60	2.65	2.75
17	8.65	2.50	(a)	5.70	3.60	2.60	2.75
18	7.50	2.50	(a)	4.40	3.65	2.50	2.60
19	5.05	2.50	(a)	3.55	3.70	2.55	2.60
20	4.55	2.50	(a)	3.10	3.65	2.55	3.10
21	3.45	2.50	(a)	3.30	3.60	2.60	4.85
22	4.75	2 50	(a)	3.55	3.75	2.60	5.20
23	6.14	2.30	(a)	3.55	4.10	2.50	4.75
24	5.75	2.70	(a)	3.55	20.20	2.45	4.20
25	5.65	2.70	(a)	3.50	7.40	3.60	3.80
26	5.40	3.25	(a)	3.45	5.70	9.10	3.35
27	4.15	3.20	(a)	3.40	4.90	5.00	3.15
28	3.65	2.90	(a)	3.38	4.70	4.10	3.00
29	3.45	2.70	(a)	3.30	4.45	3.60	3.10
30	3.30	2.70	(a)	3.40	4.35	3.25	3.35
31		3.00	(a)		3.90		4.05

a No record.

CATAWBA RIVER AT ROCKHILL, SOUTH CAROLINA.

This station, which is described in Water-Supply Paper No. 36, page 121, was established September 3, 1895. During the last year a dam has been constructed across the river about 6 miles above the gaging station, and it is probable that this will modify the flow to some extent, particularly at low stages. The maximum flood of which there is any record at this station occurred March 20, 1899, the water reaching a height of 17.25 feet on the gage, with a probable discharge of about 72,000 second-feet. The lowest stage of flow occurred in September of 1895 and 1896, when a gage height of 1.0 foot was reached, the probable discharge being 1,300 second-feet. During 1900 the following measurements were made by E. W. Myers:

February 21: Gage height, 2.63 feet; discharge, 3,803 second-feet.
February 22: Gage height, 5.28 feet; discharge, 16,791 second-feet.
April 13: Gage height, 2.75 feet; discharge, 4,703 second-feet.
April 21: Gage height, 9.07 feet; discharge, 31,610 second-feet.
May 21: Gage height, 2.42 feet; discharge, 3,703 second-feet
July 4: Gage height, 2.86 feet; discharge, 5,623 second-feet.
August 16: Gage height, 1.70 feet; discharge, 1,936 second-feet.
October 26: Gage height, 3.30 feet; discharge, 8,843 second-feet.

Daily gage height, in feet, of Catawba River at Rockhill, South Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.80	2.10	4.60	2.80	(*a*)	2.30	3.00	2.20	1.80	1.40	1.90	2.20
2	1.80	2.00	11.90	2.70	(*a*)	2.30	2.90	2.10	1.80	1.40	1.80	2.00
3	2.70	2.00	7.90	2.60	(*a*)	2.20	2.80	2.00	1.80	1.40	1.80	2.00
4	2.70	2.10	4.50	2.50	(*a*)	2.50	2.80	1.90	1.80	1.40	3.40	3.20
5	2.30	2.20	3.70	2.80	(*a*)	2.50	2.50	1.90	1.70	1.40	3.00	4.20
6	2.20	2.40	3.30	2.80	(*a*)	2.40	2.40	1.80	1.70	1.40	2.50	4.10
7	2.00	2.40	3.10	2.60	(*a*)	2.30	2.40	1.80	1.70	1.70	2.10	2.90
8	2.00	2.00	3.00	2.60	(*a*)	2.30	2.30	1.80	1.70	1.70	2.00	2.40
9	2.00	2.00	3.80	2.60	(*a*)	2.40	2.20	1.80	1.60	1.80	2.00	2.20
10	2.00	2.60	4.10	2.50	(*a*)	2.40	2.20	1.80	1.60	1.60	1.90	2.20
11	1.90	3.80	3.70	2.50	(*a*)	2.40	2.20	1.70	1.50	1.60	1.80	2.20
12	3.20	3.80	3.40	2.20	2.40	2.30	2.10	1.70	1.50	1.60	1.70	2.20
13	4.70	6.30	3.20	2.70	2.30	2.20	2.10	1.70	1.50	1.60	1.70	2.00
14	3.50	12.30	3.10	2.60	2.30	2.20	2.10	1.70	1.50	1.50	1.70	1.90
15	2.80	7.50	2.90	2.50	2.30	2.60	2.10	1.70	1.60	1.50	1.70	1.90
16	2.50	4.30	5.80	2.50	2.30	2.55	2.10	1.70	1.60	1.50	1.70	1.90
17	2.40	3.40	6.70	2.50	2.25	3.90	2.10	2.00	3.20	1.50	1.70	1.90
18	2.20	3.00	4.50	2.40	2.30	6.75	2.10	2.00	2.70	1.50	1.70	1.80
19	2.00	2.90	3.60	10.00	4.60	6.30	2.10	1.90	2.10	1.40	1.70	1.80
20	2.90	2.60	3.30	(*a*)	2.60	4.40	2.00	1.90	1.80	1.40	1.70	1.80
21	3.30	2.60	3.80	(*a*)	2.40	3.30	1.90	1.70	1.80	1.40	1.70	4.20
22	3.20	4.90	3.70	(*a*)	2 20	2.90	1.90	1.60	1.70	1.35	1.70	3.80
23	2.70	5.40	3.30	(*a*)	2.20	5.80	2.10	2.30	1.70	1.40	1.70	4.20
24	2.50	4.00	2.30	(*a*)	2.20	6.50	2.60	2.10	1.40	7.75	1.70	2.90
25	2.40	3.40	2.90	(*a*)	3.40	5.00	2.60	1.80	1.40	11.30	1.70	2.80
26	2.40	3.30	3.10	(*a*)	3.60	4.90	2.20	2.00	1.30	3.40	1.80	2.70
27	2.30	3.00	3.70	(*a*)	2.80	4.00	2.30	1.90	1.30	2.50	6.10	2.50
28	2.20	2.80	3.50	(*a*)	2.60	3.50	2.50	1.80	1.30	2.20	3.90	2.30
29	2.10	....	3.20	(*a*)	2.50	3.20	2.30	1.80	1.30	2.10	2.60	2.20
30	2.10	....	3.10	(*a*)	2.40	3.10	2.90	2.00	1.30	2.00	2.30	2.20
31	2.10	....	3.00	....	2.30	....	2.20	1.80	....	2.00	....	2.60

a Gage broken; no record.

BROAD RIVER (OF THE CAROLINAS) AT DELLINGER, SOUTH CAROLINA.

The station at Gaffney, South Carolina, was abandoned on account of its poor section, and the station at Dellinger was established August 30, 1900, by N. C. Curtis, in connection with the hydrographic investigations of the southern Appalachian region. The gage is a 4-inch by 4-inch timber, 13 feet long, spiked to a tree on the left bank of the river at Ellis's ferry, Dellinger, 1 mile below the North Carolina–South Carolina State line and 10 miles south of Shelby, North Carolina. The gage is graduated to feet and tenths and reads direct. The initial point of sounding is a stake in the center of the roadway, used for securing ferryboats to the bank. The channel is straight, the current rather rapid, and the bed of the stream sandy and slightly shifting. The right bank is about 10 feet high, and is not subject to overflow; the left bank rises to a considerable height. It has been observed that the surface of the water in the river is about 4 inches higher in the evening than in the morning. This may probably be accounted for by the fact that there are two cotton mills on Second Broad River which close their gates at night, in order to allow the ponds to fill, and cut off nearly all of the discharge of Second Broad River during low water. The observer is J. S. Gramling, ferryman. During 1900 N. C. Curtis made one measurement at this station, as follows:

August 30: Gage height, 0.8 foot; discharge, 1,430 second-feet.

Daily gage height, in feet, of Broad River (of the Carolinas) at Dellinger, South Carolina, for 1900.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	....	0.55	0.80	1.35	17	1.50	0.30	0.70	1.00
2	0.60	.60	.70	1.20	18	1.00	.30	.50	.90
3	.70	.59	.70	1.30	19	.70	.30	.70	.90
4	.70	.50	.90	2.50	20	.70	.30	.70	.95
5	.60	.50	.90	3.15	21	.60	.20	.70	5.00
6	.60	1 20	.70	2.00	22	.60	.40	.70	3.25
7	.60	.60	.60	1.70	23	.70	1.00	.70	2.30
8	.50	.70	.60	1.55	24	.70	5.50	.70	2.50
9	.30	1.00	.60	1.20	25	.60	2.50	.90	2.00
10	.50	.80	.60	1.30	26	.50	2.25	6.15	1.90
11	.50	.60	.50	1.20	27	.50	1.28	2.80	1.70
12	.50	.60	.70	1.15	28	.50	1.00	1.90	1.60
13	.40	.50	.70	1.15	29	.50	.90	1.60	1.60
14	.40	.30	.70	1.15	30	....	.90	1.50	1.75
15	1.20	.75	.70	1.15	31	....	.80	....	2.50
16	2.90	.30	.70	.80					

BROAD RIVER (OF THE CAROLINAS) NEAR ALSTON, SOUTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 125. The river is straight for a long distance above and below the station, but the current is at an angle with the bridge. The current velocity is ample and is very uniform throughout the section. The observer is G. M. Heron, a farmer living near the station. The maximum flood at this station was on April 22, 1900, when the gage height was 23.80 feet and the probable discharge about 92,000 second-feet. The minimum flow was reached October 3, 1899, the discharge being 1,485 second-feet. The maximum discharge is, therefore, about 62 times the minimum flow. During 1900 the following discharge measurements were made by E. W. Myers:

February 26: Gage height, 5.40 feet; discharge, 8,913 second-feet.
April 18: Gage height, 6.28 feet; discharge not measured.
April 20: Gage height, 13.60 feet; discharge, 44,456 second-feet.
May 22: Gage height, 3.40 feet; discharge, 4,406 second-feet.
July 5: Gage height, 4.25 feet; discharge, 5,962 second-feet.
August 17: Gage height, 2.80 feet; discharge, 2,840 second-feet.

Daily gage height, in feet, of Broad River (of the Carolinas) near Alston, South Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	2.99	8.20	4.64	5.00	3.45	5.54	4.00	3.15	2.55	2.95	3.60
2	....	2.80	14.20	4.41	4.80	3.30	4.90	3.85	3.20	2.30	2.88	3.45
3	....	2.72	12.47	4.17	4.60	3.48	5.45	3.40	2.80	2.60	3.70	3.25
4	....	2.74	8.20	4.24	4.40	4.05	5.45	3.30	2.50	2.60	7.51	7.83
5	....	3.33	6.10	4.58	4.25	4.45	4.25	3.20	2.70	3.05	7.20	9.20
6	....	3.52	5.52	4.54	4.15	3.90	5.90	3.10	2.60	3.35	5.00	6.50
7	....	3.90	5.04	4.08	4.10	3.70	3.90	2.80	2.50	3.30	3.75	4.95
8	3.30	3.45	5.16	4.05	3.90	5.05	3.65	3.03	2.50	3.10	3.50	4.25
9	3.45	3.50	8.98	4.00	3.90	4.45	4.76	3.05	2.48	2.70	3.15	3.90
10	3.60	3.58	8.30	3.90	3.70	4.45	3.74	2.90	2.30	3.25	3.05	3.60
11	3.80	8.48	6.63	3.88	3.60	4.20	3.40	2.82	2.05	3.15	2.90	3.55
12	6.30	9.84	5.43	4.50	3.60	3.85	3.30	2.80	2.30	2.90	2.80	3.45
13	7.50	14.48	5.07	4.70	3.65	3.60	3.20	2.85	2.35	2.85	2.70	3.35
14	5.00	19.95	4.66	4.41	3.64	4.05	4.80	2.60	2.38	3.10	3.00	3.60
15	3.80	16.90	4.40	4.40	3.64	4.32	4.40	2.95	2.65	3.00	2.90	3.70
16	3.20	11.11	11.68	3.90	3.54	4.20	3.70	2.90	5.30	2.50	2.85	3.30
17	2.78	7.47	12.80	3.70	3.50	10.00	3.50	2.80	6.12	2.85	2.90	3.05
18	2.38	5.57	8.87	6.40	3.40	12.33	3.40	2.95	4.10	2.70	2.95	3.10
19	2.36	4.92	6.10	17.20	4.80	8.60	3.25	2.85	3.20	2.70	2.95	3.20
20	3.09	4.51	5.30	14.60	4.20	6.00	3.10	2.75	3.05	2.60	2.75	3.30
21	3.87	4.20	6.83	15.50	3.60	5.00	3.10	2.35	2.85	2.65	3.55	7.20
22	3.52	9.25	5.84	23.40	3.47	4.50	2.98	2.60	2.65	2.60	3.35	8.55
23	3.38	9.50	5.39	18.10	3.42	10.55	3.40	2.55	2.58	2.35	3.20	7.20
24	3.73	6.64	5.08	11.80	3.25	13.98	3.10	3.50	2.40	6.95	3.15	5.15
25	3.58	7.50	7.20	10.00	6.50	10.00	3.42	3.35	2.50	8.40	3.05	4.80
26	3.38	5.50	10.80	7.40	6.20	8.00	3.25	2.80	2.80	5.85	3.90	4.45
27	3.29	5.00	8.40	7.30	5.55	6.85	4.32	3.10	2.65	3.90	10.13	4.20
28	3.10	4.50	6.54	6.10	4.40	6.35	4.32	2.60	2.50	3.55	6.35	3.80
29	2.90	....	5.60	5.65	3.85	5.95	4.35	2.75	2.45	3.30	4.65	3.70
30	2.84	....	5.11	5.50	3.70	6.15	4.45	2.90	2.45	3.00	3.85	3.95
31	3.10	....	4.78	....	3.55	....	4.95	3.10	....	3.15	....	6.30

SALUDA RIVER AT WATERLOO, SOUTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 126. Records of flow during 1899 will be found in the Twenty-first Annual Report, Part IV, page 129. During 1900 the following measurements were made by E. W. Myers:

February 23: Gage height, 7.33 feet; discharge, 3,347 second-feet.
April 19: Gage height, 9.91 feet; discharge, 5,415 second-feet.
May 22: Gage height, 3.35 feet; discharge, 757 second-feet.
July 5: Gage height, 5.10 feet; discharge, 1,486 second-feet.
August 17: Gage height, 4.10 feet; discharge 917 second-feet.
November 10: Gage height, 4.42 feet; discharge, 854 second-feet.

Daily gage height, in feet, of Saluda River at Waterloo, South Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.60	4.00	10.20	6.00	6.40	4.50	7.40	4.35	4.70	3.10	4.35	5.45
2	4.00	4.10	11.95	5.55	6.10	4.20	5.85	4.50	4.90	3.90	4.40	4.90
3	4.55	4.80	10.70	5.05	5.70	4.40	6.45	4.95	4.00	4.10	6.60	4.60
4	4.50	3.95	7.20	5.10	5.70	5.45	6.25	4.70	4.00	4.80	7.75	7.85
5	4.30	4.60	6.35	5.35	5.70	4.90	5.90	4.65	4.10	4.40	4.70	7.90
6	4.05	5.25	6.00	5.15	5.95	5.10	5.65	3.65	4.05	4.60	5.60	5.95
7	3.80	5.30	5.65	5.35	5.00	8.10	5.20	4.05	4.00	3.80	5.40	5.80
8	3.40	5.20	8.80	5.45	4.90	10.90	5.20	4.15	4.65	3.10	4.50	5.55
9	4.00	4.25	10.05	4.35	4.85	10.00	5.40	5.15	3.70	4.10	4.55	5.05
10	4.65	6.75	8.30	4.85	4.95	6.90	4.85	3.95	3.00	5.00	5.15	4.30
11	4.85	7.80	7.40	5.50	4.65	6.00	4.70	5.00	4.28	4.25	4.20	5.40
12	9.55	10.30	6.05	5.90	5.40	5.80	4.55	3.80	4.00	4.10	3.45	5.35
13	7.80	16.40	5.85	5.40	5.00	5.25	4.75	3.65	3.95	4.90	5.10	5.45
14	5.65	20.00	5.70	5.70	5.00	6.20	5.80	3.90	4.10	3.95	5.15	4.90
15	5.05	17.00	5.80	5.05	4.65	7.00	6.10	4.00	4.75	3.20	5.05	5.45
16	5.30	8.40	11.05	5.00	4.83	6.55	4.90	4.55	8.75	4.60	4.40	4.20
17	5.05	7.00	10.70	4.90	4.45	10.25	4.60	4.50	6.10	4.40	4.70	4.25
18	4.90	6.45	8.00	8.65	5.10	8.70	4.60	4.10	4.25	4.65	4.10	5.25
19	5.15	5.90	6.90	9.55	5.75	7.00	4.50	4.00	4.20	4.20	3.50	4.50
20	5.20	5.50	8.10	8.80	5.35	6.50	4.45	3.30	5.20	4.55	4.60	5.20
21	5.45	6.10	7.40	13.40	4.55	5.95	5.30	3.85	4.00	5.80	4.45	5.20
22	4.00	8.50	6.65	16.80	5.20	6.10	4.20	4.10	4.95	3.05	4.50	5.65
23	5.20	7.70	6.10	14.40	4.40	8.55	5.05	4.05	4.15	4.20	5.25	5.15
24	4.90	5.55	6.90	12.55	8.50	11.80	5.30	4.15	3.55	8.30	5.10	5.00
25	5.00	6.90	9.15	9.30	7.35	10.70	4.35	5.20	4.10	8.10	4.50	5.45
26	4.95	5.80	8.15	7.70	6.45	10.80	5.30	4.00	4.10	6.70	10.20	4.85
27	5.00	5.70	7.80	7.40	6.10	8.25	4.40	3.75	4.60	5.35	9.90	4.60
28	3.95	5.20	6.85	7.00	4.50	8.25	5.40	4.40	4.05	4.70	8.40	4.45
29	4.15	......	6.30	6.55	5.30	7.35	4.95	4.00	4.80	3.90	5.20	5.35
30	4.05	......	6.10	6.30	4.60	8.30	4.70	4.60	3.80	5.20	5.55	5.55
31	4.00	......	6.05	......	5.30	......	5.30	4.95	......	5.25	......	5.70

TALLULAH RIVER AT TALLULAH FALLS, GEORGIA.

This station was established August 29, 1900, and records of gage heights were obtained until October 19, 1900, when the observer left Tallulah Falls, and no readings have been made since that time. Measurements are made from the wagon bridge across the river about a half mile above the head of the falls. The bridge is a single iron span about 100 feet long. The gage is a vertical rod 10 feet long, graduated to feet and tenths, nailed to a 2-inch by 4-inch pine timber, and the whole spiked to a tree on the left bank of the river about 50 feet above the bridge. The observer is T. A. Robinson, proprietor of the Robinson Hotel. During 1900 the following measurements were made by Max Hall and J. C. Conn:

August 29: Gage height, 1 foot; discharge, 252 second-feet.
December 21: Gage height, 2 feet; discharge, 963 second-feet.

Daily gage height, in feet, of Tallulah River at Tallulah Falls, Georgia, for 1900.

Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.
1	......	1.50	1.03	12	......	.85	1.01	23	......	1.25	......
2	......	1.40	1.03	13	......	.80	1.01	24	......	1.20	......
3	......	1.10	1.02	14	......	1.20	1.00	25	......	1.20	......
4	......	1.00	1.01	15	......	1.95	1.00	26	......	1.19	......
5	......	1.00	1.01	16	......	2.90	1.00	27	......	1.17	......
6	......	1.00	1.03	17	......	1.95	1.00	28	......	1.10	......
7	......	1.00	1.03	18	......	1.70	1.00	29	1.00	1.09	......
8	......	1.00	1.02	19	......	1.40	1.00	30	.95	1.04	......
9	......	.90	1.02	20	......	1.35	......	31	1.60	......	......
10	......	.90	1.01	21	......	1.30	......				
11	......	.90	1.01	22	......	5.40	......				

TUGALOO RIVER NEAR MADISON, SOUTH CAROLINA.

This station, established July 19, 1898, at Cook's ferry, about a half mile from Madison, South Carolina, 1 mile below the Southern Railway bridge over Tugaloo River and 2 miles above the mouth of Chauga Creek, is described in Water-Supply Paper No. 36, page 127. Results of measurements are given in the Twentieth Annual Report, Part IV, page 162, and in the Twenty-first Annual Report, Part IV, page 131. During 1900 the following measurements were made by Max Hall and others:

February 21: Gage height, 4.25 feet; discharge, 2,243 second-feet.
August 30: Gage height, 1.71 feet; discharge, 872 second-feet.
December 25: Gage height, 3.60 feet; discharge, 1,717 second-feet.
December 27: Gage height, 2.80 feet; discharge, 1,414 second-feet.

Daily gage height, in feet, of Tugaloo River near Madison, South Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	1.6	9.4	3.5	4.2	2.3	5.1	3.1	2.5	1.7	2.1	2.5
2	1.3	1.6	5.5	3.4	4.1	2.6	5.6	2.8	2.8	1.6	2.1	2.4
3	1.3	1.8	3.9	3.4	4.3	2.8	5.1	2.7	2.1	1.7	2.2	2.3
4	1.3	1.7	3.9	3.6	4.0	2.7	4.6	2.5	1.9	1.7	2.9	5.6
5	1.2	3.5	3.7	3.7	3.8	2.9	4.2	2.5	1.8	1.9	2.3	4.8
6	1.2	2.3	3.5	3.4	3.7	2.9	3.9	2.4	1.7	3.2	2.1	3.4
7	1.2	2.1	3.8	3.3	3.6	5.5	3.8	2.3	1.6	1.8	2.0	3.1
8	1.2	2.2	4.3	3.2	3.4	6.7	3.6	2.3	1.6	1.8	2.0	3.0
9	1.2	3.0	6.6	3.1	3.4	4.5	3.8	2.2	1.5	1.5	1.9	2.9
10	1.4	3.5	5.1	3.1	3.3	3.6	3.6	2.1	1.5	1.8	1.9	2.6
11	1.6	4.6	4.5	3.3	3.2	3.3	3.7	2.1	1.5	1.7	1.8	2.5
12	5.5	7.0	4.2	4.1	3.1	3.0	3.6	2.1	1.4	1.6	1.8	2.4
13	3.3	19.9	3.9	3.8	3.1	3.3	3.9	2.2	1.4	2.6	1.8	2.3
14	2.5	9.0	3.7	3.4	3.0	3.3	3.9	2.0	1.6	1.8	1.7	2.3
15	2.1	6.2	3.6	3.2	2.9	3.1	3.7	2.3	8.1	1.6	1.7	2.2
16	2.0	5.2	5.1	3.0	2.9	3.0	3.6	2.1	7.3	1.6	1.7	2.2
17	1.9	4.5	4.0	5.9	2.8	6.9	3.2	2.3	4.0	1.5	1.7	2.1
18	1.8	4.0	3.6	5.1	2.8	5.3	3.1	2.1	2.9	1.5	1.8	2.1
19	4.5	3.8	3.7	7.6	3.3	4.5	3.0	2.0	2.6	1.4	1.9	2.0
20	6.9	3.5	6.2	7.5	2.8	3.9	2.9	1.9	2.3	1.4	2.0	2.3
21	3.4	3.5	5.0	13.4	2.7	3.5	2.8	1.8	2.2	1.4	2.0	4.2
22	3.1	5.0	4.4	8.3	2.6	4.2	2.8	1.8	2.1	1.6	2.0	3.3
23	2.9	4.0	4.2	6.3	2.5	5.8	3.1	2.1	2.0	7.4	1.9	3.0
24	2.4	3.8	4.1	6.2	3.3	13.0	2.9	2.3	2.0	6.8	1.9	4.2
25	2.4	4.0	4.2	5.3	2.9	9.4	2.7	2.1	2.9	4.9	2.2	3.6
26	2.2	3.5	5.8	4.9	2.9	11.4	3.6	2.2	1.8	3.9	9.4	3.1
27	2.1	3.3	4.8	4.6	2.7	6.5	3.2	1.9	2.1	2.9	5.3	2.8
28	1.9	3.1	4.3	4.9	2.5	6.9	3.8	1.8	1.9	2.6	4.1	2.7
29	1.9	......	4.1	4.7	2.5	6.4	3.1	1.7	1.8	2.5	3.0	2.6
30	1.8	......	3.9	4.4	2.4	5.7	4.2	1.7	1.7	2.3	3.4	2.6
31	1.8	......	3.7	......	2.3	......	3.3	2.8	......	2.2	......	4.0

SAVANNAH RIVER NEAR CALHOUN FALLS, SOUTH CAROLINA.

This station was established August 4, 1896, on the Seaboard Air Line bridge across Savannah River, above the mouth of Beaverdam Creek, below Rocky River, and about 3 miles west of the town of Calhoun Falls, South Carolina. It is described in Water-Supply Paper No. 36, page 129. More than four-fifths of the drainage area of this river in the Blue Ridge Mountains in North Carolina, South Carolina, and Georgia is covered with the original oak forest. Records of flow during 1899 will be found in the Twenty-first Annual Report, Part IV, page 134. During 1900 the following measurement was made by Max Hall:

March 1: Gage height, 5.47 feet; discharge, 13,803 second-feet.

Daily gage height, in feet, of Savannah River near Calhoun Falls, South Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.3	2.9	5.3	3.6	4.0	2.8	3.6	3.2	3.2	2.1	2.9	3.0
2	3.2	2.8	6.5	3.5	3.9	2.7	3.2	3.0	3.7	2.0	3.0	2.9
3	3.2	2.8	4.6	3.5	4.2	3.1	3.0	3.0	3.3	2.0	3.9	2.8
4	3.1	2.7	4.2	3.7	4.0	2.9	3.0	2.9	3.0	2.1	4.3	3.9
5	3.0	2.8	3.9	3.6	3.9	3.5	2.9	2.9	3.0	2.1	4.0	3.8
6	3.0	2.8	3.8	3.4	3.7	3.4	2.9	2.8	2.9	3.0	3.8	3.8
7	2.9	2.9	3.6	3.3	3.6	3.9	2.8	2.8	2.8	2.7	3.7	3.7
8	2.9	2.9	4.0	3.4	3.4	11.0	2.7	2.7	2.6	2.6	3.4	3.6
9	2.9	3.0	4.9	3.4	3.3	5.0	2.7	2.6	2.5	2.5	3.3	3.4
10	3.0	3.2	4.3	3.3	3.1	3.5	2.6	2.4	2.3	2.4	3.2	3.4
11	3.2	5.2	3.9	3.6	3.1	3.0	2.5	2.3	2.2	2.4	3.2	3.3
12	4.0	9.3	3.8	4.0	3.0	3.0	2.4	2.2	2.1	2.6	3.0	3.3
13	3.9	15.5	3.6	3.8	3.0	3.1	2.4	2.7	2.0	3.9	2.9	3.4
14	3.7	19.4	3.4	3.6	3.0	3.0	2.5	2.6	2.0	3.0	2.7	3.7
15	3.6	8.0	3.3	3.6	2.9	3.0	2.4	2.5	4.7	2.9	2.7	3.6
16	3.5	5.5	4.6	3.5	2.9	3.3	2.3	2.5	6.9	2.8	2.6	3.4
17	3.3	4.9	4.5	3.5	2.9	5.6	2.2	2.6	5.0	2.6	2.6	3.4
18	3.3	4.7	4.0	3.9	2.8	6.1	2.2	2.6	3.2	2.5	2.6	3.3
19	3.4	4.4	3.8	5.0	3.0	4.9	2.1	2.4	3.0	2.5	2.6	3.3
20	3.9	4.3	4.2	5.1	3.0	4.0	2.1	2.3	2.9	2.4	3.0	3.6
21	3.8	4.2	4.0	8.0	2.9	3.7	2.1	2.2	2.9	2.4	2.9	3.7
22	3.6	5.4	3.9	10.4	2.9	3.6	2.0	2.0	2.7	2.4	2.8	3.5
23	3.5	4.7	3.8	5.5	3.0	4.0	2.2	2.0	2.7	2.5	2.8	3.4
24	3.4	4.4	4.0	6.9	4.9	12.7	2.3	1.9	2.6	5.0	2.6	3.4
25	3.2	4.2	5.6	6.0	4.2	12.0	2.2	2.5	2.4	4.0	2.6	3.3
26	3.2	4.0	5.7	4.9	3.2	7.8	2.2	2.9	2.4	3.9	3.6	3.3
27	3.1	3.9	5.0	4.2	3.0	5.0	2.3	2.7	2.2	3.7	3.4	3.3
28	3.0	3.9	4.8	4.0	3.0	4.5	3.4	2.9	2.0	3.5	3.2	3.2
29	3.0	......	4.2	4.2	2.9	3.9	3.2	2.3	2.0	3.3	3.1	3.2
30	3.0	......	3.9	4.0	2.9	3.8	3.4	2.2	2.1	3.1	3.0	3.3
31	2.9	......	3.7	......	2.8	......	3.1	2.1	......	2.9	......	3.3

SAVANNAH RIVER AT AUGUSTA, GEORGIA.

Observations of river heights have been maintained at the highway bridge in the city of Augusta since 1875. The station is described in Water-Supply Paper No. 36, page 130. The gage heights as published are the average of four daily readings reduced to feet and hundredths. Discharge measurements are made at the North Augusta highway bridge. Records of flow during 1899 will be found in the Twenty-first Annual Report, Part IV, page 135. During 1900 one measurement was made by B. M. Hall, as follows:

August 28: Gage height, 7.30 feet; discharge, 5,968 second-feet.

Daily gage height, in feet, of Savannah River at Augusta, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.12	6.87	17.37	9.98	11.50	7.70	14.46	11.29	7.37	6.18	7.20	7.95
2	6.94	6.81	23.12	9.89	11.20	7.50	12.90	9.46	7.79	6.38	7.30	7.50
3	6.67	6.44	13 87	9.54	10.70	7.50	12.25	8.30	8.35	6.38	7.70	7.75
4	6.42	6.52	14.06	9.54	12.30	8.30	11.66	7.76	7.33	6.16	13.80	9.18
5	6.50	8.33	11.44	9.65	10.60	10.20	10.60	7.73	7.00	6.40	12.00	15.31
6	6.67	9.10	10.60	9.63	9.60	9.50	9.62	7.33	6.85	6.65	9.30	14.44
7	6.39	8.89	10.37	9.20	9.30	11.70	9.27	7.27	6.44	7.65	8.00	11.22
8	6.65	8.08	10.64	9.00	9.00	19.70	8.96	7.19	6.20	7.41	7.70	9.32
9	6.71	8.12	17.35	8.75	9.00	19.90	8.79	7.13	6.27	7.35	7.50	8.50
10	6.71	10.04	17.60	8.90	8.80	19.90	8.39	7.09	5.89	7.50	7.40	8.40
11	7.12	20.58	14.35	9.15	8.70	10.80	8.52	7.06	6.16	6.30	6.90	8.06
12	10.40	27.19	12.21	11.10	8.60	9.50	8.22	6.57	6.06	6.75	7.00	7.90
13	15.00	29.60	10.96	11.35	8.40	9.20	8.68	6.62	6.08	6.85	7.10	7.80
14	12.79	32.31	10.39	10.77	8.30	9.30	8.94	7.31	5.99	7.48	7.00	8.80
15	9.37	30.08	10.08	9.47	8.30	9.90	9.60	7.17	7.40	7.14	7.00	11.56
16	8.65	22.08	15.25	9.16	8.20	9.70	9.37	6.77	14.49	6.62	6.80	9.81
17	8.12	16.29	17.27	8.88	7.80	15.00	8.64	7.67	14.24	6.56	6.80	8.60
18	7.67	12.75	14.21	12.15	8.40	19.80	8.37	7.27	10.60	6.47	6.50	7.97
19	7.94	11.39	11.42	23.89	9.70	18.40	8.19	6.78	8.35	6.45	6.80	7.44
20	8.94	10.46	13.68	24.70	11.00	13.50	8.04	6.82	7.70	6.27	7.20	8.15
21	10.26	10.35	15.25	24.25	10.60	10.70	7.89	6.62	7.27	5.95	7.50	12.10
22	10.44	14.79	13.70	26.73	8.90	9.60	7.39	6.48	7.12	6.30	7.40	12.70
23	9.11	15.44	11.85	24.73	8.40	11.70	8.00	6.50	6.92	6.32	7.30	11.12
24	8.44	12.89	11.73	18.27	10.40	21.80	8.20	6.56	6.35	12.66	7.40	9.35
25	8.12	12.96	14.10	14.75	13.00	29.20	8.92	6.77	6.75	16.72	7.00	9.40
26	7.96	12.37	19.65	17.08	11.00	26.80	8.32	7.77	6.50	12.30	10.00	9.20
27	7.73	10.98	18.37	13.73	9.10	23.00	9.23	7.12	6.67	10.60	14.90	8.72
28	7.19	10.31	14.79	12.50	8.50	19.60	11.12	7.20	6.46	9.72	11.80	8.40
29	7.22	....	12.67	11.81	8.10	16.70	10.20	6.69	6.50	8.52	9.10	8.25
30	7.20	....	11.46	11.20	7.90	14.60	11.88	6.62	6.19	7.95	8.30	8.40
31	7.08	....	10.69	....	7.80	....	13.35	7.08	....	7.60	....	15.22

BROAD RIVER (OF GEORGIA) NEAR CARLTON, GEORGIA.

This station, established May 27, 1897, is located on the bridge of the Seaboard Air Line 3 miles east of Carlton, Georgia, and 3 miles above the mouth of the South Fork. A description of the station is given in Water-Supply Paper No. 36, page 131. The gage was last verified on October 17, 1900. Records of flow for 1899 will be found in the Twenty-first Annual Report, Part IV, page 132. During 1900 the following measurements were made by Max Hall:

February 16: Gage height, 4.25 feet; discharge, 2,088 second-feet.
March 30: Gage height, 3.30 feet; discharge, 1,480 second-feet.
May 3: Gage height, 4.49 feet; discharge, 2,562 second-feet.
October 17: Gage height, 2.22 feet; discharge, 661 second-feet.

Daily gage height, in feet, of Broad River (of Georgia) near Carlton, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.40	2.30	5.50	3.10	3.40	2.60	3.50	3.70	2.30	2.10	2.40	2.40
2	2.40	2.30	4.90	3.10	3.20	2.50	3.30	3.80	2.50	2.10	2.40	2.40
3	2.40	2.30	3.85	3.00	4.70	2.80	3.40	3.60	2.50	2.10	6.50	2.40
4	2.35	2.30	3.30	3.10	3.90	2.90	3.20	3.60	2.30	2.20	3.50	4.20
5	2.35	3.30	3.15	3.00	3.20	2.90	3.00	2.50	2.20	2.30	2.80	5.00
6	2.30	2.95	3.00	3.00	3.10	3.00	2.90	2.50	2.20	2.50	2.60	3.80
7	2.30	2.70	3.00	2.90	3.00	4.30	2.80	2.50	2.10	3.00	2.50	3.20
8	2.30	2.65	6.50	2.80	3.00	7.70	2.80	2.40	2.10	2.60	2.40	2.80
9	2.30	2.80	6.80	2.80	2.90	7.60	2.80	2.40	2.10	2.50	2.40	2.70
10	2.40	4.00	5.10	2.70	2.90	3.80	2.70	2.30	2.10	2.40	2.40	2.60
11	2.90	6.00	3.80	3.50	2.90	3.20	2.60	2.30	2.10	2.30	2.40	2.60
12	5.85	10.50	3.30	3.90	2.80	3.10	2.90	2.30	2.00	2.30	2.40	2.50
13	4.90	22.20	3.20	3.90	2.80	3.10	3.05	4.00	2.00	2.70	2.30	2.50
14	3.30	16.90	3.10	3.30	2.80	3.80	3.55	2.50	2.10	2.60	2.30	2.80
15	2.95	8.00	3.00	3.10	2.70	3.10	3.00	2.40	5.50	2.40	2.30	2.60
16	2.75	4.30	4.20	3.00	2.70	3.50	2.90	2.40	5.00	2.30	2.30	2.50
17	2.65	3.70	3.80	2.90	2.70	4.30	2.80	2.50	4.00	2.20	2.30	2.40
18	3.15	3.30	3.30	3.90	2.70	5.60	2.70	2.50	2.80	2.20	2.30	2.40
19	3.60	3.20	3.10	7.50	3.00	4.90	2.60	2.60	2.50	2.20	2.40	2.40
20	3.75	3.10	4.60	6.70	2.90	3.50	2.60	2.40	2.40	2.20	2.40	2.80
21	3.70	3.10	4.10	8.00	2.70	3.10	2.50	2.30	2.30	2.20	2.40	3.80
22	2.85	3.80	3.70	12.20	2.70	3.00	2.50	2.20	2.30	2.10	2.50	3.30
23	2.70	3.65	3.40	5.80	2.70	4.20	2.50	2.30	2.30	4.20	2.40	3.00
24	2.60	3.20	3.60	6.50	4.00	13.00	3.00	2.20	2.30	5.00	2.40	2.90
25	2.50	3.65	4.70	7.30	3.20	12.60	2.70	2.20	2.20	3.10	3.60	2.80
26	2.45	3.60	6.50	5.10	2.90	7.00	2.90	2.60	2.20	4.00	3.60	2.60
27	2.45	3.20	5.30	3.90	2.80	5.60	3.40	2.50	2.20	3.80	2.80	2.50
28	2.40	3.00	4.00	3.70	2.70	4.60	3.70	2.20	2.20	3.10	2.60	2.50
29	2.40		3.50	3.50	2.70	4.00	3.40	2.20	2.20	2.70	2.50	2.50
30	2.35		3.30	3.50	2.60	4.50	3.30	2.90	2.10	2.50	2.50	2.50
31	2.30		3.25		2.60		3.90	2.20		2.50		3.80

OCONEE RIVER NEAR DUBLIN, GEORGIA.

This station was established by the United States Weather Bureau in 1894, was discontinued on April 30, 1897, and was reestablished by the Georgia geological survey on February 11, 1898. Since October 15, 1898, the station has been maintained by the United States Weather Bureau. It is located about a half mile east of Dublin, Georgia, and is described in Water-Supply Paper No. 36, page 133. Records of measurement will be found as follows: For 1898, Twentieth Annual Report, Part IV, page 170; for 1899, Twenty-first Annual Report, Part IV, page 136. During 1900 the following measurements of Oconee River at Dublin were made by B. M. Hall and his assistants:

April 12: Gage height, 4.25 feet; discharge, 4,680 second-feet.
December 7: Gage height, 7.30 feet; discharge, 7,991 second-feet.

Daily gage height, in feet, of Oconee River near Dublin, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	1.7	8.0	8.8	8.3	1.6	19.0	4.7	0.8	—0.1	1.0	2.3
2	2.1	1.6	9.6	6.5	6.4	1.4	16.9	5.0	2.7	— .3	.9	1.8
3	1.8	1.6	10.4	5.3	6.9	1.3	14.8	3.7	2.3	— .3	3.7	1.6
4	1.7	1.6	11.0	4.8	7.3	1.2	12.7	2.9	2.1	— .2	4.7	1.8
5	1.6	1.8	11.7	4.5	7.5	1.9	10.1	2.5	1.5	.0	5.5	3.2
6	1.6	3.4	11.0	4.3	6.7	2.8	8.5	1.9	1.2	.8	6.5	6.4
7	1.5	3.7	9.0	4.2	5.4	4.1	8.0	1.6	.5	1.2	6.6	7.2
8	1.4	3.5	6.6	4.0	4.1	5.0	5.5	1.6	.4	.9	4.8	7.6
9	1.2	3.1	5.8	3.7	3.9	6.0	3.9	1.5	.2	1.1	3.9	6.8
10	1.4	3.5	7.0	3.5	3.3	6.2	3.2	1.3	.2	1.2	2.6	4.5
11	1.9	7.9	8.0	3.3	3.0	6.2	2.6	.7	.0	1.0	1.8	3.3
12	2.4	10.2	8.5	3.9	2.7	5.7	2.8	.4	— .2	.8	1.3	2.7
13	4.3	11.9	8.7	5.0	2.5	4.3	6.6	.2	— .3	.6	1.2	2.3
14	5.4	16.4	8.0	5.9	2.3	3.0	6.1	.1	— .1	.7	1.0	2.3
15	5.7	22.0	7.1	6.3	2.2	2.9	5.5	.3	— .1	.6	1.0	5.2
16	4.9	24.4	6.4	5.0	2.1	5.0	4.7	1.1	.4	.6	.9	6.7
17	3.3	24.9	8.1	4.1	2.0	7.5	4.1	.8	4.8	.6	.8	8.1
18	2.9	24.1	8.7	3.4	1.9	8.3	2.8	.6	5.8	.5	.7	8.4
19	2.8	22.6	9.0	5.1	2.1	9.9	2.3	.5	6.0	.2	.9	6.4
20	3.2	20.0	9.1	8.2	3.7	10.3	2.0	.3	3.5	.1	.7	4.2
21	4.1	17.2	8.5	11.1	5.5	10.6	1.8	.1	1.9	.1	.7	4.6
22	4.7	14.0	7.4	15.6	5.3	10.2	1.5	.5	1.3	.0	1.1	6.8
23	4.4	10.7	7.8	16.9	3.6	7.9	1.2	.5	.7	.0	1.2	7.7
24	3.9	9.1	8.3	17.6	3.1	8.0	1.0	.4	.4	.7	.8	8.0
25	3.3	9.0	8.9	17.3	3.6	9.0	2.4	.8	.3	3.7	.8	8.2
26	2.9	8.7	9.5	17.0	5.8	9.9	3.1	1.3	.3	5.6	.7	6.5
27	2.4	8.1	9.6	17.1	5.0	11.6	2.1	.9	.3	5.5	1.7	4.8
28	2.2	7.4	9.8	16.0	3.4	16.7	1.7	.7	.2	3.0	3.5	3.8
29	2.0	....	10.2	13.6	3.0	20.0	1.7	.5	.2	2.1	5.3	3.4
30	1.8	....	10.4	11.4	2.2	20.8	5.9	.5	0.0	1.9	3.4	3.3
31	1.7	....	10.2	....	1.9	....	5.2	.8	....	1.3	....	8.4

YELLOW RIVER AT ALMON, GEORGIA.

This station, which was established September 12, 1897, is described in Water-Supply Paper No. 36, page 134. During the year 1900 the bridge was washed away and a new bridge was built, but the gage was preserved and a new gage was referred to the same datum. It is attached to the post of a bridge bent near the left bank, and is referred to a bench mark on a sycamore tree on the left bank 40 yards above the bridge, a railroad spike in the tree being 7 feet above the zero of the gage. The gage was verified December 22, 1900. Records of measurements at this station during 1899 will be found in the Twenty-first Annual Report, Part IV, page 137. During 1900 the following measurements of the discharge at Almon were made by B. M. Hall and his assistants:

April 19: Gage height, 9 feet; discharge, 3,295 second-feet.
November 30: Gage height, 2.40 feet; discharge, 341 second-feet.
December 22: Gage height, 4.50 feet; discharge, 966 second-feet.

Daily gage height, in feet, of Yellow River at Almon, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	2.0	4.5	3.1	3.7	2.4	4.0	3.4	3.0	2.0	2.0	2.4
2	1.9	2.0	4.5	3.0	3.8	2.4	5.0	2.7	3.0	2.0	2.0	2.3
3	1.9	2.0	3.5	3.0	7.2	2.4	5.0	2.5	2.5	2.0	2.0	2.3
4	1.9	2.0	3.4	3.0	6.9	2.4	4.7	2.3	2.3	2.5	4.3	7.5
5	2.0	2.5	3.2	3.0	4.0	3.4	4.0	2.3	2.1	2.5	4.0	7.0
6	2.0	2.7	3.0	3.0	3.6	4.0	3.5	2.2	2.1	2.8	3.0	5.0
7	2.0	2.5	3.0	2.9	3.4	3.4	3.0	2.1	2.0	3.5	2.5	3.5
8	2.0	2.5	4.7	2.9	3.2	6.7	3.0	2.0	2.0	4.0	2.0	3.0
9	2.0	3.5	10.0	2.9	3.1	4.4	3.0	2.0	2.0	3.0	2.0	2.9
10	2.3	5.7	6.0	2.9	3.0	3.3	3.0	2.0	2.0	2.7	2.0	2.8
11	2.9	5.9	4.0	3.9	3.0	3.1	3.0	1.9	2.0	2.4	2.0	2.8
12	4.4	15.0	3.8	4.7	3.0	2.9	3.0	1.9	2.0	2.4	2.0	2.9
13	3.5	20.0	3.6	4.0	2.9	2.8	3.0	1.9	2.0	2.4	2.0	2.7
14	3.0	15.0	3.4	3.4	2.8	3.2	3.0	1.9	3.0	2.3	2.0	4.0
15	2.5	7.0	3.3	3.0	2.8	3.0	3.0	2.5	8.0	2.3	2.0	3.5
16	2.5	5.0	3.8	2.0	2.8	4.0	2.8	2.3	7.0	2.2	2.0	3.2
17	2.4	4.9	3.4	3.0	2.8	6.0	2.7	2.2	4.0	2.1	2.0	3.0
18	3.4	4.7	3.0	8.0	2.7	5.0	2.6	2.0	3.0	2.0	2.0	2.8
19	4.0	3.6	3.4	9.0	3.5	4.0	2.5	2.0	2.5	2.0	2.0	2.8
20	4.3	4.7	5.0	6.8	2.8	3.5	2.0	2.0	2.0	2.0	2.0	5.0
21	3.6	3.9	4.3	12.0	2.8	3.2	2.0	2.0	2.0	2.0	2.0	6.5
22	3.0	3.8	3.7	10.0	2.6	3.0	2.0	2.5	2.0	2.0	2.0	4.5
23	2.8	3.7	3.4	6.0	2.6	7.5	2.0	2.5	2.0	3.0	2.0	3.5
24	2.6	3.7	3.7	7.2	4.0	11.0	2.0	2.4	2.0	3.0	2.0	3.5
25	2.5	3.7	5.5	12.0	3.0	11.0	2.5	2.3	2.0	2.5	2.0	3.5
26	2.4	3.8	8.0	6.8	2.8	12.0	2.0	2.0	2.0	2.3	4.5	3.0
27	2.3	3.8	6.0	6.0	2.6	9.0	3.0	2.0	2.0	2.0	3.5	3.0
28	2.2	3.8	4.4	5.8	2.4	9.5	3.5	2.0	2.0	2.0	2.5	2.9
29	2.1	....	4.0	5.4	2.4	6.3	3.5	2.0	2.0	2.0	2.4	2.9
30	2.0	....	3.5	4.3	2.4	5.0	5.0	2.0	2.0	2.0	2.4	4.0
31	2.0	....	3.2	....	2.4	....	4.0	5.0	....	2.0	....	7.5

TOWALIGA RIVER NEAR JULIETTE, GEORGIA.

This station was established on the Southern Railway bridge 2½ miles north of Juliette, Georgia, May 5, 1899, but observations of gage heights were not started until November 2, 1899. A description of the station will be found in Water-Supply Paper No. 36, page 136. Bench mark No. 1 is an iron girder 40 feet from the left end of the bridge and is 37.30 feet above gage datum. W. L. Jackson, a farmer living near the station (post-office address, Berner, Georgia), is the observer. Records of measurements made during 1899 will be found in Water-Supply Paper No. 36, page 136. During 1900 the following measurements were made by B. M. Hall and his assistants:

February 17: Gage height, 6.35 feet; discharge, 1,025 second-feet.
April 3: Gage height, 2.60 feet; discharge, 348 second-feet.
December 8: Gage height, 2.75 feet; discharge, 468 second-feet.

Daily gage height, in feet, of Towaliga River near Juliette, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.2	2.0	2.9	1.8	3.1	2.0	4.0	2.2	4.5	0.9	1.3	1.9
2	2.2	1.9	4.3	1.6	3.6	2.1	4.0	2.2	1.5	1.0	2.0	1.9
3	2.0	1.9	3.1	2.6	4.9	2.1	3.5	1.7	1.9	1.4	8.2	4.7
4	2.0	2.1	2.8	2.8	3.3	3.7	3.5	1.7	1.6	2.1	7.0	4.0
5	1.9	2.7	2.4	2.6	3.1	2.9	4.1	2.3	1.5	3.4	6.4	3.4
6	1.9	2.6	2.4	2.5	2.6	2.5	3.5	1.7	1.3	3.6	3.5	3.0
7	1.9	2.3	1.4	2.7	2.6	3.2	3.3	1.5	1.2	3.9	2.2	3.0
8	1.9	1.4	2.9	2.6	2.5	5.2	4.2	1.3	1.0	3.8	2.1	2.4
9	1.9	2.4	3.4	2.5	2.5	2.4	4.0	1.2	1.0	1.7	2.1	2.4
10	1.9	7.3	2.8	2.5	2.5	2.6	4.0	1.2	1.0	1.5	2.0	2.3
11	1.9	11.8	2.3	3.4	2.4	2.9	3.8	1.2	1.0	1.5	2.0	2.0
12	2.7	14.1	1.3	5.7	2.4	2.3	3.7	1.1	1.0	1.6	1.9	2.0
13	2.8	14.8	2.0	4.0	2.4	2.3	4.4	1.3	1.0	1.7	1.9	2.3
14	2.3	16.3	1.1	2.9	2.3	2.4	3.7	1.0	2.4	1.7	1.9	9.0
15	2.2	16.3	1.0	2.8	2.3	2.3	2.2	1.7	8.0	1.5	1.9	7.4
16	2.1	8.3	4.0	2.7	2.2	2.9	2.0	1.5	6.4	1.4	1.8	4.0
17	2.0	4.8	3.1	2.7	2.2	3.3	1.8	1.3	4.2	1.3	1.8	3.6
18	2.1	3.8	2.3	12.8	2.2	3.8	1.0	1.9	3.1	1.1	1.8	3.0
19	2.8	3.3	1.1	17.8	2.2	4.1	1.0	1.3	2.9	1.1	2.0	2.6
20	3.2	3.2	3.3	14.8	2.2	5.2	1.0	1.2	2.0	1.1	1.9	6.4
21	2.9	2.4	3.1	7.8	2.2	2.2	1.0	1.1	1.4	1.1	1.8	7.5
22	2.5	4.0	2.3	12.8	2.1	1.9	1.5	0.8	1.3	1.1	1.8	5.5
23	2.3	3.3	2.2	5.5	2.1	2.2	1.5	0.9	1.2	2.4	1.9	3.5
24	2.2	2.9	2.7	4.8	2.8	9.8	2.2	2.1	1.3	3.6	1.9	3.5
25	2.2	2.4	3.4	4.1	2.9	10.8	1.9	3.0	1.3	3.5	2.5	2.8
26	2.1	3.0	4.0	3.6	2.5	8.8	1.6	4.3	1.2	2.9	4.4	2.7
27	2.0	2.9	3.6	3.4	2.4	6.8	2.4	2.6	1.2	2.1	3.1	2.5
28	2.1	2.4	2.8	3.2	2.4	6.6	2.5	1.5	1.1	1.5	2.4	2.5
29	2.0	....	2.4	3.3	2.2	6.2	4.0	1.2	1.1	1.3	2.3	2.3
30	2.0	....	2.4	3.2	2.1	4.2	5.1	1.6	0.8	1.2	1.9	3.4
31	2.1	....	2.1	....	2.1	....	3.4	5.5	....	1.2	....	4.3

OCMULGEE RIVER AT MACON, GEORGIA.

This station was established by the United States Weather Bureau January 21, 1893, and measurements were begun by the United States Geological Survey in 1895. The station is described in Water-Supply Paper No. 36, page 136. During the year 1900 Mr. T. S. Collins, of the United States Weather Bureau, put in a new gage on the center pier of the bridge on which the old gage was placed, and referred it to the same datum as the old gage. The old gage is still in place, is in good condition, and is still used except during low water, when mud accumulates around its base at a higher level than the river. The new gage was put in to save cleaning away the mud from the bottom of the old gage. Records of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 139. During 1900 the following measurements were made by B. M. Hall and his assistants:

April 13: Gage height, 7.38 feet; discharge, 4,855 second-feet.
November 20: Gage height, 2.40 feet: discharge, 1,369 second-feet.
December 6: Gage height, 8.65 feet; discharge, 5,698 second-feet.
December 21: Gage height, 12.82 feet; discharge, 9,621 second-feet.

Daily gage height, in feet, of Ocmulgee River at Macon, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.6	1.6	9.2	5.2	6.1	2.9	9.6	6.1	10.5	1.8	2.0	2.7
2	1.5	1.5	9.4	4.9	7.3	2.9	8.3	4.4	5.8	1.8	3.2	2.6
3	1.2	1.5	7.7	4.8	8.6	3.2	13.3	4.2	5.0	1.7	2.8	2.5
4	1.2	1.5	6.2	4.6	8.0	3.8	11.2	3.7	3.5	2.2	12.3	8.4
5	1.2	2.8	5.8	4.5	7.3	4.6	8.3	3.4	2.7	4.1	8.2	11.5
6	1.5	2.9	5.5	4.5	6.4	6.4	6.4	3.1	2.5	3.6	4.9	9.3
7	1.4	2.5	5.3	4.3	5.6	8.0	5.5	3.0	2.4	5.0	3.6	6.4
8	1.4	2.3	7.0	4.3	4.4	8.9	4.9	2.8	2.1	4.6	3.2	4.8
9	1.3	3.2	7.8	4.1	4.1	7.7	5.0	2.6	2.2	2.7	2.8	4.2
10	1.3	8.3	9.7	4.1	4.1	6.6	4.5	2.5	2.1	3.2	2.6	3.7
11	1.9	16.1	8.1	4.3	4.1	5.5	4.3	2.4	2.0	2.6	2.5	3.3
12	2.9	18.7	6.4	7.0	4.0	5.2	4.8	2.3	2.0	2.5	2.4	3.2
13	4.2	19.0	5.8	7.6	3.9	3.8	5.3	2.4	1.8	2.4	2.3	3.0
14	3.7	21.7	5.3	6.1	3.8	3.7	4.9	2.6	1.7	2.7	2.2	8.5
15	2.6	19.5	5.3	5.3	3.6	3.2	4.5	2.4	4.7	2.6	2.2	12.5
16	2.2	15.5	10.4	4.8	3.4	8.6	4.0	2.4	13.3	2.4	2.2	8.5
17	2.0	11.4	7.3	4.3	3.4	8.8	3.9	2.6	10.5	2.2	2.1	4.6
18	2.0	8.5	5.8	5.0	3.3	10.9	3.7	2.7	6.0	2.1	2.1	4.4
19	2.9	7.4	5.2	18.0	4.1	11.2	3.5	2.7	4.0	2.0	2.1	3.9
20	3.8	6.8	8.0	15.6	4.0	8.0	3.5	2.6	3.3	1.9	2.0	4.0
21	4.6	8.2	7.7	13.9	3.7	5.3	3.4	2.4	2.7	1.9	2.4	12.8
22	3.9	8.9	6.6	16.0	3.5	4.0	3.3	2.3	2.5	1.9	2.4	12.1
23	3.1	7.7	5.6	13.9	3.3	4.0	3.4	2.2	2.4	2.1	2.5	8.6
24	2.7	6.4	7.3	13.2	4.6	16.0	3.9	3.6	2.3	8.3	2.7	6.5
25	2.5	7.3	7.9	13.0	4.8	20.2	3.4	4.1	2.3	4.2	2.5	5.5
26	2.2	6.5	10.5	12.4	4.2	20.0	3.3	4.3	2.2	3.7	7.1	4.8
27	2.0	5.9	10.9	9.8	3.8	16.4	4.2	3.8	2.0	2.9	5.5	4.1
28	2.0	5.5	7.8	7.6	3.3	14.0	4.5	2.7	2.0	2.5	4.3	3.9
29	1.9	......	7.4	7.0	3.1	12.7	5.6	2.4	2.0	2.4	3.2	3.7
30	1.7	......	6.6	6.3	3.0	10.4	6.3	2.3	1.9	2.3	2.9	3.8
31	1.6	......	5.8	......	2.9	......	8.0	3.8	......	2.1	......	7.5

FLINT RIVER AT ALBANY, GEORGIA.

This station, which is described in Water-Supply Paper No. 36, page 138, was originally established by the United States Weather Bureau on April 10, 1893, and has been maintained from that date to the present time. In 1898 the gage was washed out by a freshet, but soon afterwards it was replaced. The present rod is located at the foot of Broad street, just below the county bridge. It is a pine board, and is in two sections. The first section, which reads from 0 to 18.6 feet, is spiked to a cypress stump which stands at the edge of the water; the second section, which reads from 18.7 feet to 30 feet, is spiked to a cypress pole. The bench marks are as follows: (1) The top of the rail at the railroad station of the Plant System, being 42.2 feet above the zero of the gage and 184 feet above mean sea level, making the elevation of the zero of the rod 141.8 feet above sea level; (2) a cut in the lower iron pier of the county bridge 10 feet above gage datum and 151.8 feet above mean sea level; and (3) a spike in the corner of Mase & Company's warehouse, corner of Broad and Front streets, 53.8 feet above gage datum. The highest water recorded was on March 25, 1897, when the height of 31.6 feet was reached, and the lowest point recorded since the commencement of the record was on October 9, 1895, when the reading was −0.9 foot. The danger line is at 20 feet. Discharge measurements are made at the county highway bridge in Albany, a steel structure in two spans of 130 feet each, with two approaches of 315 and 205 feet, respectively.

Kinchafoonee and Muckalee creeks are two important tributaries of Flint River. They unite about 2 miles north of Albany, forming Big Muckalee Creek, which enters Flint River on the west side within the city limits. There is a wagon bridge over the Kinchafoonee about 1 mile above its junction with the Muckalee, and a similar bridge on the Muckalee 1¾ miles above its mouth and about 300 yards below the mouth of the Kinchafoonee. Measurements will be made at these bridges whenever Flint River is measured at Albany. No discharge measurements were made at this point during 1900 or in previous years, but measurements will be made during 1901.

Daily gage height, in feet, of Flint River at Albany, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.7	1.8	9.1	11.1	9.4	1.1	15.8	4.2	1.3	0.9	3.0	2.5
2	4.3	1.9	9.2	10.0	10.2	1.3	16.0	4.2	1.5	1.0	3.4	1.9
3	3.0	2.3	9.3	9.1	11.1	1.3	16.0	3.8	1.9	1.0	3.7	1.8
4	3.3	2.3	9.5	8.3	11.0	1.2	15.2	3.4	2.4	1.2	3.9	2.3
5	2.9	2.6	9.6	7.2	10.3	1.4	13.0	2.8	2.9	1.6	4.6	2.7
6	2.6	2.9	9.3	6.1	9.7	1.7	10.3	2.2	3.4	1.9	5.7	2.9
7	2.3	3.4	9.2	5.9	6.2	2.1	2.0	1.6	3.7	2.1	4.8	3.4
8	1.7	3.8	8.9	5.4	4.7	2.5	6.1	1.0	3.7	2.9	4.9	3.8
9	1.3	4.8	9.1	4.7	3.8	2.9	5.3	.8	3.8	3.1	5.6	4.1
10	1.2	6.4	9.2	4.3	3.9	3.5	4.9	1.2	3.6	3.1	3.7	4.7
11	1.2	9.8	9.1	4.3	4.5	3.5	4.0	1.0	3.7	3.1	2.9	5.2
12	1.7	14.3	9.0	4.3	4.9	3.6	3.8	.8	3.6	3.7	2.1	6.1
13	2.3	18.1	8.9	4.5	5.2	3.8	4.4	.8	3.7	3.9	1.7	6.9
14	2.8	20.0	8.9	4.7	5.2	4.3	4.9	.8	3.9	4.1	1.3	7.1
15	3.3	21.3	9.7	4.9	5.1	3.4	5.0	.9	4.3	4.5	1.2	7.1
16	3.1	22.4	10.5	5.4	4.6	2.0	5.4	.8	4.5	4.2	1.2	7.4
17	2.9	26.2	10.8	5.9	4.1	2.1	5.8	1.0	4.6	4.2	1.1	7.4
18	2.8	29.0	11.2	7.8	3.8	2.4	4.6	1.2	4.6	4.3	.9	7.8
19	2.8	29.0	11.2	8.6	3.1	2.4	3.1	1.2	4.3	4.3	.9	8.2
20	2.9	28.1	12.1	10.7	2.6	2.4	2.4	1.3	4.1	4.2	.9	8.5
21	3.0	26.4	12.2	11.2	2.4	2.5	1.6	1.4	3.7	4.3	1.0	8.9
22	3.3	23.1	12.1	12.1	2.0	2.8	1.4	1.2	3.5	4.3	1.3	8.9
23	3.4	21.0	12.1	13.6	2.0	2.9	1.5	1.0	3.5	4.4	1.4	9.1
24	3.7	17.2	12.2	14.3	1.9	3.3	1.6	.9	3.1	4.5	1.5	9.0
25	3.5	13.3	12.2	14.9	1.7	3.9	1.4	.9	2.7	4.2	1.7	9.0
26	3.1	11.2	16.3	15.2	1.4	4.2	1.7	.9	2.3	4.0	2.2	8.7
27	2.5	9.0	16.9	12.1	1.3	5.3	1.6	.8	1.1	3.7	2.4	8.6
28	2.2	9.0	16.0	11.3	1.2	7.5	1.9	.8	1.0	3.6	2.7	8.4
29	2.0	......	15.1	9.0	1.2	8.2	2.7	.9	1.0	3.4	2.7	8.9
30	1.9	......	13.4	8.9	1.0	12.5	2.9	.9	.9	3.2	2.8	9.4
31	1.3	......	11.6	......	1.0	......	3.9	1.1	......	3.1	......	10.3

FLINT RIVER AT WOODBURY, GEORGIA.

Measurements of the flow of Flint River were made during 1897 and 1898 at Molina, Georgia, but the river bed was so shifting that the station was discontinued on June 2, 1898. Records of the measurements made at Molina will be found as follows: For 1897, Nineteenth Annual Report, Part IV, page 234; for 1898, Twentieth Annual Report, Part IV, page 233. A gage has been maintained at Albany, Georgia, by the United States Weather Bureau, as described in Water-Supply Paper No. 36, page 138. Two measurements were made in 1899 at the Macon and Birmingham bridge near Woodbury, Georgia, 5 miles below the Molina station. On March 29, 1900, a gage was put in near this bridge, and the station was reestablished. The gage is a vertical rod fastened to a willow tree on the left bank of the river about 300 feet above the bridge, and is referred to the bench mark (the top of the iron girder under the cross-ties at a point 12 feet to the left of the center pier), which is 27 feet above the zero of the gage, the zero of the gage being 659.6 feet above sea level. This gage was maintained by the Georgia geological survey until November 1, 1900, when it was adopted by the United States Weather Bureau as a half-year station, instead of the one at Reynolds, Georgia. During 1900 the following measurements were made by B. M. Hall and his assistants:

March 29: Gage height, 2.20 feet; discharge, 2,329 second-feet.
May 2: Gage height, 2.85 feet; discharge, 3,220 second-feet.
December 12: Gage height, 0.85 foot; discharge, 998 second-feet.
December 21: Gage height, 4.35 feet; discharge, 5,423 second-feet.

Daily gage height, in feet, of Flint River at Woodbury, Georgia, for 1900.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.3	1.9	0.6	2.9	2.5	0.4	0.2	0.4	0.7
2		1.2	1.5	.5	2.8	1.7	.7	.1	1.2	.6
3		1.2	1.3	.6	4.5	1.2	.6	.2	2.0	.5
4		1.1	1.4	1.0	4.3	1.0	.4	.5	3.3	1.8
5		1.1	1.2	1.4	3.7	1.2	.3	1.5	2.8	2.3
6		1.1	1.0	1.6	2.4	.8	.2	1.8	1.3	2.1
7		1.0	.9	1.5	1.8	.6	.2	1.2	1.0	1.8
8		1.0	.8	1.4	1.4	.5	.2	1.0	.8	1.4
9		1.0	.7	1.8	1.1	.4	.1	1.8	.7	1.3
10		1.2	.8	1.8	1.0	.4	.1	.7	.6	1.0
11		1.3	.6	1.6	.9	.3	.2	.5	.5	.9
12		2.1	.7	1.0	1.6	.3	.2	.5	.6	.8
13		2.4	.7	.7	1.5	.7	.1	.6	.5	.8
14		2.1	.6	.6	1.6	.4	.1	.6	.5	2.4
15		1.6	.6	.5	1.3	.3	1.3	.5	.5	3.3
16		1.4	.5	1.0	1.0	.4	1.6	.4	.4	2.7
17		1.2	.6	4.1	.8	.4	1.5	.4	.5	2.1
18		2.0	.5	4.0	.7	.5	1.3	.3	.5	1.6
19		4.6	1.0	3.8	.6	.4	1.1	.2	.6	1.3
20		5.2	.8	6.0	.5	.3	.8	.2	.5	2.1
21		5.8	.7	5.0	.8	.3	.4	.3	.6	4.3
22		5.0	.6	2.4	.6	.2	.3	.3	.7	3.9
23		2.8	.5	2.0	.5	.1	.3	.6	.6	3.5
24		2.6	1.0	9.0	1.1	.2	.2	.9	.7	2.8
25		2.4	1.5	8.5	.8	.1	.3	1.0	.7	2.1
26		2.2	1.3	8.0	1.0	.3	.2	1.1	1.5	1.7
27		1.9	.9	7.0	1.2	.3	.2	.7	1.6	1.4
28		1.7	.7	5.9	1.2	.2	.2	.5	1.2	1.3
29	2.2	1.5	.6	5.1	1.6	.2	.2	.4	1.0	1.2
30	1.9	1.2	.5	4.1	2.4	.3	.1	.4	.8	1.3
31	1.6		.5		3.0	.4		.3		2.2

CHATTAHOOCHEE RIVER AT OAKDALE, GEORGIA.

Two gaging stations are maintained on Chattahoochee River, one at Oakdale, 8 miles northwest of Atlanta, and the other at West Point, Georgia, where the river reaches the Alabama State line. The station at Oakdale was established October 17, 1895, and is described in Water-Supply Paper No. 36, page 139. The results of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 140. During 1900 the following measurements were made by B. M. Hall and his assistants:

January 4: Gage height, 1.53 feet; discharge, 1,784 second-feet.
March 27: Gage height, 5.85 feet; discharge, 5,504 second-feet.
July 6: Gage height, 4 feet; discharge, 3,886 second-feet.
September 12: Gage height, 1.08 feet; discharge, 1,456 second-feet.
November 29: Gage height, 2.32 feet; discharge, 2,334 second-feet.

Daily gage height, in feet, of Chattahoochee River at Oakdale, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.0	1.0	4.5	3.4	5.0	3.0	5.0	5.0	2.0	2.1	2.4	2.2
2	.7	1.0	5.9	3.1	4.8	3.7	4.5	4.5	2.0	2.1	2.4	2.2
3	.5	.9	4.3	3.0	4.5	4.0	6.0	4.0	2.0	2.1	3.0	2.1
4	.5	.9	3.6	2.7	4.0	4.7	7.5	4.0	1.9	3.0	2.8	2.3
5	.9	2.9	3.3	2.7	3.9	4.0	7.0	4.0	1.7	3.4	2.7	4.1
6	1.2	3.5	3.1	2.8	3.0	3.8	6.5	3.5	1.8	3.8	2.5	4.0
7	1.3	2.2	3.0	2.8	3.0	4.7	6.4	3.5	1.8	4.0	2.5	4.0
8	1.3	1.9	8.8	2.7	3.0	9.7	6.0	3.5	1.8	4.0	2.5	3.8
9	1.2	3.8	7.9	2.7	2.9	10.5	5.8	3.0	1.7	3.9	2.4	3.7
10	1.1	4.3	6.9	2.6	2.9	8.0	5.7	3.0	1.7	3.5	2.4	3.5
11	2.0	7.4	5.5	3.0	2.8	5.0	5.6	3.0	1.5	3.5	2.4	2.1
12	3.9	8.0	4.0	6.4	2.7	4.0	5.4	3.0	1.5	3.9	2.4	2.0
13	3.0	15.5	3.1	5.4	2.7	4.5	5.2	3.0	4.3	4.3	2.3	2.0
14	2.8	20.7	3.2	4.2	2.6	4.0	5.0	3.0	8.4	4.2	2.2	2.3
15	2.2	16.4	3.0	3.8	2.6	3.5	4.5	3.0	10.2	4.0	2.1	2.3
16	1.9	6.0	5.0	3.3	2.6	3.0	4.4	2.7	8.2	3.6	2.1	2.2
17	1.7	4.8	3.6	4.0	2.5	3.5	4.3	3.0	6.0	3.4	2.0	2.1
18	1.8	3.8	3.0	6.9	3.5	4.5	4.2	4.0	3.1	3.2	2.0	2.1
19	2.9	3.5	4.5	9.0	3.7	6.0	4.1	3.5	3.0	3.0	1.8	2.0
20	4.0	3.1	5.9	7.3	3.0	6.5	4.0	3.5	2.8	3.0	1.5	2.3
21	5.8	3.0	6.6	6.3	3.1	8.0	3.9	3.0	2.8	2.8	1.5	2.6
22	4.8	4.2	4.8	7.0	3.2	9.0	3.8	3.0	2.7	3.0	1.8	2.8
23	2.9	4.3	4.1	6.3	3.7	13.6	3.7	3.0	2.5	3.3	2.0	2.7
24	3.0	3.8	3.5	13.6	3.9	18.0	3.7	3.0	2.3	3.3	1.9	3.0
25	2.6	4.1	7.7	7.5	3.7	17.5	4.0	2.7	2.3	3.0	1.8	2.8
26	1.9	4.0	7.5	6.0	3.5	11.4	5.0	2.7	2.0	3.0	1.8	2.7
27	1.7	3.3	6.0	5.5	3.4	10.5	6.0	2.6	2.0	2.9	5.6	2.5
28	1.5	3.0	4.5	5.0	3.2	7.5	6.5	2.5	1.8	2.8	3.3	2.3
29	1.5	......	4.0	5.0	3.0	6.0	7.4	3.0	1.5	2.6	2.3	2.3
30	1.4	......	3.8	5.0	2.5	5.5	10.0	3.0	1.5	2.4	2.0	3.0
31	1.3	......	3.5	......	2.4	......	6.0	2.7	......	2.4	......	3.8

CHATTAHOOCHEE RIVER AT WEST POINT, GEORGIA.

This station was established July 30, 1896, on the highway bridge in West Point, Georgia, about 500 feet below the railroad bridge. It is described in Water-Supply Paper No. 36, page 142. The gage was last verified December 4, 1900. The observer is C. E. Melton. The results of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 141. During 1900 the following measurements were made by B. M. Hall and his assistants:

January 20: Gage height, 4.65 feet; discharge, 6,574 second-feet.
February 24: Gage height, 4.92 feet; discharge, 7,158 second-feet.
August 22: Gage height, 2.80 feet; discharge, 2,755 second-feet.
December 4: Gage height, 3.93 feet; discharge, 5,224 second-feet.

Daily gage height, in feet, of Chattahoochee River at West Point, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.00	2.80	5.90	4.10	4.90	3.40	6.30	6.40	4.10	2.60	2.80	3.70
2	2.80	2.60	4.70	4.10	4.80	3.30	9.40	5.70	6.10	2.50	2.70	3.20
3	2.50	2.40	4.60	4.05	4.60	3.30	7.80	5.00	4.50	2.50	4.60	3.10
4	2.50	3.00	5.00	4.05	4.40	3.60	7.00	4.50	3.20	2.60	4.20	3.90
5	2.40	3.00	4.80	4.00	4.30	5.00	6.50	4.00	3.00	3.80	4.30	4.50
6	2.80	4.60	4.50	3.95	4.20	4.80	6.20	3.60	2.90	4.00	3.60	5.80
7	2.90	4.50	4.20	3.90	4.00	4.30	5.40	3.40	2.80	4.20	3.40	5.90
8	2.80	4.20	5.00	3.90	3.80	5.10	5.00	3.20	2.70	3.70	3.20	4.60
9	2.80	4.60	8.10	3.85	3.60	8.10	5.10	3.10	2.60	3.50	3.10	3.90
10	2.70	7.30	7.50	3.80	3.60	8.50	4.20	3.00	2.50	3.40	3.00	3.60
11	3.40	8.60	6.30	4.90	3.50	5.80	4.00	2.90	2.40	3.40	3.00	3.30
12	4.70	12.20	5.60	6.10	3.40	4.60	3.60	2.80	2.30	3.60	2.90	3.20
13	4.40	19.12	4.70	6.70	3.40	6.50	5 40	3.40	2.20	3.80	2.90	3.10
14	4.70	19.50	4.50	6.00	3.40	3.90	5.00	3.80	2.30	3.70	2.80	4.90
15	4.90	18.50	4.30	5.50	3.30	4.20	4.80	3.00	9.20	3.20	2.80	4.20
16	4.60	12.40	4.50	4.20	3.30	6.40	4.50	3.00	12.60	3.00	2.70	3.70
17	3.70	5.90	4.30	4.00	3.20	6.00	4.30	2.90	8.80	3.00	2.70	3.50
18	3.40	5.50	4.10	6.00	3.20	7.00	4.10	2.90	8.00	2.90	2.70	3.30
19	3.90	4.70	5.00	7.70	3.70	8.40	4.00	2.80	5.70	2.90	2.70	3.00
20	4.60	4.50	5.20	8.50	3.60	6.00	3.80	2.80	4.30	2.80	2.70	5.80
21	4.80	4.60	5.20	7.40	3.50	4.50	3.60	2.80	3.20	2.80	2.60	6.50
22	5.10	4.60	6.30	7.00	3.40	3.80	3.50	2.80	3.00	3.00	2.80	6.40
23	4.20	4.70	6.20	7.50	3.40	4.60	3.80	2.90	2.90	4.60	2.90	6.00
24	3.80	4.80	5.80	7.00	5.00	16.40	3.70	3.50	2.80	5.00	3.00	5.30
25	3.70	4.80	6.10	9.20	4.40	17.80	3.60	3.80	2.80	4.90	3.20	4.80
26	3.30	5.00	6.50	8.00	4.20	14.60	3.60	3.40	2.70	3.40	3.80	4.20
27	3.20	4.60	5.80	6.00	4.00	12.20	4.00	3.20	2.70	3.20	4.50	4.10
28	3.00	4.90	5.40	4.80	3.60	8.40	6.10	3.00	2.70	3.00	4.00	3.90
29	3.00	....	5.30	4.50	3.50	5.60	6.70	2.90	2.60	2.90	5.00	3.60
30	2.90	....	5.10	5.20	3.40	6.70	12.60	3.30	2.60	2.80	4.60	3.80
31	2.90	....	4.50	....	3.40	......	9.20	3.90	....	2.80	....	7.20

ETOWAH RIVER AT CANTON, GEORGIA.

This station was established by the United States Weather Bureau March 12, 1892. It is located on the iron highway bridge about 1,000 feet north of the Atlanta, Knoxville and Northern Railway station at Canton and about a half mile north of Canton Creek. The gage is a vertical timber attached to the upstream side of the left-bank pier of the bridge, and is graduated to feet and tenths. Owing to high water at the time the gage was put in it was set 1 foot higher than intended. Recognizing the error, the gage-height records were begun by adding 1 foot to the actual readings. It was the intention to lower the gage as soon as the water went down, but this has not been done, so that all of the gage heights and discharge measurements have been based on the rod with the zero point set 1 foot lower than the actual rod. The gage will probably be lowered to its proper place during the year 1901. This station is described in Water-Supply Paper No. 36, page 143. Records of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 145. During 1900 the following measurements were made by B. M. Hall and his assistants:

February 27: Gage height, 0.80 foot; discharge, 1,113 second-feet.
May 19: Gage height, 1.05 feet; discharge, 1,351 second-feet.
December 1: Gage height, 0.55 foot; discharge, 816 second-feet.

Daily gage height, in feet, of Etowah River at Canton, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.6	0.6	0.8	1.4	1.2	1.4	1.7	1.0	0.6	0.3	1.3	0.6
2	.6	.8	.8	1.0	1.2	1.4	1.7	1.0	.6	.2	1.4	.6
3	.6	1.0	.8	.8	1.2	2.4	1.8	1.0	.6	.2	1.6	.5
4	.6	1.0	.8	.8	1.2	2.0	1.8	1.0	.6	1.6	1.6	2.8
5	.6	1.2	.8	.8	1.1	3.0	1.8	1.0	.6	1.5	1.4	2.6
6	.6	1.2	.8	.8	1.1	3.0	2.4	.8	.6	1.3	1.4	1.3
7	.6	1.2	.8	.8	1.1	6.0	2.2	.8	.6	1.3	1.4	1.0
8	.6	2.7	3.4	.8	1.1	6.0	1.8	.8	.6	2.2	1.4	.8
9	.6	2.5	5.4	.8	1.1	4.0	1.3	.8	.6	3.1	1.4	.8
10	.6	1.8	2.2	.8	1.0	(*a*)	1.2	.6	.6	2.0	1.4	.7
11	.6	2.7	1.6	.8	1.0	(*a*)	1.0	.6	.6	2.0	1.4	.6
12	1.6	14.2	1.0	2.3	1.0	(*a*)	1.0	.6	.6	2.0	1.4	.6
13	1.0	6.0	.9	2.6	1.0	(*a*)	1.0	.6	.6	2.6	1.4	.5
14	.6	3.1	.8	2.2	1.0	(*a*)	3.0	.6	.6	2.3	1.4	.4
15	.6	2.0	.8	2.0	.9	(*a*)	1.8	.6	3.6	2.0	1.2	.4
16	.4	1.5	.9	1.8	.9	(*a*)	1.2	.8	5.0	1.5	1.2	.4
17	.4	1.5	.9	1.8	.9	(*a*)	1.2	1.7	3.1	1.4	1.2	.4
18	.4	1.0	.9	2.3	.9	(*a*)	1.2	2.3	2.3	1.3	1.2	.3
19	1.0	1.0	.9	3.6	1.2	(*a*)	1.0	2.3	1.6	1.0	1.4	.3
20	1.0	1.0	5.2	2.0	1.1	(*a*)	1.0	2.0	1.4	1.0	2.1	2.3
21	.4	1.0	3.6	5.0	1.0	(*a*)	1.0	1.0	.8	1.0	4.6	2.1
22	.4	1.0	1.8	3.0	1.0	(*a*)	1.0	1.0	.7	1.0	3.7	1.3
23	.4	1.0	1.8	2.0	1.0	(*a*)	1.0	1.0	.6	2.6	3.0	1.0
24	.4	1.0	2.8	4.0	1.8	(*a*)	1.0	3.0	.6	7.2	2.1	1.0
25	.4	1.0	2.1	2.0	1.4	(*a*)	1.0	2.0	.6	3.5	2.0	1.0
26	.4	1.0	3.6	1.8	1.2	(*a*)	1.0	1.0	.6	2.7	4.0	.8
27	.4	.8	2.0	1.6	1.2	(*a*)	1.5	.6	.6	2.5	2.2	.8
28	.4	.8	2.0	1.0	1.0	(*a*)	2.8	.6	.4	2.0	2.0	.7
29	.4	....	2.0	1.0	1.0	(*a*)	3.5	.6	.4	1.8	1.0	.7
30	.4	....	1.9	1.4	1.0	(*a*)	4.0	.6	.3	1.4	.7	.7
31	.6	....	1.9	....	1.0	....	2.0	.6	....	1.3	....	2.3

a No record.

COOSAWATTEE RIVER AT CARTERS, GEORGIA.

This station was established August 15, 1896, at the iron highway bridge at Carters, Murray County, Georgia, about 20 miles northeast of Calhoun. The gage was last verified November 17, 1900. The station is described in Water-Supply Paper No. 36, page 144. Records of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 146. During 1900 the following measurements were made by O. P. Hall and Max Hall:

April 28: Gage height, 2.60 feet; discharge, 1,075 second-feet.
May 11: Gage height, 2.15 feet; discharge, 811 second-feet.
May 24: Gage height, 2.05 feet; discharge, 781 second-feet.
August 13: Gage height, 1.58 feet; discharge, 576 second-feet.
September 7: Gage height, 1.25 feet; discharge, 423 second-feet.
November 17: Gage height, 1.37 feet; discharge, 458 second-feet.
November 26: Gage height, 4.08 feet; discharge, 1,899 second-feet.
December 22: Gage height, 2.70 feet; discharge, 1,132 second-feet.

Daily gage height, in feet, of Coosawattee River at Carters, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Nov.	Dec.
1	1.20	1.40	3.00	2.40	2.70	1.90	3.50	2.00	(*a*)	1.40
2	1.20	1.40	3.10	2.40	2.60	2.00	3.50	2.00	(*a*)	1.40
3	1.10	1.30	2.70	2.50	2.50	2.00	5.00	1.90	(*a*)	1.50
4	1.10	1.40	2.80	2.60	2.40	2.00	4.80	1.90	1.50	1.60
5	1.00	1.50	4.75	2.50	2.30	2.10	4.00	1.80	1.40	1.80
6	1.00	1.70	4.75	2.60	2.20	2.20	3.80	1.70	1.50	1.70
7	1.10	1.80	4.90	2.60	2.20	5.00	3.60	1.70	1.50	1.60
8	1.10	2.00	5.20	2.50	2.10	3.00	3.50	1.70	1.60	1.60
9	1.20	4.10	5.00	2.60	2.40	5.00	3.40	1.60	1.60	1.60
10	4.00	2.50	4.60	2.70	2.20	4.50	3.50	1.60	1.50	1.50
11	4.30	2.50	3.10	4.00	2.00	3.00	3.40	1.60	1.50	1.40
12	7.00	8.50	2.90	5.00	1.90	2.20	3.30	1.60	1.40	1.40
13	3.50	20.50	3.00	3.00	1.70	2.00	3.00	1.50	1.40	1.50
14	2.00	5.40	2.90	2.50	1.70	2.40	2.80	1.50	1.30	1.60
15	1.90	4.00	2.80	2.60	1.80	2.60	2.60	1.40	1.30	1.70
16	1.70	3.20	2.50	2.70	1.80	3.00	2.60	1.40	1.30	1.60
17	1.70	2.80	2.50	2.80	2.10	3.00	2.40	1.50	1.40	1.80
18	2.00	2.70	3.00	3.00	2.00	3.40	2.20	1.50	1.40	2.00
19	4.30	2.50	7.50	3.50	1.90	5.00	2.00	1.50	1.40	4.00
20	4.00	2.20	4.00	3.70	1.80	5.60	2.00	1.60	1.30	4.20
21	2.50	3.00	3.50	4.50	1.70	4.20	2.00	1.60	1.30	3.20
22	2.20	3.20	3.00	3.50	1.70	4.70	1.90	1.80	1.40	2.60
23	2.00	3.10	2.90	3.00	1.80	4.50	1.80	2.00	1.40	2.70
24	2.00	3.05	2.50	2.90	1.90	4.00	3.00	2.50	1.60	2.60
25	1.90	3.00	2.00	2.80	2.00	5.00	2.20	1.90	3.50	2.50
26	1.80	3.00	5.00	2.70	2.10	6.00	3.50	(*a*)	5.00	2.50
27	1.80	2.90	3.60	2.80	2.00	6.50	5.20	(*a*)	4.00	2.40
28	1.70	2.50	3.50	3.00	1.90	5.00	3.20	(*a*)	2.50	2.30
29	1.60	....	3.10	3.10	1.80	4.50	2.40	(*a*)	1.50	2.40
30	1.50	....	3.00	3.00	1.80	4.00	2.30	(*a*)	1.50	2.50
31	1.50	....	2.80	....	1.90	....	2.20	(*a*)	....	2.60

a No record August 26 to November 3.

OOSTANAULA RIVER AT RESACA, GEORGIA.

This station was established July 27, 1896, on the iron bridge of the Western and Atlantic Railroad in the town of Resaca, Georgia, 1,000 feet from the railroad station. It is described in Water-Supply Paper No. 36, page 146. Records of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 147. During 1900 the following measurements were made by O. P. Hall:

April 30: Gage height, 8 feet; discharge, 5,118 second-feet.
May 15: Gage height, 3.60 feet; discharge, 1,466 second-feet.
May 25: Gage height, 3.75 feet; discharge, 1,539 second-feet.
December 11: Gage height, 4.30 feet; discharge, 1,919 second-feet.

Daily gage height, in feet, of Oostanaula River at Resaca, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Nov.	Dec.
1	2.7	3.1	6.0	5.8	6.8	3.3	2.8	4.5
2	(a)	3.0	7.3	5.4	5.7	3.5	2.9	4.2
3	(a)	3.0	6.8	5.3	5.5	4.0	3.0	4.0
4	(a)	3.1	5.9	5.6	5.3	5.5	4.6	6.0
5	(a)	4.3	5.4	6.3	4.8	5.0	4.5	8.6
6	(a)	4.2	5.1	6.0	4.6	7.7	3.7	8.3
7	2.7	3.7	6.9	5.2	4.4	7.9	3.5	6.0
8	2.6	3.5	11.3	5.0	4.0	13.0	3.0	5.6
9	2.4	5.6	15.5	4.8	3.9	10.8	2.9	5.0
10	2.5	9.1	14.2	4.6	3.8	7.5	2.8	4.8
11	4.2	7.3	11.1	7.2	3.7	5.6	2.8	4.2
12	11.3	7.8	7.6	11.6	3.6	5.8	2.8	4.0
13	11.3	20.3	6.7	9.8	3.6	6.8	2.7	4.0
14	9.9	23.0	6.0	7.4	3.4	6.6	2.7	4.0
15	6.1	23.5	5.6	6.2	3.4	5.6	2.7	4.0
16	4.9	20.8	7.3	5.8	3.4	4.8	2.7	3.9
17	4.3	13.7	6.9	6.8	3.3	6.6	2.6	3.5
18	4.1	6.5	5.9	11.9	3.3	6.8	2.6	3.4
19	6.1	5.5	6.0	12.0	3.8	10.9	2.6	3.4
20	13.1	5.2	16.9	10.4	3.9	7.0	2.7	3.8
21	12.1	5.3	17.2	11.8	3.8	6.5	2.8	10.9
22	10.2	9.1	13.8	11.6	3.7	4.8	3.6	9.3
23	6.0	8.9	8.8	9.7	3.6	9.9	3.4	6.8
24	5.2	7.3	7.7	7.7	3.7	12.8	3.3	9.0
25	4.8	7.0	8.0	7.2	3.8	14.0	3.7	8.7
26	4.4	6.7	12.2	6.2	4.0	15.0	14.4	6.7
27	4.0	6.0	10.8	5.8	4.0	17.2	13.0	5.6
28	3.7	5.5	8.3	5.6	3.7	17.5	12.2	4.6
29	3.6	....	7.2	5.5	3.6	13.0	7.6	5.4
30	3.5	....	6.6	7.8	3.6	9.6	5.2	5.2
31	3.4	....	6.2	....	3.4	....	....	7.7

a Frozen.

NOTE.—This is a half-year Weather Bureau station.

COOSA RIVER AT ROME, GEORGIA.

This station is described in Water-Supply Paper No. 36, page 148. Measurements of flow are made at Rome, also at Riverside, 120 miles farther downstream. The measurements at Rome are made on the Oostanaula and the Etowah just above their junction to form the Coosa. Etowah River is measured at the Second avenue bridge, and Oostanaula River at the Fifth avenue bridge, and the results added together give the flow of Coosa River at Rome. Results of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 149. During 1900 the following measurements were made by Max Hall and others:

February 21: Gage height, 4.80 feet; discharge, 8,115 second-feet.
May 19: Gage height, 2.30 feet; discharge, 4,496 second-feet.
September 13: Gage height, 0.90 foot; discharge, 1,992 second-feet.
December 8: Gage height, 3.73 feet; discharge, 6,066 second-feet.

Daily gage height, in feet, of Coosa River at Rome, Georgia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	2.0	4.2	4.4	6.2	2.4	10.5	3.4	1.5	1.2	2.1	3.2
2	1.6	1.8	5.8	4.2	4.8	2.5	8.0	3.2	1.5	1.2	2.2	2.8
3	1.5	1.6	5.6	4.0	4.0	2.8	8.0	3.0	1.7	1.0	2.0	2.6
4	1.5	2.0	4.4	4.0	4.0	4.2	7.0	2.8	1.7	1.0	2.3	3.5
5	1.5	3.0	4.1	4.0	3.8	4.2	5.5	2.6	1.5	.9	2.3	7.4
6	1.5	3.8	3.8	4.0	3.7	4.2	4.2	2.5	1.5	.9	2.1	6.8
7	1.5	2.8	5.0	3.8	3.6	4.8	3.8	2.2	1.4	.9	2.1	5.2
8	1.5	2.4	8.2	3.8	3.4	13.0	3.8	2.2	1.0	3.8	2.0	3.8
9	1.5	4.0	15.0	3.6	3.0	12.6	4.0	2.0	1.0	5.9	1.9	3.6
10	1.5	6.9	13.4	3.5	3.0	8.0	4.3	2.0	.8	2.6	1.8	3.2
11	2.0	7.0	10.3	6.0	3.0	5.9	3.8	1.8	.8	2.0	1.8	2.8
12	7.0	6.4	7.5	11.0	3.0	5.0	3.4	1.8	.8	1.8	1.6	2.6
13	9.0	22.6	5.5	7.4	2.5	5.2	3.8	1.8	.8	2.5	1.5	2.6
14	7.2	27.2	4.8	5.5	2.4	5.3	3.4	1.7	.8	3.2	1.5	2.4
15	5.5	25.3	4.2	4.5	2.4	4.2	3.4	2.0	6.5	3.0	1.5	2.2
16	3.5	21.2	5.3	5.6	2.4	3.8	3.3	1.7	11.1	2.0	1.5	2.2
17	3.0	18.0	5.6	6.2	2.4	4.8	3.1	1.6	7.0	1.6	1.5	2.2
18	2.9	10.7	4.5	11.0	2.4	6.0	3.0	1.8	3.2	1.5	1.4	2.0
19	5.0	5.0	5.2	11.1	2.9	6.5	2.8	2.2	2.3	1.5	1.4	2.0
20	11.3	4.0	15.9	11.4	3.0	7.2	2.6	2.0	2.0	1.4	1.6	2.8
21	10.6	4.1	17.5	13.6	2.6	4.2	2.5	1.6	1.8	1.8	1.8	6.7
22	8.5	6.8	14.6	12.7	2.5	3.6	2.4	1.6	1.8	1.8	2.1	8.0
23	5.8	7.6	10.4	10.5	2.3	5.5	2.4	1.6	1.6	1.6	2.1	7.0
24	4.0	6.0	7.2	8.6	2.9	14.2	2.4	1.9	1.6	1.6	2.0	6.6
25	3.4	5.8	8.8	8.5	3.2	18.2	3.6	2.4	1.5	1.5	5.0	6.6
26	3.1	5.2	13.0	6.5	2.7	17.0	2.8	2.0	1.5	1.5	11.0	5.6
27	2.8	4.6	12.1	5.3	2.6	15.5	6.2	1.8	1.4	1.4	11.5	4.0
28	2.6	4.0	8.9	4.8	2.5	15.6	6.8	1.6	1.4	2.2	8.6	3.8
29	2.4	......	5.8	4.3	2.4	14.2	6.2	1.5	1.3	2.2	7.0	3.6
30	2.1	......	5.7	6.0	2.9	10.0	4.5	1.5	1.3	2.1	4.0	3.5
31	2.0	......	5.3	......	3.0	......	4.0	1.5	......	2.1	......	5.6

COOSA RIVER NEAR RIVERSIDE, ALABAMA.

This station, established September 25, 1896, is at the bridge of the Southern Railway near Riverside. It is described in Water-Supply Paper No. 36, page 149. Records of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 150. During 1900 the following measurements were made by Max Hall and others:

February 10: Gage height, 5.03 feet; discharge, 13,493 second-feet.
March 21: Gage height, 12.50 feet; discharge, 43,759 second-feet.
May 5: Gage height, 4.15 feet; discharge, 11,196 second-feet.
August 21: Gage height, 2.32 feet; discharge, 5,609 second-feet.
December 28: Gage height, 4.25 feet; discharge, 11,335 second-feet.

Daily gage height, in feet, of Coosa River near Riverside, Alabama, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.50	2.70	6.90	6.65	5.00	2.75	11.60	4.70	1.85	1.55	2.30	5.75
2	3.00	2.65	7.55	6.25	5.30	2.80	10.10	3.90	2.00	1.55	2.25	4.35
3	2.50	2.60	6.90	6.00	5.30	2.90	8.90	3.00	2.20	1.50	2.50	3.75
4	2.40	2.50	6.25	5.60	4.75	2.60	8.20	2.75	2.10	1.50	2.50	3.40
5	2.15	2.60	5.40	5.10	4.30	2.70	7.50	2.55	2.00	1.50	2.50	3.30
6	2.05	2.80	5.00	4.90	4.20	3.45	6.45	2.40	1.80	1.45	2.40	4.35
7	1.95	2.95	4.90	4.75	4.00	3.90	5.50	2.25	1.70	1.40	2.40	6.05
8	1.95	3.00	6.00	4.40	3.65	4.20	4.70	2.15	1.60	1.50	2.35	5.40
9	2.00	3.75	8.75	4.35	3.40	7.05	5.00	2.10	1.50	2.20	2.30	4.80
10	2.00	4.25	10.00	4.30	3.30	8.30	4.30	2.00	1.45	2.35	2.30	4.00
11	2.10	5.80	10.55	6.50	3.15	8.00	4.20	2.00	1.35	3.85	2.15	3.60
12	3.50	6.50	10.05	12.40	2.95	7.70	4.10	1.90	1.30	3.60	2.10	3.15
13	6.00	13.30	8.75	12.90	2.70	6.70	5.65	2.25	1.25	3.80	2.10	2.95
14	7.40	15.30	7.50	11.70	2.70	4.30	4.65	2.00	1.20	3.80	2.00	2.80
15	7.00	15.20	5.60	9.50	2.65	4.50	3.75	1.90	3.35	3.00	1.90	2.70
16	6.40	14.50	6.00	7.20	2.65	4.70	3.60	1.85	6.00	2.90	1.80	2.65
17	5.10	14.00	6.30	12.40	2.60	5.00	3.50	2.00	7.00	2.80	1.75	2.60
18	4.00	13.25	6.00	18.10	2.60	4.90	3.35	2.60	7.50	2.65	1.70	2.55
19	4.25	12.80	6.50	17.55	2.60	6.90	3.10	2.20	6.00	2.50	1.80	2.55
20	8.00	12.10	10.00	15.65	2.60	6.90	3.00	2.10	4.35	2.40	2.00	3.00
21	9.70	9.00	12.20	13.95	2.65	6.45	2.90	2.20	3.20	2.30	2.50	3.30
22	10.00	7.80	12.85	13.15	3.20	6.10	2.70	2.00	2.50	2.20	4.00	5.20
23	9.40	6.80	12.60	12.65	2.90	7.00	2.45	2.00	2.00	2.15	3.80	7.00
24	8.75	7.20	11.80	12.20	3.00	11.35	2.50	1.95	1.90	3.00	3.20	7.30
25	7.75	6.90	10.60	10.80	3.25	12.50	2.60	1.90	1.85	5.25	3.10	6.90
26	6.00	6.50	10.30	9.15	3.10	14.10	2.50	2.20	1.80	7.50	3.00	6.35
27	4.10	5.25	10.20	7.90	3.20	14.42	2.60	2.10	1.80	5.00	4.35	5.90
28	3.60	5.00	9.85	6.50	3.00	14.60	3.70	2.00	1.65	3.80	6.40	4.90
29	3.30	....	9.50	5.70	2.80	13.80	5.70	1.95	1.60	3.00	9.20	4.30
30	3.00	....	8.50	5.35	2.70	12.80	5.30	1.90	1.55	2.65	8.20	4.00
31	2.70	....	7.20	....	2.60	....	5.90	1.90	....	2.50	....	6.50

COOSA RIVER AT LOCKS NOS. 4 AND 5, ALABAMA.

Records of gage heights at these stations are kept by the United States Engineer Corps, who have kindly furnished copies to the Geological Survey. Records of gage heights at Lock No. 5 during the year 1900 are not available. The records for Lock No. 4 are given in the accompanying table. Discharge measurements are not made at either of these stations. The stations are described in Water-Supply Paper No. 36, page 150.

Daily gage height, in feet, of Coosa River at Lock No. 4, Alabama, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.5	2.9	7.9	6.9	5.8	3.0	13.6	5.7	1.8	1.3	2.6	7.7
2	3.0	2.7	8.4	6.1	6.0	3.2	11.0	4.4	1.9	1.2	2.4	5.3
3	2.7	2.5	7.9	5.5	6.2	3.2	10.0	3.6	2.3	1.2	2.4	4.2
4	2.4	2.5	7.4	5.3	5.4	2.8	9.4	3.2	2.1	1.2	2.7	3.9
5	2.1	2.9	6.5	5.3	4.8	3.2	8.4	2.8	1.9	1.2	2.7	4.7
6	1.9	3.2	6.0	5.4	4.7	3.8	7.3	2.5	1.8	1.2	2.7	5.7
7	1.9	3.6	6.0	5.1	4.2	4.4	6.1	2.2	1.6	1.3	2.8	7.0
8	2.0	3.9	7.8	4.9	4.0	5.0	5.1	2.2	1.6	2.0	2.9	6.8
9	2.0	4.5	10.0	4.6	3.7	7.0	5.4	2.1	1.8	2.4	2.5	5.7
10	1.9	5.9	11.2	4.9	3.7	9.0	4.7	2.0	1.2	3.9	2.3	4.8
11	2.1	6.7	11.9	7.4	3.5	9.1	4.9	2.0	1.2	4.7	2.0	4.2
12	5.8	7.5	11.6	13.9	3.4	8.0	4.4	1.9	1.1	4.2	1.9	3.8
13	7.0	15.0	10.3	14.5	3.3	6.0	4.8	2.2	1.1	4.4	1.8	3.5
14	8.6	17.5	8.6	13.0	3.1	5.0	3.3	2.0	1.2	4.4	1.7	3.3
15	7.6	17.4	6.8	10.8	3.0	5.0	3.3	1.9	4.3	3.7	1.7	3.2
16	7.6	17.0	6.8	9.0	2.9	5.3	3.7	1.8	6.4	3.3	1.7	3.0
17	6.2	16.5	7.2	14.6	2.8	5.7	3.7	2.1	8.6	3.2	1.6	2.9
18	5.1	16.1	7.0	20.3	2.8	5.5	3.5	1.9	8.7	2.7	1.6	2.8
19	4.6	15.5	7.1	20.3	2.8	7.6	3.1	2.0	6.4	2.1	1.5	2.6
20	7.9	13.7	11.2	18.0	2.9	7.9	2.9	2.2	4.4	1.9	2.1	2.8
21	10.5	10.3	13.8	16.0	3.1	7.3	2.9	2.4	3.0	1.7	2.3	3.5
22	11.5	8.6	14.7	15.0	3.2	6.7	2.7	2.3	2.4	1.6	4.5	5.5
23	11.0	8.3	14.3	14.4	3.0	6.7	2.7	2.0	2.1	2.3	4.4	7.4
24	8.9	8.4	13.5	13.8	3.4	12.1	2.7	1.8	1.9	3.5	4.0	8.5
25	7.0	8.3	12.0	12.2	3.6	14.2	2.8	1.9	1.8	5.0	3.6	8.1
26	5.5	7.5	11.6	10.2	3.3	16.6	2.7	2.3	1.7	8.6	6.1	8.5
27	4.5	6.8	11.6	9.2	3.5	15.5	4.0	2.4	1.7	8.2	9.0	6.9
28	4.0	6.2	11.8	7.8	3.0	17.0	4.2	2.3	1.6	5.2	10.2	6.0
29	3.8	....	11.0	6.8	3.0	15.2	5.6	1.9	1.5	4.5	10.0	5.1
30	3.3	....	9.9	6.0	2.8	14.5	6.3	2.0	1.5	2.9	8.7	4.5
31	3.0	....	8.0	....	2.8	....	6.8	1.9	....	2.6	....	6.0

TALLAPOOSA RIVER NEAR SUSANNA, ALABAMA.

This station was established July 27, 1900, by J. R. Hall. It is located at the mouth of Blue Creek, which is 10 feet above the east landing of McCarty's ferry, 13 miles southwest of Dadeville, and 3 miles from Susanna, the nearest post-office. The rod is graduated to feet and tenths; it is 18 feet long, and is nailed vertically to a tree overhanging the water on the south side of the creek at the junction of the creek and the river. The gage is referred to a bench mark on a white hickory tree about 40 feet from the rod on the south bank of the creek, and is 376.67 feet above tide water. Discharge measurements are made from a boat held in place by a wire stretched across the river, upon which the distances from the initial point are tagged. The section is an exceptionally good one, depth and current being almost uniform the entire width of the stream. The observer is T. A. Walls, a farmer who lives 1 mile from the station. During 1900 the following measurements were made by James R. Hall:

July 27: Gage height, 1.80 feet; discharge, 2,309 second-feet.
August 9: Gage height, 1.55 feet; discharge, 1,900 second-feet.
September 28: Gage height, 1.50 feet; discharge, 1,809 second-feet.
November 24: Gage height, 2.40 feet; discharge, 3,629 second-feet.

Daily gage height, in feet, of Tallapoosa River near Susanna, Alabama, for 1900.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	------	5.80	2.40	1.40	1.80	2.00	17	------	1.95	8.40	2.35	1.75	2.60
2	------	4.00	3.80	1.40	1.70	2.00	18	------	1.95	4.80	2.30	1.75	2.50
3	------	2.00	4.80	1.40	1.70	2.10	19	------	1.80	3.00	2.20	1.80	2.40
4	------	1.80	4.20	1.35	1.65	2.20	20	------	1.75	2.50	2.10	1.85	4.50
5	------	1.80	2.25	1.30	1.65	2.30	21	------	1.70	1.80	1.90	1.85	5.80
6	------	2.10	1.50	2.80	1.65	2.50	22	------	1.70	1.80	1.70	1.90	4.50
7	------	2.20	1.45	3.00	1.60	2.40	23	------	1.90	1.80	3.90	2.40	4.00
8	------	1.70	1.45	2.50	1.60	2.40	24	------	2.00	1.70	6.00	2.40	4.00
9	------	1.55	1.40	1.85	1.60	2.40	25	------	2.05	1.60	5.00	3.00	3.70
10	------	1.50	1.35	1.80	1.60	2.30	26	------	2.50	1.50	4.30	4.90	3.20
11	------	1.40	1.35	1.75	1.60	2.10	27	1.80	2.15	1.50	4.10	4.20	2.80
12	------	1.40	1.35	1.70	1.55	2.00	28	1.90	2.00	1.50	2.30	3.90	2.70
13	------	1.40	1.35	1.90	1.55	1.90	29	1.80	1.90	1.45	2.20	3.00	2.60
14	------	1.40	1.30	2.40	1.60	3.80	30	4.00	1.80	1.45	1.90	2.80	2.70
15	------	1.40	1.35	2.45	1.60	3.90	31	6.80	2.25	------	1.85	------	2.90
16	------	1.90	11.70	2.40	1.60	2.80							

TALLAPOOSA RIVER NEAR STURDEVANT, ALABAMA.

This station was established July 19, 1900, by J. R. Hall. It is located at the Columbus and Western Railroad bridge a fourth of a mile west of Sturdevant. The gage rod is 20 feet high, and is graduated to feet and tenths. It is in two sections and is fastened vertically, the shorter section to a post at the edge of the water on the east bank about 20 feet below the bridge, and the longer section to the first stone pier from the east bank. It is so set that when the water rises above the short section it is on the long section, and the readings are made as from one continuous rod. The initial point of sounding is the east end of the bridge. The section is broken by three piers and by some large rocks below the bridge. The gage is referred to a bench mark consisting of a nail in the southwest corner of pier No. 2, east side of river, 455.70 feet above tide water and 14.20 feet above the zero of the gage. The observer is B. F. Neighbors, farmer and postmaster at Sturdevant, who lives a fourth of a mile from the station. During 1900 the following measurements were made by James R. Hall:

July 20: Gage height, 2.85 feet; discharge, 2,603 second-feet.
August 13: Gage height, 1.95 feet; discharge, 1,887 second-feet.

Daily gage height, in feet, of Tallapoosa River near Sturdevant, Alabama, for 1900.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	------	4.30	3.40	1.80	2.50	2.90	17	------	3.00	7.90	2.60	2.30	3.20
2	------	3.40	6.10	1.70	3.40	2.80	18	------	2.80	5.00	2.20	2.20	3.10
3	------	2.80	4.20	1.60	4.70	2.70	19	2.95	4.00	3.80	2.10	2.20	3.00
4	------	2.50	2.90	1.60	3.60	3.00	20	2.80	2.90	3.00	2.00	2.20	5.20
5	------	2.40	2.50	3.30	3.30	3.20	21	3.05	2.40	2.70	1.90	2.50	6.80
6	------	2.35	2.20	3.00	3.20	3.30	22	2.75	2.30	2.50	2.10	3.20	5.30
7	------	2.25	2.00	3.00	2.90	3.20	23	2.65	2.40	2.40	5.00	3.50	4.90
8	------	2.20	1.90	2.90	2.70	3.00	24	2.55	2.70	2.30	7.30	3.20	5.60
9	------	2.10	1.80	3.10	2.60	2.80	25	2.65	2.50	2.20	6.40	4.80	4.70
10	------	2.00	1.70	3.20	2.50	2.70	26	2.60	2.80	2.10	5.40	5.90	4.20
11	------	1.95	1.60	3.30	2.40	2.60	27	2.50	2.60	2.00	4.20	5.40	3.90
12	------	1.90	1.60	3.40	2.40	2.60	28	2.70	2.50	2.00	3.60	3.40	3.60
13	------	2.00	1.60	3.50	2.40	2.70	29	6.50	2.40	2.00	2.90	3.20	3.40
14	------	2.10	1.80	3.50	2.30	4.70	30	7.60	2.30	1.90	2.70	3.10	3.50
15	------	2.60	8.80	3.00	2.30	3.00	31	5.00	2.80	------	2.60	------	7.50
16	------	3.40	12.00	2.60	2.30	3.70							

TALLAPOOSA RIVER NEAR MILSTEAD, ALABAMA.

This station was established August 7, 1897, at the bridge of the Tallassee and Montgomery Railway, about a fourth of a mile from Milstead. It is described in Water-Supply Paper No. 36, page 152. The gage was last verified December 3, 1900. Records of discharge measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 151. During 1900 the following measurements were made by Max Hall:

February 23: Gage height, 9.20 feet; discharge, 9,956 second-feet.
March 5: Gage height, 6.70 feet; discharge, 7,088 second-feet.
December 3: Gage height, 2.95 feet; discharge, 3,031 second-feet.

Daily gage height, in feet, of Tallapoosa River near Milstead, Alabama, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.70	2.50	13.20	5.50	6.30	2.60	9.00	6.50	2.70	1.80	2.50	3.30
2	2.60	2.40	13.10	5.30	5.90	2.70	9.10	4.50	8.00	1.60	3.30	3.30
3	2.40	2.30	10.70	5.00	5.40	3.00	10.60	3.50	8.10	1.50	6.10	3.30
4	2.30	4.50	8.00	5.30	4.90	3.50	7.10	2.80	4.40	1.80	6.50	3.50
5	2.30	4.20	6.80	4.80	4.70	3.30	8.00	2.70	3.00	3.30	7.10	3.90
6	2.30	4.30	6.10	4.70	3.90	3.50	5.20	2.50	2.40	6.40	5.50	3.90
7	2.20	4.40	5.60	4.60	3.80	3.30	4.40	2.30	2.20	3.40	4.10	3.80
8	2.20	3.80	10.90	4.60	3.70	5.90	4.00	2.20	2.00	3.20	3.50	3.80
9	2.20	5.20	13.80	4.50	3.60	9.70	3.50	2.10	1.80	2.60	3.00	3.10
10	2.20	8.90	12.70	4.60	3.50	6.90	7.60	2.00	1.70	2.60	2.90	3.10
11	2.60	19.00	10.00	5.50	3.30	5.60	5.50	1.90	1.70	3.00	2.70	2.80
12	7.30	30.00	7.90	10.60	3.20	4.60	4.10	1.90	1.60	2.80	2.60	2.80
13	6.00	43.25	6.60	11.50	3.10	5.30	4.70	1.80	1.50	3.40	2.60	2.80
14	4.50	42.00	5.90	9.00	3.00	4.00	6.70	1.90	1.50	3.30	2.50	7.70
15	4.00	31.90	5.40	6.60	2.90	3.80	6.00	2.20	14.00	3.30	2.50	9.10
16	3.40	22.80	7.00	5.30	2.90	3.50	5.10	2.70	25.60	2.70	2.50	7.30
17	3.00	13.50	7.20	4.70	2.80	4.50	3.80	3.10	18.00	2.70	2.50	5.20
18	2.90	8.90	5.60	13.90	2.80	5.90	3.80	2.50	11.00	2.20	2.50	4.20
19	3.70	7.00	5.40	17.06	2.80	5.00	3.60	4.00	5.30	2.10	2.50	4.00
20	9.50	6.10	6.00	15.00	2.90	5.90	3.10	4.20	3.60	2.00	2.50	8.60
21	7.50	6.50	11.40	16.90	2.80	5.90	3.00	2.50	3.00	1.90	2.50	17.00
22	5.90	9.80	10.50	13.30	3.00	5.50	2.80	2.20	2.50	2.00	4.00	13.50
23	4.60	9.50	7.60	10.30	3.10	5.40	2.70	2.00	2.30	4.80	4.00	10.40
24	3.90	8.90	15.50	13.20	3.40	20.00	2.60	2.30	2.20	12.10	3.90	11.30
25	3.50	8.40	15.20	12.50	3.50	25.04	2.50	3.30	2.00	10.50	3.50	8.70
26	3.10	8.00	16.00	9.40	5.00	20.00	2.50	3.40	2.00	9.00	10.50	6.60
27	3.00	7.00	13.70	7.50	4.50	16.00	2.80	3.60	2.00	6.00	8.80	5.60
28	2.80	6.00	11.20	6.40	3.20	18.00	2.90	2.70	2.00	4.20	6.70	5.00
29	2.70	....	8.70	6.20	2.70	13.80	3.20	2.60	2.00	2.20	4.50	4.60
30	2.60	....	7.10	6.10	3.00	9.00	8.10	2.10	1.90	2.90	3.70	4.30
31	2.50	....	6.20	....	2.50	....	10.60	3.20	....	2.70	....	11.60

ALABAMA RIVER AT MONTGOMERY, ALABAMA.

This station was established by the United States Engineer Corps a number of years ago, at the Montgomery wharf, near the union passenger station at the foot of Commerce street. The readings are now taken by the Weather Bureau, and copies are furnished to the Geological Survey. The station is described in Water-Supply Paper No. 36, page 153. No measurements were made in 1899 or previous years. During 1900 one measurement was made by Max Hall, as follows:

March 6: Gage height, 11.40 feet; discharge, 29,470 second-feet.

Daily gage height, in feet, of Alabama River at Montgomery, Alabama, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.9	6.0	12.4	14.0	10.2	3.5	29.0	10.6	3.0	1.7	3.7	10.6
2	4.3	5.8	17.6	10.8	9.6	3.5	24.8	9.9	3.5	1.6	3.7	9.2
3	3.9	5.3	19.0	9.2	9.2	3.9	22.5	6.6	5.7	1.4	4.2	7.0
4	3.5	5.0	19.4	8.6	9.2	4.5	20.2	5.3	5.0	1.4	12.6	6.2
5	3.2	6.0	14.6	8.1	8.3	4.4	17.2	4.5	4.4	1.5	10.6	5.8
6	2.9	6.1	11.8	7.3	7.2	4.4	14.8	3.9	2.9	3.0	8.2	5.6
7	2.5	6.1	10.1	7.3	6.6	4.4	12.2	3.3	2.5	4.1	5.7	6.7
8	2.2	6.1	10.1	7.3	6.2	5.0	9.8	3.2	2.0	3.9	4.9	7.6
9	2.2	6.1	15.3	7.3	5.6	10.0	7.4	3.0	1.8	5.1	4.5	7.8
10	2.2	8.0	18.6	7.3	5.6	11.0	6.4	2.6	1.6	3.7	4.0	7.0
11	2.8	14.2	19.6	7.3	5.3	12.0	8.4	2.6	1.6	3.4	3.5	6.0
12	8.0	21.2	19.5	13.5	5.0	12.0	7.6	2.5	1.4	4.0	3.2	5.1
13	10.6	31.2	18.4	20.5	5.0	10.5	7.6	2.4	1.0	8.5	3.0	4.5
14	10.6	43.8	16.5	23.5	4.8	9.5	8.0	2.2	1.2	8.0	3.0	6.0
15	11.0	48.4	13.7	24.0	4.6	7.0	9.9	2.2	7.0	6.0	2.7	9.0
16	11.0	47.8	11.7	18.8	4.4	6.2	10.0	2.5	16.0	5.2	2.7	8.2
17	9.6	44.5	11.9	16.8	4.0	6.9	6.4	2.5	17.2	4.1	2.5	7.1
18	8.0	41.2	11.3	23.5	4.0	8.1	5.2	2.7	16.7	3.7	2.5	6.2
19	8.0	37.5	10.6	29.0	4.0	8.1	5.0	3.1	15.8	3.4	2.3	5.0
20	10.0	33.5	13.3	34.5	4.0	9.0	4.8	3.1	10.2	2.6	2.2	4.8
21	12.4	35.5	19.3	36.4	4.0	9.7	4.5	3.0	8.0	2.0	1.7	10.0
22	14.6	28.0	22.5	36.5	3.8	10.2	4.0	2.6	4.7	1.9	6.0	12.8
23	16.0	23.6	23.5	33.5	3.8	10.2	4.0	2.7	3.5	5.5	7.0	14.0
24	15.4	21.0	25.1	31.2	4.6	14.2	3.8	3.0	3.0	8.0	6.6	14.5
25	12.9	18.6	26.8	29.3	4.9	22.0	3.6	3.0	2.6	9.4	6.6	14.0
26	11.6	14.2	28.1	26.5	5.2	27.4	3.6	3.0	2.4	8.2	9.9	13.4
27	7.4	12.8	27.8	22.2	5.0	29.5	3.6	3.0	2.3	9.8	13.0	10.6
28	7.0	11.6	25.6	17.8	4.7	30.8	5.2	3.3	2.0	10.6	13.4	9.8
29	6.8	....	23.2	14.6	4.5	32.8	7.0	3.3	2.0	8.6	13.4	8.8
30	6.4	....	20.5	11.2	4.3	31.8	9.2	3.0	1.7	5.5	11.5	9.0
31	6.3	....	17.5	....	3.8	....	11.6	2.9	....	4.3	....	10.0

ALABAMA RIVER AT SELMA, ALABAMA.

This station was originally established by the United States Engineer Corps; readings are now taken by the United States Weather Bureau. The gage, which is attached to the iron highway bridge, the floor of which is about 60 feet above low water, is in two sections. The lower section, which reads from −3.0 feet to +2.30 feet, is secured to the pile on the lower side of the cofferdam on the draw pier; the upper section, which reads from 2.30 feet to 48 feet, is spiked to the highway bridge. The bench mark, which is an iron bolt driven into the face of a rock bluff 182.3 feet from the first bridge pier, on the road ascending to the city, is 26 feet above the zero of the gage and 87.30 feet above mean sea level. The top of the coping stone of the pivot pier at the highway bridge to which gage is attached is 56 feet above the zero of the gage and 117.30 feet above mean sea level. Graduations extend from −3.0 feet to +48 feet. During 1900 the following measurements were made:

April 14: Gage height, 23.60 feet; discharge, 66,607 second-feet.
May 26: Gage height, 6.10 feet; discharge, 17,049 second-feet.
August 24: Gage height, 3.10 feet; discharge, 9,879 second-feet.

Daily gage height, in feet, of Alabama River at Selma, Alabama, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.2	4.8	17.2	19.8	15.4	4.8	34.8	14.0	3.9	0.8	2.0	16.0
2	6.6	3.6	19.7	16.8	13.9	4.6	33.0	13.0	3.9	.7	2.0	14.0
3	4.3	3.5	22.2	14.0	13.0	4.4	29.8	11.0	3.8	.6	4.0	11.0
4	3.3	3.9	22.0	12.0	12.0	4.2	26.5	9.0	4.5	.6	9.0	9.0
5	3.0	4.7	20.6	10.9	11.8	5.6	23.5	7.0	5.4	.5	14.0	8.0
6	3.0	6.2	17.8	8.0	10.2	5.0	20.2	6.0	5.0	1.0	13.5	7.5
7	3.0	8.2	15.0	7.8	9.6	4.6	17.0	5.5	4.5	1.8	9.4	7.0
8	3.0	8.4	13.9	8.9	8.8	4.2	14.0	5.0	4.1	2.5	6.3	7.0
9	2.7	8.5	14.9	9.6	8.0	6.8	11.5	4.8	3.3	4.0	4.0	9.0
10	2.7	10.7	18.8	9.5	7.8	11.6	10.0	4.5	1.8	4.2	2.0	9.4
11	3.3	16.0	20.9	9.8	7.5	13.5	9.8	3.2	1.0	2.0	2.0	6.0
12	7.7	22.2	22.2	12.0	7.3	14.0	10.2	3.0	.7	2.0	1.9	5.0
13	12.4	29.9	22.0	17.7	7.0	13.9	10.0	2.8	.6	2.5	1.6	2.0
14	13.5	38.6	19.9	23.4	6.6	12.8	9.9	2.5	1.0	4.3	1.6	3.2
15	14.7	44.0	19.0	25.5	6.4	11.0	9.9	2.5	1.6	6.7	1.0	9.0
16	14.0	47.0	16.9	25.0	6.0	9.0	10.0	2.4	11.0	6.0	1.0	11.0
17	13.2	48.0	15.3	22.5	5.7	8.9	9.9	2.8	18.0	5.2	1.0	11.0
18	12.0	47.9	13.9	23.5	5.5	8.8	9.0	2.7	19.0	2.5	1.0	10.0
19	11.1	47.0	14.3	29.0	5.2	8.6	7.0	2.7	19.4	1.0	1.0	6.0
20	11.1	44.1	14.6	34.8	5.1	10.0	7.0	2.5	16.0	1.0	1.0	5.1
21	13.4	41.6	18.8	39.0	5.0	10.9	6.5	2.3	12.5	.9	1.0	9.0
22	16.9	36.9	23.0	39.8	5.0	12.0	6.5	2.6	10.0	1.0	1.6	14.5
23	18.5	33.2	25.5	41.0	4.8	12.9	6.3	3.6	6.0	1.5	6.0	17.0
24	18.3	22.6	29.0	40.0	5.5	14.0	6.0	3.8	3.0	6.0	9.0	17.2
25	17.0	22.6	30.2	38.5	6.1	17.6	5.8	4.0	1.9	11.5	9.8	17.6
26	14.7	21.1	32.7	35.8	6.2	24.5	5.0	3.5	1.6	12.0	9.9	18.0
27	13.0	19.0	33.3	32.7	6.6	29.0	4.5	3.5	1.0	11.5	13.0	17.0
28	11.2	16.9	32.5	28.5	6.8	32.0	4.4	3.4	1.0	12.3	16.0	14.5
29	8.4	....	30.5	23.0	6.0	33.5	7.5	3.5	.9	13.0	16.8	12.9
30	6.5	....	27.7	18.0	5.5	35.0	8.0	4.0	.8	11.0	17.0	11.2
31	4.8	....	24.4	....	5.0	....	11.8	4.2	....	5.0	....	11.0

BLACK WARRIOR RIVER AT TUSCALOOSA, ALABAMA.

A continuous record of the gage heights at Tuscaloosa has been kept by the United States Engineer Corps since 1889. During 1895 and 1896 a number of discharge measurements were made, from which a rating table was established. Since that time measurements of flow and computations of the discharge have been made regularly by the United States Geological Survey. The station is described in Water-Supply Paper No. 36, page 156. The records are furnished by R. C. McCalla, jr., United States assistant engineer. Records of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 153. No measurements were made during the year 1900.

Daily gage height, in feet, of Black Warrior River at Tuscaloosa, Alabama, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10.90	6.92	18.14	21.55	21.23	4.24	41.00	9.85	5.50	0.75	4.20	12.50
2	9.48	6.40	25.44	18.60	18.95	5.30	33.88	8.00	5.00	.80	5.10	9.65
3	8.32	5.00	26.00	15.80	16.33	13.95	32.27	6.50	4.07	.60	5.40	8.50
4	7.10	5.17	23.30	13.60	13.82	15.16	32.13	5.15	4.30	.25	5.55	7.90
5	6.18	6.40	20.29	12.27	11.60	20.98	30.96	4.40	3.58	.40	5.05	8.20
6	5.53	9.58	17.43	12.17	9.60	21.50	27.31	3.80	2.80	.40	4.45	10.20
7	5.12	11.50	15.34	11.44	8.20	20.92	23.70	3.35	2.30	.80	3.90	10.65
8	4.84	16.53	27.58	10.29	7.28	21.75	20.80	3.00	1.90	1.80	3.50	9.65
9	4.60	12.23	39.00	9.97	6.80	38.25	18.45	2.50	1.50	3.90	3.10	8.75
10	4.50	20.60	36.03	10.58	6.50	31.70	15.96	2.30	1.40	6.05	2.90	8.15
11	7.12	23.00	31.63	26.35	6.12	24.73	12.96	2.10	1.10	6.10	2.70	7.50
12	31.63	20.64	27.34	52.79	5.90	19.60	11.05	2.00	.90	14.30	2.50	6.90
13	31.80	41.37	23.78	53.40	5.48	15.95	10.60	1.75	.80	22.50	2.40	6.45
14	28.18	47.96	20.43	48.69	4.98	15.60	12.90	1.50	1.40	21.85	2.25	6.40
15	24.09	45.73	17.40	42.30	4.50	19.23	10.35	1.40	5.45	16.40	2.20	6.65
16	20.12	40.23	16.63	37.10	3.85	29.15	8.50	1.50	10.65	11.60	2.10	6.45
17	16.50	34.74	21.18	63.00	3.65	28.89	7.00	1.48	8.95	8.20	2.05	6.10
18	14.28	29.75	20.28	64.05	3.50	25.33	6.00	1.40	6.34	6.13	2.00	5.75
19	15.80	25.88	18.80	62.17	3.52	24.51	5.60	3.00	4.44	5.10	1.95	5.30
20	25.00	22.43	45.10	59.35	3.39	30.10	6.35	4.40	3.35	4.30	3.90	5.45
21	32.60	19.90	51.00	56.10	3.65	27.80	8.50	3.75	2.60	3.60	8.40	6.30
22	29.44	23.58	47.98	51.71	3.50	25.38	8.00	3.00	2.20	3.15	10.25	8.35
23	24.54	26.59	42.40	46.20	3.35	24.55	8.10	2.50	1.87	4.60	12.50	11.90
24	20.43	24.20	38.24	41.88	4.40	50.00	8.70	2.55	1.65	7.30	11.00	17.00
25	17.12	22.38	35.41	37.94	7.55	58.35	7.40	2.10	1.60	10.40	9.45	18.70
26	14.12	21.00	36.78	33.94	7.68	56.35	6.80	4.48	1.45	8.55	15.90	17.00
27	12.14	18.63	35.33	30.89	6.70	52.90	9.20	4.30	1.30	6.75	22.20	14.60
28	10.47	16.52	31.80	28.15	5.30	49.05	16.20	3.25	1.05	5.40	21.00	12.50
29	9.10	......	28.85	25.73	4.25	48.25	13.50	2.40	.90	4.70	17.35	10.95
30	8.27	......	26.25	23.50	3.60	46.35	11.83	2.10	.75	4.10	14.00	10.15
31	7.60	......	24.20	......	3.62	......	11.05	2.50	......	3.70	......	14.20

BLACK WARRIOR RIVER NEAR CORDOVA, ALABAMA.

This station is located at the Kansas City, Memphis and Birmingham Railroad bridge three-fourths of a mile from Cordova, Alabama. The gage was established by the United States Weather Bureau, but records were discontinued by that bureau some time ago. From 12 to 55 feet the gage is a vertical timber bolted to the inside of the bridge pier on the left bank of the river. Below 12 feet the gage was sloping, but it was out of position and could not be used when the station was established by the Geological Survey on May 21, 1900, so a short new section was put in at that time. This section is a 2-inch by 10-inch plank, graduated to feet and tenths, marked with nails from −1.5 feet to +12.5 feet, and spiked to a willow tree on the right bank of the river about 200 feet below the bridge. The bench mark is the top of the stone pier on the left bank, and is 54.95 feet above the zero of the gage. Measurements are made from the railroad bridge, which is a single-span, iron, through bridge 300 feet long. The section is a good one. The observer is A. B. Logan, who lives on the right bank of the river, only a few hundred feet from the end of the bridge. During 1900 one measurement was made by Max Hall, as follows:

May 21: Gage height, 0.10 foot; discharge, 747 second-feet.

Daily gage height, in feet, of Black Warrior River near Cordova, Alabama, for 1900.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		0.6	8.1	0.9	0.5	—0.8	—0.1	1.4
2		2.8	5.2	.5	.2	— .8	+ .5	1.0
3		5.3	7.1	.4	.1	— .9	.8	.8
4		7.1	6.5	.2	.0	— .9	.4	1.0
5		7.5	5.3	.1	— .1	—1.0	.3	1.9
6		7.6	4.6	.0	— .2	—1.0	.3	1.8
7		6.5	3.5	.1	— .3	—1.1	.2	1.4
8		7.3	2.1	.2	— .4	+ .2	.2	1.2
9		6.5	2.5	.3	— .5	.9	.1	1.0
10		4.5	2.7	.3	— .5	.9	.0	.8
11		3.2	1.0	.4	— .6	.1	— .1	.7
12		3.0	.8	.5	— .6	9.4	— .2	.7
13		4.6	1.0	.5	— .7	9.2	— .2	.8
14		8.6	.8	.5	— .6	3.2	— .3	.8
15		9.8	.5	.6	1.5	2.3	— .3	.8
16		8.0	.4	.6	.9	1.7	— .3	.6
17		8.2	.4	.6	.5	1.0	— .4	.5
18		7.2	.3	.6	.1	.6	+ .3	.4
19		13.4	.3	.1	.0	.3	.2	.4
20		10.0	.2	.0	— .1	.2	.1	.5
21	0.1	6.1	.7	.2	— .2	.1	.3	1.5
22	.1	6.5	1.0	.3	— .3	.0	1.1	3.0
23	.1	15.2	.8	.4	— .3	1.0	.8	2.9
24	1.5	32.9	.5	.8	— .4	.7	.8	5.0
25	1.5	33.8	.9	1.7	— .4	.5	.9	4.0
26	1.0	31.3	.5	.8	— .5	.3	5.1	3.1
27	.6	22.1	1.6	.2	— .5	.2	4.9	2.5
28	.7	23.9	2.4	.5	— .6	.1	3.6	2.1
29	.8	22.4	1.3	.1	— .7	.0	2.8	1.8
30	.9	16.5	1.2	.9	— .7	— .1	1.9	1.7
31	.9		1.5	1.0		— .1		2.8

HILLABEE CREEK NEAR ALEXANDER CITY, ALABAMA.

This station, which was established August 29, 1900, by J. R. Hall, is located 6½ miles northeast of Alexander City, on the road leading from that town to Newsite. The gage, which is graduated to feet and tenths and is placed vertically, is in two sections, the short section, which reads from 0 to 5.50 feet, being fastened to a post in the edge of the water on the north bank 20 feet from the upstream side of the bridge, the long section, which reads from 5.50 feet to 16 feet, being fastened to the upstream end of the first pier on the north bank, and arranged so that when water rises above the short section the readings are made from the long one, both sections being easily read from the north approach to the bridge. The initial point of sounding is on the south side of the first pier on the north bank. The gage is referred to a bench mark at the top of a chord on the downstream side of the bridge at the second pier from the north bank, and is 27.6 feet above the zero of the gage. The bridge is in three spans having a total length of 276 feet, with a north approach of 116 feet and a south approach of 124 feet, making a total, over all, of 516 feet. The observer is J. H. Chisholm, a farmer, post-office address Alexander City, Alabama. During 1900 the following measurements were made by James R. Hall:

August 29: Gage height, 1.40 feet; discharge, 184 second-feet.
November 28: Gage height, 2 feet; discharge, 390 second-feet.

Daily gage height, in feet, of Hillabee Creek near Alexander City, Alabama, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	2.3	1.3	1.6	1.9	17	......	2.6	1.3	1.5	2.7
2	......	2.3	1.1	2.6	1.9	18	......	2.2	1.3	1.4	2.8
3	......	1.6	1.1	6.8	1.8	19	......	1.6	1.2	1.5	3.0
4	......	1.4	1.1	3.2	1.9	20	......	1.5	1.2	1.6	2.9
5	......	1.3	3.2	2.2	1.8	21	......	1.5	1.2	1.7	6.0
6	......	1.2	2.0	1.8	1.9	22	......	1.4	1.9	2.1	4.0
7	......	1.2	2.8	1.7	1.8	23	......	1.2	5.9	1.9	3.0
8	......	1.1	2.6	1.7	1.7	24	......	1.3	2.9	1.9	2.9
9	......	1.1	2.4	1.8	1.7	25	......	1.4	2.1	5.1	2.9
10	......	1.2	2.3	1.7	1.7	26	......	1.3	1.9	2.9	2.8
11	......	1.1	2.3	1.7	1.7	27	......	1.4	1.8	2.4	2.6
12	......	1.1	1.8	1.7	1.7	28	......	1.3	1.7	2.0	2.5
13	......	1.1	1.6	1.7	1.8	29	1.4	1.4	1.6	1.9	2.5
14	......	1.1	1.4	1.7	3.8	30	1.3	1.3	1.5	1.9	5.8
15	......	8.1	1.4	1.7	2.9	31	1.8	......	1.5	......	5.7
16	......	5.0	1.2	1.6	2.8						

TALLADEGA CREEK AT NOTTINGHAM, ALABAMA.

This station is located on the Southern Railroad bridge a fourth of a mile from the depot at Nottingham, Alabama, and 1 mile north of Alpine, Alabama. The gage, which is graduated to feet and tenths and is 20 feet long, is fastened vertically to the north end of the bridge on the upstream side, the bottom end of the gage being nailed to an old mudsill projecting from the north bank. The initial point of sounding is at the gage. The bench mark is the top rail on the upstream side of the bridge, and is 24.13 feet above gage datum. The section is a good one and is free from piers. The observer is R. M. McClatchy, station agent at Nottingham. During 1900 the following measurements were made by James R. Hall:

August 16: Gage height, 1.10 feet; discharge, 102 second-feet.
November 29: Gage height, 1.70 feet; discharge, 240 second-feet.

Daily gage height, in feet, of Talladega Creek at Nottingham, Alabama, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	1.2	1.0	1.3	1.6	17	1.2	2.3	1.1	1.2	1.5
2	......	2.0	1.0	1.3	1.4	18	1.2	1.7	1.1	1.2	1.5
3	......	1.3	1.0	2.3	1.4	19	1.1	1.6	1.1	1.2	1.4
4	......	1.1	1.0	2.1	1.8	20	1.1	1.5	1.0	1.5	2.7
5	......	1.0	1.2	1.7	1.7	21	1.1	1.3	1.2	2.2	3.0
6	......	1.0	1.3	1.5	1.6	22	1.1	1.2	1.4	1.9	2.6
7	......	1.0	1.3	1.4	1.5	23	1.1	1.2	1.6	1.8	4.0
8	......	.9	1.4	1.4	1.5	24	1.0	1.2	2.9	1.6	2.5
9	......	11.0	1.3	1.3	1.4	25	.9	1.2	3.5	3.9	2.1
10	......	8.0	1.3	1.3	1.3	26	1.0	1.2	3.0	3.8	2.0
11	......	10.3	1.3	1.3	1.3	27	1.1	1.2	2.6	3.4	1.8
12	......	8.0	1.5	1.3	1.3	28	1.2	1.2	1.4	2.0	1.7
13	......	8.3	1.4	1.2	1.6	29	1.0	1.1	1.3	1.8	1.6
14	......	9.3	1.3	1.2	1.8	30	1.0	1.1	1.3	1.7	1.9
15	......	9.3	1.2	1.2	1.7	31	1.6	......	1.3	......	5.1
16	1.1	3.9	1.2	1.2	1.6						

BIG SANDY CREEK NEAR DADEVILLE, ALABAMA.

This station, which was established by J. R. Hall August 2, 1900, is located about 4½ miles southwest of Dadeville, at the highway bridge on the Dadeville-Susanna road. The gage, which is graduated to feet and tenths, is 16 feet high and is fastened vertically to the first pier on the north side of the creek. The initial point of sounding is at the gage rod. The section is good for ordinary or flood measurements, but is rather wide and shoaly for low-water measurements. The latter can, however, be made a short distance from the gage. The observer is L. H. Finch, a farmer who lives 200 yards from the station, post-office address, Dadeville, Alabama. During 1900 the following measurements were made by James R. Hall:

July 6: Gage height, 1.20 feet; discharge, 260 second-feet.
August 8: Gage height, 1.00 foot; discharge, 110 second-feet.
August 8: Gage height, 1.00 foot; discharge, 116 second-feet.
August 25: Gage height, 1.35 feet; discharge, 281 second-feet.
November 16: Gage height, 1.10 feet; discharge, 155 second-feet.
December 31: Gage height, 2.00 feet; discharge, 870 second-feet.

The measurements of August 8 and November 16 were made a half mile below Smith's bridge.

Daily gage height, in feet, of Big Sandy Creek near Dadeville, Alabama, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.00	1.10	0.95	1.00	1.10	17	1.80	3.90	1.10	1.05	1.45
2	1.20	1.10	.90	1.30	1.15	18	1.20	1.50	1.00	1.10	1.30
3	1.10	1.40	.90	2.00	1.25	19	1.10	1.10	1.05	1.10	2.40
4	1.10	1.30	.90	1.80	1.40	20	1.00	1.05	1.05	1.10	4.50
5	1.10	1.20	3.50	1.40	1.35	21	1.00	1.00	1.00	1.10	3.50
6	1.05	1.05	1.80	1.20	1.30	22	.90	1.00	1.50	1.30	1.70
7	1.05	1.00	1.25	1.20	1.25	23	.90	1.00	1.45	1.25	1.50
8	1.00	1.00	1.20	1.20	1.20	24	1.70	1.00	1.40	1.20	1.40
9	1.05	.95	1.10	1.15	1.15	25	1.40	1.00	1.20	1.50	1.40
10	1.00	2.00	1.15	1.15	1.10	26	1.60	1.00	1.15	1.90	1.35
11	1.00	1.80	1.10	1.15	1.10	27	1.15	1.05	1.10	1.80	1.35
12	9.05	1.40	1.20	1.15	1.10	28	1.10	1.05	1.05	1.20	1.35
13	9.00	1.20	1.30	1.10	1.10	29	1.00	1.00	1.05	1.15	1.30
14	9.00	1.20	1.15	1.10	2.20	30	1.00	.90	1.00	1.10	1.75
15	1.80	2.00	1.10	1.10	1.80	31	1.80	......	1.05	......	2.00
16	1.00	2.20	1.05	1.10	1.45						

TOMBIGBEE RIVER AT COLUMBUS, MISSISSIPPI.

This station is located about 1,000 feet below the highway bridge 1½ miles from the Southern Railway depot at Columbus. The rod, which is in three sections, is fastened vertically to the rock bluff on the left bank. It is a 3-inch by 10-inch pine timber 45 feet long, marked with brass figures and copper nails, the graduation extending from −5.0 feet to +40.0 feet. The initial point of sounding is the end of the iron bridge, right bank, downstream side. Bench mark No. 1 is 250 feet from the initial point of sounding. The bridge floor is 40.85 feet above the zero of the rod, and the top of the iron girder under the floor timbers is 39.85 feet above the zero. Bench mark No. 2 is the top of the rail at the depot of the Southern Railway, and is 55.2 feet above gage datum and 190.9 feet above mean sea level. The width of the river at low water is 160 feet. The maximum recorded height of the river was on April 8, 1892, when the gage registered 42 feet. The lowest recorded height was on October 26, 1893, when the gage reading was −3.9 feet. The danger line is at 33 feet. No measurements of discharge were made during 1900.

Daily gage height, in feet, of Tombigbee River at Columbus, Mississippi, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.5	0.4	7.1	4.5	8.0	1.0	19.7	5.8	−1.2	−2.7	+2.6	+3.4
2	2.2	.3	6.8	3.8	6.5	8.0	18.3	4.0	−1.0	−2.8	+4.9	+2.5
3	1.8	.2	5.6	2.7	5.9	10.0	17.6	2.8	−1.0	−3.0	+5.5	+1.9
4	1.6	.4	4.4	1.9	4.5	13.4	16.2	1.9	− .7	−3.1	+5.1	+1.0
5	1.4	1.8	3.8	1.5	2.8	15.3	15.9	1 0	− .6	−3.3	+4.4	+ .1
6	1.2	3.5	3.4	1.3	1.5	17.0	15.4	.0	− .9	−3.5	+3.1	+ .2
7	1.1	3.5	7.6	1.3	.8	20.7	14.5	− .5	−1.3	−3.5	+1.9	+ .3
8	1.0	3.3	14.4	1.1	.5	23.6	13.5	− .9	−1.9	−2.2	+ .9	+ .3
9	.9	4.2	15.1	.7	1.4	25.5	10.0	−1.4	−2.1	−1.0	− .1	.0
10	.9	8.4	13.8	.5	2.3	25.0	6.8	−1.8	−2.3	− .6	− .5	− .3
11	2.0	7.8	11.3	11.7	3.3	23.6	5.5	−2.2	−2.4	− .4	− .9	+ .5
12	6.6	7.6	9.9	16.2	3.6	21.6	4.0	−2.6	−2.5	+2.6	−1.1	− .6
13	8.3	10.2	6.7	17.4	2.8	20.0	3.5	−2.6	−2.6	+4.8	−1.3	+ .9
14	7.1	9.8	4.3	19.3	2.2	18.5	2.0	−2.7	−2.7	+5.2	−1.3	+ .9
15	5.6	8.1	4.8	20.8	1.6	17.8	1.9	−2.2	−2.7	+5.6	−1.4	+ .9
16	4.6	5.8	5.6	20.9	+ .7	17.1	1.5	−2.2	−2.8	+5.4	−1.5	+ .9
17	2.8	4.6	5.2	22.9	.0	17.3	1.0	−2.3	−2.9	+2.4	−1.5	+ .9
18	2.4	3.8	4.6	26.9	− .4	17.8	.5	−2.3	−3.0	+ .4	−1.6	−1.0
19	2.2	3.2	9.4	27.6	−1.0	18.0	.0	−1.8	−3.0	− .4	−1.6	−1.0
20	2.1	2.8	15.6	27.5	− .8	16.8	.4	−1.4	−3.1	− .9	−1.6	−1.0
21	1.9	3.5	18.2	27.1	− .5	15.2	1.3	−1.1	−3.0	−1.1	−1.6	−1.0
22	1.8	5.6	19.0	25.5	− .5	13.5	2.0	−1.6	−2.9	−1.3	+1.2	+3.8
23	1.6	5.4	19.2	23.3	+ .1	13.8	1.9	−1.9	−2.7	−1.0	.0	+5.0
24	1.4	4.5	18.1	21.3	.2	18.5	1.4	−2.0	−1.3	− .2	+1.7	+6.0
25	1.2	5.0	15.2	19.4	.3	21.5	.7	− .1	−1.7	+ .8	+2.3	+6.6
26	1.1	5.0	11.4	17.3	2.3	24.1	.1	+1.2	−2.0	+1.0	+2.8	+6.8
27	.9	3.9	7.8	14.8	2.4	25.0	1.8	+ .6	−2.2	+5.1	+3.3	+6.1
28	.7	4.2	4.6	11.8	2.2	24.8	5.0	− .3	−2.4	+5.6	+3.8	+5.0
29	.6	......	3.9	9.5	1.6	23.5	5.9	−1.0	−2.5	+4.6	+3.9	+4.2
30	.5	......	3.1	9.4	1.0	21.7	6.7	−1.4	−2.5	+4.0	+3.8	+4.8
31	.4	......	3.3	......	.8	......	7.2	−1.1	......	+3.0	......	+4.0

TOMBIGBEE RIVER NEAR EPES, ALABAMA.

A record of gage heights has been kept at this station for the last ten years by the Alabama Great Southern Railway Company. The gage is painted on the center brick pier of the railway bridge of that company across the Tombigbee a half mile east of Epes, and is referred to two bench marks, the first, the top of the iron girder at the third crossbeam at the station, 80 feet from the right-bank end of the iron bridge, is 64.70 feet above datum of gage, the second, the top of the cross-tie or the base of the rail at the station, 80 feet from the right-bank end of the iron bridge, is 65.50 feet above datum of gage. The west bank of the river is a solid wall of limestone, the east bank is flat and is subject to overflow. The trestle at the east end of the bridge is seven-eighths of a mile long. The section is good, though the water is very deep and rather swift.

Daily gage height, in feet, of Tombigbee River near Epes, Alabama, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.5	3.0	18.0	24.5	43.0	6.0	44.5	14.5	2.0	0.5	7.0	8.0
2	7.5	3.0	19.0	19.5	41.0	8.0	44.5	12.0	2.5	.5	8.0	7.5
3	6.5	3.0	18.0	16.0	39.0	15.0	44.5	10.5	2.0	.5	9.0	7.0
4	6.0	3.0	17.0	12.0	33.5	21.0	44.0	8.0	2.0	.5	8.5	6.0
5	5.5	5.0	15.0	10.0	28.0	24.5	42.5	6.0	2.0	.5	8.5	5.0
6	5.0	6.0	14.0	8.0	20.5	27.0	42.0	5.0	2.0	.5	7.5	4.5
7	4.5	7.0	13.0	7.5	16.0	29.5	41.0	5.0	2.0	.5	7.0	4.0
8	4.0	7.5	18.0	7.5	10.0	32.0	40.0	4.0	2.0	.5	5.5	4.0
9	3.5	11.5	21.0	7.0	7.0	34.5	39.0	3.0	2.0	.5	4.5	4.0
10	3.5	13.5	23.0	6.5	7.0	37.0	38.0	2.0	2.0	2.0	4.0	3.5
11	13.0	15.0	24.0	20.5	7.0	38.5	34.0	2.0	1.5	4.0	4.0	3.0
12	20.0	20.5	24.0	26.0	8.0	39.5	26.0	2.0	1.5	6.0	3.0	3.0
13	23.0	26.0	23.0	29.0	8.0	40.5	23.0	2.0	1.5	7.5	3.0	3.5
14	23.5	28.0	20.0	30.0	7.0	41.0	15.5	2.0	2.0	8.5	2.5	3.5
15	22.0	28.0	17.5	31.0	6.0	41.5	13.0	2.0	1.5	10.0	2.0	3.5
16	21.0	26.0	17.0	38.0	6.0	42.0	8.0	1.5	1.0	10.5	2.0	3.5
17	18.5	24.0	18.0	46.0	5.0	42.0	7.0	1.5	1.0	10.0	2.0	3.0
18	15.0	22.0	18.0	48.5	4.0	42.0	6.0	1.5	1.0	7.5	2.0	3.0
19	11.5	18.5	18.5	51.0	3.5	41.5	5.0	1.5	1.0	5.0	2.5	3.0
20	10.0	16.0	26.0	51.5	3.5	41.5	6.5	1.5	.5	4.0	2.5	6.0
21	8.5	14.0	30.0	52.0	3.5	41.5	7.0	1.0	.5	3.5	3.0	5.0
22	8.0	15.0	32.0	52.0	3.5	41.0	8.0	1.0	.5	3.0	3.5	5.0
23	8.0	17.5	34.0	51.5	3.5	41.0	9.0	2.0	.5	2.0	3.5	8.5
24	7.0	18.0	35.5	51.0	4.0	42.5	8.0	1.5	.5	2.0	3.5	10.0
25	6.5	17.5	37.5	49.5	4.5	42.5	6.0	1.5	.5	3.0	6.5	11.5
26	6.0	17.0	38.0	47.5	5.0	43.5	5.5	1.5	.5	4.0	8.5	11.5
27	5.0	16.0	39.0	47.0	6.0	43.5	5.0	5.0	.5	4.5	7.5	12.5
28	3.0	17.0	38.5	46.5	7.0	43.5	5.5	4.5	.5	7.5	7.5	12.0
29	3.0	-------	35.0	46.0	7.0	44.0	14.0	4.0	.5	9.0	8.0	10.0
30	3.0	-------	33.0	44.5	6.0	44.5	14.5	3.0	.5	8.0	8.5	10.0
31	3.0	-------	30.0	-------	5.0	-------	14.5	2.0	-------	7.5	-------	10.5

YOUGHIOGHENY RIVER AT FRIENDSVILLE, MARYLAND.

This station, which was established by E. G. Paul on August 17, 1898, is located at the iron highway bridge connecting the east and west portions of the village. It is described in Water-Supply Paper No. 36, page 159. Records of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 156. During 1900 the following measurements were made by E. G. Paul and C. R. Olberg:

February 15: Gage height, 6.2 feet; discharge, 1,816 second-feet.
June 26: Gage height, 4.6 feet; discharge, 361 second-feet.
September 13: Gage height, 3.8 feet; discharge, 48 second-feet.

Daily gage height, in feet, of Youghiogheny River at Friendsville, Maryland, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.1	4.8	6.3	5.8	4.6	4.3	4.8	4.7	4.0	3.9	4.1	5.3
2	5.1	4.8	6.8	5.8	4.6	4.3	4.8	4.5	4.0	3.9	4.1	5.2
3	5.1	4.8	6.6	5.8	4.5	4.3	4.7	4.3	4.0	3.9	4.1	5.1
4	5.1	4.8	6.3	5.6	4.5	4.4	4.8	4.2	4.0	3.9	4.4	5.3
5	5.1	4.8	6.2	5.5	4.5	4.3	4.6	4.2	4.0	3.9	4.3	5.6
6	5.1	5.4	6.3	5.5	4.6	4.3	4.4	4.2	4.0	3.9	4.2	5.8
7	5.2	5.6	6.1	5.5	4.6	4.2	4.3	4.1	4.0	3.9	4.2	7.5
8	5.3	6.6	6.0	5.4	4.7	4.2	......	4.1	3.9	3.9	4.2	7.3
9	5.3	6.8	5.8	5.4	4.7	4.2	4.3	4.0	3.9	3.9	4.4	6.9
10	5.3	6.6	5.7	5.3	4.6	4.2	4.2	4.0	3.9	3.9	4.3	6.4
11	5.4	6.4	5.6	5.3	4.5	4.1	4.2	4.0	3.9	3.9	4.3	6.1
12	6.3	6.2	5.5	5.2	4.6	4.1	4.1	4.0	3.9	3.9	4.3	5.8
13	6.3	6.3	5.3	5.1	4.7	4.2	4.1	4.0	3.9	3.9	4.3	5.6
14	6.0	6.4	5.3	5.0	4.7	4.5	4.1	4.0	3.9	4.1	4.3	5.4
15	5.8	6.3	5.3	5.0	4.8	4.7	4.1	4.1	3.9	4.3	4.2	5.4
16	5.8	6.1	5.4	4.9	4.9	5.4	4.1	4.2	3.8	4.3	4.2	5.3
17	5.6	5.8	5.3	4.9	4.9	6.7	4.0	4.5	3.8	4.2	4.2	5.2
18	5.6	5.6	5.5	4.8	4.8	7.1	4.0	4.5	3.8	4.2	4.3	5.1
19	5.6	5.2	5.7	4.8	4.7	7.0	4.0	4.4	8.8	4.2	4.4	4.9
20	5.7	5.1	5.9	4.7	4.7	6.5	4.1	4.3	3.8	4.1	4.4	4.7
21	6.0	5.1	7.0	4.7	4.7	6.0	4.1	4.2	3.8	4.2	4.5	4.6
22	6.3	5.0	6.5	4.7	4.7	5.3	4.2	4.2	3.8	4.2	4.7	4.6
23	6.1	5.0	6.1	4.6	4.7	4.8	4.3	4.6	3.8	4.1	4.8	4.5
24	5.7	5.0	5.8	4.6	4.6	4.7	4.3	4.2	3.8	4.0	4.9	4.3
25	5.5	5.0	5.6	4.7	4.5	4.7	4.4	4.3	3.8	4.0	5.2	4.3
26	5.4	5.0	5.5	4.7	4.4	4.6	4.7	4.3	3.8	4.0	9.5	4.4
27	5.3	5.1	5.4	4.8	4.4	4.5	5.0	4.1	3.9	4.1	8.3	4.6
28	5.2	5.1	5.4	4.8	4.4	4.6	4.6	4.1	3.9	4.2	6.9	4.8
29	5.0	......	5.5	4.7	4.4	4.8	4.7	4.2	3.9	4.1	5.8	5.0
30	5.0	......	5.7	4.7	4.4	4.9	4.9	4.1	3.9	4.1	5.5	5.2
31	5.0	......	5.7	......	4.4	......	5.5	4.1	......	4.1	......	5.2

CHEAT RIVER NEAR UNEVA, WEST VIRGINIA.

This station was established July 8, 1899. As there is no bridge at the place convenient for making measurements, a cable of 600 feet span was stretched across the stream 6 miles northwest of Morgantown, near Uneva, West Virginia. The station is described in Water-Supply Paper No. 36, page 160. During 1900 one measurement was made by E. G. Paul, as follows:

June 25: Gage height, 2.80 feet; discharge, 1,403 second-feet.

Daily gage height, in feet, of Cheat River near Uneva, West Virginia, for 1900.

Day.	July.	Aug.	Sept	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.2	3.2	2.3	2.1	1.6	......	17	2.8	1.6	1.4	1.4	2.2	2.9
2	2.8	3.1	2.1	2.0	1.6	4.0	18	2.9	1.5	1.4	1.4	2.1	2.8
3	2.7	2.9	2.0	1.9	1.7	4.0	19	2.9	1.5	1.4	1.5	2.2	2.8
4	2.6	2.7	1.9	1.8	1.7	4.3	20	3.0	1.6	1.4	1.4	3.0	2.7
5	2.6	2.6	1.6	1.7	1.6	7.0	21	3.0	2.0	1.3	1.3	3.3	2.7
6	2.4	2.4	1.5	1.6	2.0	7.0	22	3.0	1.9	1.5	1.3	3.5	2.6
7	2.3	2.4	1.4	1.5	2.3	6.0	23	2.9	1.8	1.5	1.3	3.8	3.0
8	3.0	2.3	1.4	1.6	2.5	5.0	24	3.5	1.8	1.4	2.3	4.0	3.2
9	2.9	2.0	1.4	1.7	2.4	4.4	25	4.8	1.8	1.4	2.3	......	3.3
10	2.9	2.0	1.4	1.7	2.2	4.7	26	5.1	1.8	1.5	2.2	......	3.3
11	2.8	2.0	1.4	1.7	2.0	3.4	27	5.2	1.7	1.3	2.1	......	3.2
12	2.7	1.8	1.4	1.7	1.9	3.4	28	4.9	1.7	1.3	2.0	......	3.1
13	2.6	1.7	1.3	1.6	1.9	3.2	29	3.7	2.0	1.4	1.8	......	3.1
14	2.5	1.7	1.3	1.5	1.9	3.0	30	3.4	2.3	1.4	1.7	......	......
15	2.6	1.7	1.3	1.5	2.0	3.0	31	3.2	2.3	......	1.6	......	......
16	2.6	1.6	1.4	1.4	2.2	3.0							

NEW RIVER AT RADFORD, VIRGINIA.

This station, which was established by D. C. Humphreys on August 1, 1898, the gage having been erected by the United States Weather Bureau, is described in Water-Supply Paper No. 36, page 161. On account of the inaccuracies of the Weather Bureau gage, a wire gage was put in February 23, 1900, the zero being on the same level as that of the old gage. The observer is T. M. Brady. Records of measurements for 1899 will be found in Water-Supply Paper No. 36, page 162. During 1900 the following measurements were made by D. C. Humphreys:

February 23: Gage height, 2.55 feet; discharge, 11,681 second-feet.
February 24: Gage height, 2.10 feet; discharge, 8,500 second-feet.
March 30: Gage height, 1.78 feet; discharge, 7.709 second-feet.
June 27: Gage height, 1.62 feet; discharge, 6,749 second-feet.
July 28: Gage height, 1.25 feet; discharge, 5,256 second-feet.
August 22: Gage height, 0.00; discharge, 1,365 second-feet.
December 20: Gage height, 0.70 foot; discharge, 2,975 second-feet.

Daily gage height, in feet, of New River at Radford, Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.20	0.30	5.85	1.90	1.20	0.80	1.00	0.40	−0.30	0.40	0.90	1.60
2	.20	.80	6.60	1.20	1.10	.70	.80	.30	− .30	.40	.80	1.00
3	.20	.90	3.20	1.20	1.00	1.00	.60	.20	− .40	.00	.80	1.00
4	.20	.80	2.10	1.10	1.30	1.00	.70	.30	− .30	.00	1.00	1.60
5	.20	.80	2.00	1.20	1.20	.90	.90	.30	− .30	.00	1.40	4.50
6	.20	.70	1.90	1.10	1.00	.90	.70	.00	− .80	.10	1.20	3.00
7	.30	1.00	1.80	1.00	1.00	.80	.50	.00	− .70	.10	1.00	2.00
8	.30	1.20	2.10	1.00	.90	.90	.37	− .20	− .70	.20	.90	2.00
9	.40	.90	2.20	.90	1.00	.80	.34	− .40	− .60	.20	.80	2.10
10	.50	1 00	2.00	1.00	1.30	.80	.50	− .70	− .40	.30	.80	2.00
11	.70	.90	2.70	1.90	1.00	.70	.36	− .90	− .30	.20	.70	1.30
12	1.00	1.20	2.60	1.80	1.00	.70	.42	− .00	− .50	.00	.60	1.40
13	3.00	2.00	2.00	1.20	1.00	.80	.28	− .50	− .40	.00	.60	1.00
14	1.90	4.80	1.80	1.00	.90	1.00	.14	− .80	.40	.20	.50	1.00
15	1.60	2.80	1.70	.90	.90	1.10	.20	− .70	1.00	.30	.60	.90
16	1.20	1.70	1.40	.80	.80	1.20	.28	− .60	2.85	.30	.50	.90
17	.90	1.50	1.70	.80	.80	1.60	.26	− .80	2.40	.20	.40	.80
18	.80	1.40	1.60	.70	.80	1.20	.14	− .80	1.20	.10	.40	.80
19	1.00	1.30	1.30	4.00	.90	2.00	.02	− .70	.50	.00	.30	.70
20	2.40	.90	3.95	2.60	.80	1.40	.00	− .70	.20	.00	.30	.70
21	1.90	1.00	4.50	2.30	1.00	1.10	.08	− .60	.40	.00	.40	.60
22	1.80	3.00	3.30	2.70	.90	1.00	.16	.00	.50	.30	.50	.60
23	1.60	2.90	2.40	2.90	.90	1.20	.24	.00	.50	6.83	.50	.80
24	1.30	2.20	2.20	2.30	.80	1.00	.42	.10	.50	23.00	.40	.70
25	1.20	2.10	2.10	1.90	2.00	2.00	.50	.20	.40	4.60	.50	1.00
26	1.00	1.90	1.90	1.70	1.90	1.60	.58	.20	.30	2.30	7.80	.90
27	.90	1.00	2.60	1.60	1.00	2.00	.86	.00	.20	1.30	4.30	.70
28	.30	2.60	2.40	1.40	1.10	1.60	2.20	.00	.00	1.20	2.40	.80
29	.20	......	1.90	1.30	1.00	1.80	.80	.00	− .30	1.20	1.90	.70
30	.20	......	1.70	1.20	.90	1.60	.90	− .20	− .40	1.00	1.80	.60
31	.30	......	1.00	......	.90	......	.50	− .20	......	1.03	......	.70

GREENBRIER RIVER AT ALDERSON, WEST VIRGINIA.

This station, which was established by C. C. Babb and D. C. Humphreys on August 1, 1895, is described in Water-Supply Paper No. 36, page 163. Records of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 159. During 1900 the following measurements were made by D. C. Humphreys:

March 31: Gage height, 4.07 feet; discharge, 5,128 second-feet.
June 29: Gage height, 1.99 feet; discharge, 564 second-feet.

July 24: Gage height, 1.97 feet; discharge, 493 second-feet.
August 20: Gage height, 1.38 feet; discharge, 148 second-feet.
December 21: Gage height, 2.24 feet; discharge, 834 second-feet.

Daily gage height, in feet, of Greenbrier River at Alderson, West Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.90	2.15	3.98	3.90	2.30	2.25	2.75	2.45	1.55	1.40	1.45	3.00
2	1.88	1.85	6.81	3.48	2.25	2.15	3.00	2.15	1.53	1.50	1.58	2.75
3	1.88	1.95	5.08	3.30	2.18	2.10	2.45	2.00	1.48	1.45	1.60	2.58
4	1.88	1.95	4.00	3.20	2.15	2.20	2.40	1.90	1.45	1.43	3.20	3.48
5	1.90	1.95	3.58	3.08	2.10	2.13	2.08	1.80	1.40	1.40	2.75	7.00
6	1.86	2.10	3.55	3.00	2.05	2.05	2.00	1.70	1.38	1.38	2.25	5.15
7	1.85	2.40	4.53	2.88	2.02	1.98	1.90	1.42	1.35	1.37	2.05	4.00
8	1.85	2.60	4.90	2.80	2.00	1.90	1.98	1.60	1.30	1.35	1.93	3.55
9	1.85	3.75	4.20	3.00	1.95	1.90	1.93	1.57	1.28	1.38	1.90	3.40
10	2.05	4.25	3.70	3.02	2.10	1.88	1.78	1.55	1.27	1.37	1.80	3.40
11	2.05	3.45	3.45	2.85	2.00	1.82	1.73	1.52	1.25	1.35	1.72	3.15
12	2.17	3.10	3.17	2.65	1.95	1.75	1.65	1.48	1.23	1.35	1.75	2.92
13	4.18	7.24	3.00	2.55	1.97	1.68	1.63	1.45	1.20	1.33	1.75	2.73
14	3.15	7.90	2.90	2.50	1.92	1.70	1.60	1.40	1.20	1.45	1.85	2.65
15	2.80	5.05	2.93	2.37	1.85	2.05	1.55	1.40	1.31	1.70	1.80	2.55
16	2.53	4.00	2.87	2.30	1.83	2.28	1.52	1.40	1.88	1.70	1.78	2.45
17	2.38	3.48	2.85	2.20	1.80	3.20	1.45	1.35	1.65	1.60	1.75	2.30
18	2.40	3.10	2.60	2.40	1.77	5.23	1.45	1.37	1.50	1.55	1.68	2.25
19	2.65	2.65	2.89	2.52	1.73	4.40	1.45	1.40	1.45	1.50	1.65	2.25
20	5.98	2.50	8.12	3.40	1.80	3.50	1.42	1.37	1.40	1.45	1.62	2.20
21	5.65	2.55	8.23	3.55	2.90	3.00	1.42	1.40	1.38	1.45	1.60	2.23
22	4.33	4.05	5.50	3.65	2.50	2.65	1.48	1.40	1.43	1.43	1.72	2.20
23	3.45	5.40	4.50	3.73	2.32	2.45	2.10	1.50	1.50	2.47	2.43	2.08
24	3.03	4.37	3.40	3.45	2.20	2.25	2.20	1.40	1.63	3.68	3.38	2.05
25	2.75	3.75	4.85	3.16	2.20	2.15	2.27	1.45	1.50	2.60	3.68	2.18
26	2.55	3.53	4.60	2.92	2.50	2.07	2.44	1.40	1.53	2.45	18.23	2.23
27	2.43	3.20	4.75	2.75	2.45	2.05	3.97	1.50	1.45	2.25	9.30	2.18
28	2.25	2.83	4.13	2.20	2.20	1.95	3.90	1.50	1.40	2.00	5.03	2.13
29	2.08	......	4.05	2.45	2.20	1.95	2.90	1.55	1.45	1.75	4.00	2.12
30	2.45	......	3.80	2.40	2.40	2.00	2.50	1.60	1.40	1.70	3.37	2.38
31	2.05	......	4.10	......	2.40	......	2.48	1.50	......	1.63	......	2.35

NORTH FORK OF NEW RIVER AT WEAVERSFORD, NORTH CAROLINA.

During the summer of 1900 a special investigation of the hydrographic conditions of the southern Appalachian region was made by the United States Geological Survey. Temporary stations were established on several of the largest rivers, among these being the North Fork and the South Fork of New River. A station was also established on New River near Oldtown, Virginia. The regular station on New River, which is at Fayette, West Virginia, has been continued. Descriptions of these temporary stations and the gage heights obtained are given on the following pages.

The station at Weaversford was established July 27, 1900, by Cleveland Abbe, jr., and N. C. Curtis. The nearest railroad station is at North Wilkesboro, 40 miles distant, and the Weaversford post-office is a fourth of a mile from the gaging station, which can only be reached by private conveyance. The gage rod is 12.6 feet long, and is divided into feet and tenths. It is nailed to the downstream vertical timber of the forebay of Dixon's mill. The discharge measurements are made by wading at a comparatively shallow ford, not much used and not on a public highway, located 400 yards below the house of Mr. Dixon, the owner of the mill. The initial point of sounding is on the right bank, at the outer edge of a fence post opposite the ford where measurements are made. The banks are high and have been overflowed only once, viz, in 1878. The bed of the stream is rocky and gravelly, and is constant in form. The observer is C. L. Nelson, post-office address Weaversford, Ashe County, North Carolina. The gage heights for 1900 will be published next year. During 1900 the following measurements were made by N. C. Curtis and Cleveland Abbe, jr.:

July 28: Gage height, 0.60 foot; discharge, 536 second-feet.
October 27: Gage height, 0.90 foot; discharge, 708 second-feet.

SOUTH FORK OF NEW RIVER AT NEW RIVER, NORTH CAROLINA.

This station was established July 28, 1900, by Cleveland Abbe, jr., and N. C. Curtis. The nearest railroad station is North Wilkesboro, 30 miles distant, and the gaging station can only be reached by private conveyance. The discharge measurements are made by wading across a ford a half mile above the confluence of the North and South forks of New River and about 1 mile downstream from the gage at Warden's store. The gage is a wire cord running over a bolt driven into a locust tree, and reads on a horizontal scale divided into feet and tenths. The pointer or index on the gage wire is 10.55 feet from the extreme tip of the double window-sash weights which are attached. When the latter rest on the bottom, the index stands opposite 1 foot on the scale, which is read direct. The initial point of sounding is a notch on the stream side of the second small poplar on the left of the road going toward the stream and opposite the ford. The channel is straight, the current fairly swift, and the banks are low and seldom overflow. The bed of the stream is rocky, with bowlders and cobbles. The drainage area at this station is 326.5 square miles. The observer is F. R. Warden, a storekeeper located about 75 yards downstream from the gage. During 1900 the following measurements were made by N. C. Curtis and Cleveland Abbe, jr.:

July 28: Gage height, 2.7 feet; discharge, 751 second-feet.
October 28: Gage height, 2.6 feet; discharge, 1,635 second-feet.

Daily gage height, in feet, of South Fork of New River at New River, North Carolina, for 1900.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	2.45	2.30	2.30	2.60	2.70	17	......	2.20	2.80	2.25	2.40	2.60
2	......	2.35	2.25	2.30	2.60	2.70	18	......	2.20	2.40	2.20	2.40	2.60
3	......	2.30	2.20	2.45	3.50	2.70	19	......	2.20	2.40	2.20	2.40	2.60
4	......	2.30	2.20	2.80	3.80	3.95	20	......	2.20	2.30	2.20	2.40	2.60
5	......	2.30	2.20	2.75	3.30	3.70	21	......	2.20	2.30	2.20	2.35	2.60
6	......	2.30	2.20	2.70	2.80	3.20	22	......	2.30	2.30	2.20	2.30	2.60
7	......	2.30	2.20	2.55	2.65	2.85	23	......	2.30	2.30	7.90	2.30	2.70
8	......	2.30	2.20	2.50	2.60	2.80	24	......	2.30	2.30	6.70	2.30	2.60
9	......	2.30	2.20	2.45	2.60	2.80	25	......	2.30	2.30	3.75	2.70	2.60
10	......	2.30	2.20	2.40	2.60	2.75	26	......	2.25	2.30	3.05	5.20	2.60
11	......	2.30	2.20	2.45	2.60	2.70	27	......	2.20	2.30	2.90	3.60	2.60
12	......	2.30	2.15	2.35	2.55	2.70	28	......	2.20	2.30	2.70	3.05	2.60
13	......	2.35	2.10	2.30	2.50	2.60	29	2.65	2.50	2.30	2.60	2.95	2.60
14	......	2.40	2.55	2.30	2.50	2.60	30	2.50	2.45	2.30	2.60	2.80	2.60
15	......	2.35	2.60	2.30	2.45	2.60	31	2.50	2.35	......	2.60	......	2.80
16	......	2.30	3.70	2.30	2.40	2.60							

NEW RIVER NEAR OLDTOWN, VIRGINIA.

This station, which was established by Cleveland Abbe, jr., and N. C. Curtis, July 31, 1900, is located about 2 miles west of Oldtown, and can only be reached by private conveyance. Oldtown is 30 miles from the railroad at Mount Airy, and 9 miles from a branch of the Norfolk and Western Railway. The wire gage is suspended from an overhanging tree on the left bank, 50 yards upstream from the ferry. The horizontal scale is so placed that the zero mark is next to the bank. The distance from the index on the wire to the bottom of the weight is 16.1 feet. The initial point of sounding is on the right bank, and is a notch cut in the wooden upright of the beam supporting the north end of the ferry cable. The channel above and below the station is straight and the current is fairly swift. The right bank is rather low and is subject to overflow. The left bank is rarely submerged in flood. The bed of the stream is rocky and sandy. The observer is Joshua Austin, a farmer of Oldtown. During 1900 the following measurements were made by N. C. Curtis and Cleveland Abbe, jr.:

July 31: Gage height, 6.6 feet; discharge, 1,541 second-feet.
October 29: Gage height, 6.3 feet; discharge, 2,293 second-feet.

Daily gage height, in feet, of New River near Oldtown, Virginia, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.70	......	6.90	6.60	6.30	17	6.10	5.80	6.90	6.80	6.50
2	6.70	6.80	6.80	6.60	6.30	18	7.00	6.50	6.10	6.80	6.60
3	6.80	6.90	6.70	5.40	6.50	19	7.00	6.80	6.10	6.80	6.60
4	6.90	7.00	6.60	5.10	5.80	20	7.10	6.90	6.10	6.80	6.70
5	6.90	7.10	6.40	5.60	4.60	21	6.90	6.80	6.10	6.80	6.70
6	6.90	7.10	6.40	5.10	5.50	22	6.90	6.80	6.10	6.70	6.50
7	6.90	7.10	6.50	6.30	5.80	23	6.50	6.80	6.10	6.70	6.50
8	6.80	7.10	6.60	6.40	5.90	24	6.60	6.70	1.20	6.60	6.50
9	7.00	7.20	6.70	6.50	5.90	25	6 70	6.80	4.30	6.60	6.80
10	7.10	7.20	6.70	6.50	6.00	26	6.90	6.50	5.40	2.40	6.70
11	7.10	7.20	6.80	6.50	6.10	27	6.10	6.80	5.90	4.60	6.70
12	7.20	7.20	6.90	6.60	6.20	28	6.10	6.90	6.10	5.80	6.70
13	7.20	7.20	6.90	6.70	6.30	29	7.00	6.90	6.30	5.10	6.70
14	7.20	6.80	6.80	6.60	6.30	30	6.30	......	6.30	6.20	6.30
15	6.70	5.70	6.90	6.60	6.50	31	6.60	......	6.50	......	6.40
16	6.80	3.90	6.90	6.70	6.50						

NEW RIVER AT FAYETTE, WEST VIRGINIA.

This station, which was established July 29, 1895, is just above the mouth of Wolf Creek, on the one-span highway bridge at Fayette, West Virginia. It is described in Water-Supply Paper No. 36, page 164. Records of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 157. During 1900 the following measurements were made by D. C. Humphreys:

March 31: Gage height, 8.49 feet; discharge, 17,387 second-feet.
June 29: Gage height, 5.58 feet; discharge, 11,436 second-feet.
July 25: Gage height, 2.47 feet; discharge, 4,625 second-feet.
August 20: Gage height, 0.55 foot; discharge, 2,275 second-feet.
December 21: Gage height, 3.40 feet; discharge, 5,915 second-feet.

Daily gage height, in feet, of New River at Fayette, West Virginia, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.95	3.95	7.80	8.30	4.50	4.30	6.60	3.00	0.90	1.10	3.50	(*a*)
2	3.20	3.60	12.50	7.50	4.40	3.60	6.15	2.20	.90	.95	3.70	(*a*)
3	3.40	3.55	8.15	6.90	4.10	3.30	5.30	1.40	.90	.80	3.00	(*a*)
4	3.10	3.50	6.40	6.50	4.00	3.00	4.00	1.00	.80	.80	2.80	(*a*)
5	3.10	3.40	5.55	6.20	4.00	4.00	3.10	.70	.80	.75	2.65	(*a*)
6	3.00	3.45	4.05	5.70	3.95	3.50	2.70	.50	.70	1.10	2.90	(*a*)
7	3.05	3.30	4.10	5.40	3.85	3.30	2.90	.25	.70	1.10	3.25	(*a*)
8	3.10	3.05	3.80	5.00	3.85	3.00	2.10	.10	.70	1.45	3.40	(*a*)
9	3.40	3.00	3.50	4.85	3.90	2.65	1.80	.10	.60	1.70	3.80	(*a*)
10	3.60	3.20	3.45	4.95	4.00	2.50	1.45	.00	.75	1.80	4.00	(*a*)
11	4.10	3.40	3.90	4.75	4.50	2.40	1.10	.90	.80	1.60	3.75	(*a*)
12	4.44	4.05	4.05	4.40	4.60	2.20	.90	.60	.85	1.35	3.60	(*a*)
13	6.20	4.20	4.00	4.25	4.25	3.45	.80	.30	.75	1.40	3.45	(*a*)
14	5.45	11.25	4.00	4.30	3.85	3.60	.70	.20	.90	2.05	3.35	(*a*)
15	5.30	9.60	5.10	4.20	3.55	3.50	.60	.10	.80	2.25	3.10	(*a*)
16	5.00	7.05	5.75	3.80	3.25	8.20	.60	.10	.00	2.00	3.00	(*a*)
17	4.70	3.40	5.85	3.60	3.15	10.40	.60	.20	6.15	1.85	2.70	(*a*)
18	4.40	3.55	6.20	3.40	2.90	11.00	.50	.20	7.80	3.05	2.50	(*a*)
19	4.30	4.10	7.85	3.80	4.50	10.50	.80	.10	6.00	3.20	2.40	(*a*)
20	5.45	4.05	10.40	10.20	4.45	8.50	.90	.30	5.40	2.95	2.30	(*a*)
21	8.75	5.10	13.60	8.50	4.10	6.80	.90	.20	5.05	3.15	3.10	(*a*)
22	6.40	5.40	12.30	8.00	4.60	6.30	.75	.40	4.60	3.15	4.40	(*a*)
23	4.40	7.30	9.90	9.80	4.10	6.00	.50	.40	4.30	2.90	5.80	(*a*)
24	3.25	6.55	7.45	9.30	3.50	5.80	2.10	.50	2.85	16.05	6.60	2.50
25	3.60	5.60	5.95	7.85	4.00	5.60	2.70	.70	2.50	18.10	......	2.80
26	3.35	6.10	5.15	6.85	6.55	5.25	2.90	1.00	2.05	13.30	25.00	3.00
27	3.50	5.30	4.90	6.10	6.05	5.00	5.00	1.15	1.40	10.00	(*a*)	3.20
28	3.60	4.20	7.50	5.50	5.30	4.70	6.20	1.30	1.25	6.50	(*a*)	3.50
29	3.75	......	9.65	5.00	4.60	5.50	6.50	1.50	1.15	5.00	(*a*)	3.90
30	4.20	......	8.60	4.60	4.25	6.75	5.00	2.00	1.90	4.75	(*a*)	3.90
31	4.05	......	8.50	......	4.90	......	3.80	1.40	......	4.00	......	4.10

a Gage broken; no record.

SOUTH FORK OF HOLSTON RIVER AT BLUFF CITY, TENNESSEE.

This station was originally established by the United States Weather Bureau at the highway bridge at Bluff City. Readings were begun July 17, 1900, by the United States Geological Survey, in connection with the general hydrographic investigation of the southern Appalachian region. The gage is a 4-inch by 8-inch timber bolted to the downstream side of the stone pier. The initial point of sounding is on the north end of the bridge, downstream side. The channel is straight for about 500 feet above and below the bridge, and the current is swift. The north bank is high, but the south bank is subject to overflow at the bridge. The bed is rocky and constant in section. The drainage area is 828.1 square miles. O. V. Cox is the observer. During 1900 the following measurements were made by E. W. Myers and L. V. Branch:

July 17: Gage height, 0.25 foot; discharge, 378 second-feet.
August 16: Gage height, 0.25 foot; discharge, 329 second-feet.
September 25: Gage height, 1.15 feet; discharge, 791 second-feet.
November 8: Gage height, 0.90 foot; discharge, 681 second-feet.
December 27: Gage height, 0.60 foot; discharge, 392 second-feet.

Daily gage height, in feet, of South Fork of Holston River at Bluff City, Tennessee, for 1900.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	0.30	0.45	0.65	1.40	17	0.40	0.20	1.70	0.20	0.45	1.00
2	......	......	.25	.40	.60	1.20	18	.40	.20	.90	.10	.40	.80
3	......	......	.25	.30	.60	1.10	19	.40	.20	.60	.10	.50	.80
4	......	......	.25	.20	1.70	2.55	20	.40	.20	.50	.10	.55	.75
5	......	......	.20	.20	1.80	4.35	21	.40	1.00	.50	.10	.55	.75
6	......	......	.20	.10	1.50	3.20	22	.40	1.50	.20	.40	.55	.70
7	......	......	.20	.10	1.40	2.70	23	.40	1.40	.90	.45	.60	.70
8	......	......	.15	.30	1.00	1.50	24	.40	.60	1.10	2.60	.90	.70
9	......	......	.15	.30	.80	1.70	25	.60	.40	1.00	1.90	1.30	.70
10	......	......	.10	.25	.80	1.50	26	2.00	.35	.90	1.60	4.30	.70
11	......	0.60	.10	.25	.80	1.50	27	3.70	.30	.70	1.30	3.70	.60
12	......	.45	.10	.20	.80	1.40	28	1.80	.25	.70	1.20	2.50	.60
13	......	.35	.10	.20	.80	1.40	29	......	.20	.70	1.10	1.90	.60
14	......	.30	.05	.20	.70	1.30	30	......	1.20	.40	.70	1.60	.60
15	......	.25	2.00	.20	.60	1.30	31	......	.60	......	.70	......	.80
16	......	.25	3.00	.25	.50	1.20							

WATAUGA RIVER AT BUTLER, TENNESSEE.

In connection with the general hydrographic investigation of the southern Appalachian region, stations were established on Watauga River and on Roan Creek at Butler, Tennessee; also on Elk Creek at Lineback, Tennessee. Descriptions of these stations and records of the gage heights and discharge measurements are given on the following pages. The station on Watauga River at Butler is about 100 yards below the mouth of Roan Creek. It was established August 14, 1900. The gage rod, which is graduated to feet and tenths, is nailed to a tree on the right bank. Measurements are made from the highway bridge. The initial point of sounding is at the downstream end of the guard rail. The channel is straight above and below the station, and the current is swift. The banks are high, and the bed is sandy and rocky. The drainage area is 261 square miles. The observer is Edgar L. Shull. During 1900 the following measurements were made by E. W. Myers and L. V. Branch:

July 30: Gage height, 1.37 feet; discharge, 434 second-feet.
August 7: Gage height, 0.90 foot; discharge, 214 second-feet.
August 17: Gage height, 0.84 foot; discharge, 166 second-feet.
October 6: Gage height, 1.12 feet; discharge, 238 second-feet.
November 7: Gage height, 2.20 feet; discharge, 591 second-feet.
December 28: Gage height, 1.40 feet; discharge, 311 second-feet.

Daily gage height, in feet, of Watauga River at Butler, Tennessee, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	0.90	0.90	5.60	2.00	17	......	4.50	0.70	1.50	1.50
2	......	.90	.90	5.00	2.40	18	0.90	4.00	.70	1.50	1.50
3	......	.90	.90	2.30	2.40	19	.80	3.20	.70	1.40	1.50
4	......	.90	.90	2.10	5.00	20	.80	2.70	.70	1.40	1.50
5	......	.90	.90	2.50	4.00	21	1.10	1.10	.70	1.40	1.50
6	......	.90	.90	2.30	3.50	22	1.60	1.00	.70	1.40	1.50
7	......	.80	.90	2.00	3.00	23	1.30	1.10	15.00	1.40	1.50
8	......	.80	.90	2.00	2.50	24	1.20	.90	9.00	1.40	1.50
9	......	.80	.90	1.90	2.10	25	.90	.90	4.50	1.40	1.50
10	......	.80	.90	1.90	1.90	26	.90	.90	2.50	5.40	1.50
11	......	.80	.90	1.90	1.50	27	.90	.90	2.00	4.00	1.50
12	......	.80	.80	1.80	1.50	28	.90	.90	4.50	3.00	1.50
13	......	.80	.80	1.60	1.50	29	.80	.90	4.00	3.00	1.50
14	1.30	1.70	.90	1.50	1.50	30	1.90	.90	4.00	2.40	1.50
15	.80	1.70	.80	1.50	1.50	31	1.40	......	3.20	......	1.50
16	.70	3.10	.70	1.50	1.50						

ROAN CREEK AT BUTLER, TENNESSEE.

This station was established August 8, 1900. The gage is a vertical rod nailed to a tree on the left bank of the stream, at Cole & Scott's gristmill, about a half mile above the mouth of the creek. Measurements are made from the highway bridge at the mouth of the creek, the initial point of sounding being on the right bank, at the end of the upstream guard rail. The left bank is low and is subject to overflow. The bed is composed of sand and mud. The drainage area is 163.6 square miles. The observer is W. N. Bridges, of Butler.

During 1900 the following measurements were made by E. W. Myers and L. V. Branch:

July 30: Gage height, 1.47 feet; discharge, 137 second-feet.
August 7: Gage height, 1.02 feet; discharge, 65 second-feet.
August 17: Gage height, 0.85 foot; discharge, 58 second-feet.
October 6: Gage height, 0.86 foot; discharge, 52 second-feet.
November 7: Gage height, 1.50 feet; discharge, 171 second-feet.
December 28: Gage height, 1.20 feet; discharge, 82 second-feet.

Daily gage height, in feet, of Roan Creek at Butler, Tennessee, for 1900.

Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.
1	......	0.95	1.00	12	0.78	0.73	0.87	23	1.27	1.20	4.80
2	......	1.00	.85	13	.85	.75	.90	24	1.00	1.25	......
3	......	.83	.85	14	1.20	1.00	.85	25	.90	1.05	......
4	......	.88	.85	15	.93	1.65	.88	26	.90	.95	......
5	......	.83	.80	16	.86	2.50	.82	27	.84	.98	......
6	......	.81	.86	17	.84	1.30	.80	28	.86	.91	......
7	......	.80	.80	18	.85	1.05	.80	29	.91	.95	......
8	0.90	.76	.83	19	.80	1.00	.80	30	1.32	1.30	......
9	.72	.80	.89	20	.82	.93	.81	31	1.05	......	......
10	.82	.75	.88	21	1.05	.92	.78				
11	.78	.75	.83	22	1.71	.95	.80				

ELK CREEK AT LINEBACK, TENNESSEE.

This station was established August 8, 1900. The gage rod is nailed to a tree on the left bank, 100 yards below the Lineback post-office. Gagings are made by wading. The banks are low and are subject to overflow. The channel is straight and the current is swift. The drainage area is 80.4 square miles. The observer is Dove Lineback, of Lineback, Tennessee. During 1900 the following measurements were made by E. W. Myers and L. V. Branch:

August 9: Gage height, 3.5 feet; discharge, 70 second-feet.
August 17: Gage height, 3.5 feet; discharge, 56 second-feet.
October 6: Gage height, 3.5 feet; discharge, 53 second-feet.

Daily gage height, in feet, of Elk Creek at Lineback, Tennessee, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	3.60	3.40	4.00	5.30	17	3.50	4.00	3.40	3.90	4.00
2	......	3.50	3.40	3.90	5.30	18	3.50	3.80	3.40	3.80	4.00
3	......	3.50	3.40	5.30	5.30	19	3.40	3.70	3.30	3.80	4.30
4	......	3.50	3.60	5.60	5.80	20	3.50	3.60	3.30	3.80	4.20
5	......	3.40	3.60	5.30	4.80	21	4.00	3.60	3.30	3.80	4.10
6	......	3.50	3.50	4.50	4.60	22	3.90	3.60	3.30	3.80	4.00
7	......	3.50	3.50	4.30	4.50	23	3.40	3.60	11.00	3.80	4.00
8	3.50	3.40	3.50	4.20	4.40	24	3.40	3.60	5.60	3.90	4.00
9	3.50	3.40	3.50	4.00	4.30	25	3.40	3.60	5.50	3.90	4.20
10	3.50	3.40	3.40	4.00	4.20	26	3.40	3.50	5.40	6.30	4.30
11	3.50	3.30	3.50	4.00	4.40	27	3.40	3.50	5.30	5.70	4.20
12	3.50	3.30	3.60	4.00	4.40	28	3.50	3.50	4.70	4.70	4.10
13	3.50	3.40	3.50	4.00	4.30	29	3.50	3.40	4.50	5.50	4.00
14	3.70	3.80	3.50	4.00	4.20	30	4.00	3.40	4.00	3.60	4.20
15	3.60	4.30	3.40	3.90	4.00	31	3.90	......	4.00	......	4.40
16	3.50	4.30	3.40	3.90	4.00						

NOLICHUCKY RIVER NEAR CHUCKY VALLEY, TENNESSEE.

This station was established September 6, 1900, at the highway bridge 1 mile above Chucky Valley, as an aid in the general hydrographic investigations of the southern Appalachian region made during the summer of 1900. The wire gage is suspended from the upstream side of the bridge, and is referred to a scale on the guard rail. The initial point of sounding is at the end of the lower guard rail on the left bank, downstream side. The banks are high, the current is sluggish, and the bed is sandy. The stream is straight above and below the station. The drainage area is 817 square miles. The observer is Byrd Bayless, Chucky Valley, Tennessee. During 1900 the following measurements were made by L. V. Branch and E. W. Myers:

September 5: Gage height, 2 feet; discharge, 302 second-feet.
September 20: Gage height, 2.18 feet; discharge, 442 second-feet.
October 15: Gage height, 2 feet; discharge, 378 second-feet.
November 10: Gage height, 2.90 feet; discharge, 919 second-feet.

Daily gage height, in feet, of Nolichucky River near Chucky Valley, Tennessee, for 1900.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	......	1.80	2.50	3.10	17	3.10	2.00	2.50	2.70
2	......	1.90	2.60	3.20	18	2.60	1.90	2.50	2.70
3	......	1.90	3.00	3.00	19	2.30	2.00	2.40	2.60
4	......	2.00	5.20	4.80	20	2.10	1.90	2.40	2.60
5	2.00	3.30	4.00	3.30	21	2.00	1.90	2.30	2.90
6	2.00	3.20	3.50	3.50	22	2.00	1.90	2.50	2.80
7	2.00	2.50	3.20	3.40	23	2.20	9.30	2.50	2.90
8	2.00	2.30	2.50	3.30	24	2.20	5.20	2.50	3.00
9	1.80	2.30	3.00	3.30	25	2.10	3.90	2.70	3.00
10	1.80	2.20	2.90	3.20	26	2.10	3.30	6.50	3.20
11	1.80	2.10	2.80	3.10	27	2.10	3.10	4.50	3.10
12	1.80	2.10	2.80	3.00	28	2.00	2.90	3.40	3.00
13	1.80	2.10	2.70	3.00	29	2.00	2.80	3.40	2.90
14	2.60	2.00	2.70	2.90	30	1.80	2.70	3.20	3.00
15	2.30	2.00	2.60	2.90	31	......	2.60	......	3.20
16	4.70	2.00	2.50	2.80					

FRENCH BROAD RIVER NEAR ASHEVILLE, NORTH CAROLINA.

This station, which was established by C. C. Babb in September, 1895, is located at the Bingham School iron highway bridge, 3 miles west of Asheville, and is reached by electric car from that place. It is described in Water-Supply Paper No. 36, page 165. Records of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 160. During 1900 the following measurements were made by E. W. Myers, R. E. Shuford, and others:

Discharge measurements of French Broad River near Asheville, North Carolina.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
January 6	2.52	1,368	September 6	3.00	1,002
February 13	7.95	16,967	September 13	2.82	710
March 17	4.20	4,982	September 19	3.24	1,452
April 22	6.80	13,069	October 13	3.00	997
June 6	3.30	2,848	October 23	8.20	16,575
June 15	3.60	2,258	November 20	3.20	1,414
July 4	3.75	4,273	December 14	3.50	1,638
July 6	4.05	3,112	December 30	3.78	2,135
August 11	3.10	1,294			

Daily gage height, in feet, of French Broad River near Asheville, North Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.67	2.83	7.40	3.40	4.53	3.05	4.05	3.65	3.33	2.95	3.50	3.90
2	2.35	2.65	6.70	3.33	4.47	3.10	4.10	3.55	3.20	2.93	4.00	3.73
3	2.25	2.63	6.10	3.40	3.45	3.03	4.15	3.50	3.15	2.97	4.13	3.64
4	2.30	2.80	5.80	3.73	3.35	3.05	4.20	3.40	3.10	3.10	4.25	4.98
5	2.35	3.10	4.70	3.60	3.27	3.55	4.17	3.35	3.07	3.27	4.13	4.57
6	2.47	3.20	3.75	3.20	3.20	3.80	4.20	3.35	3.10	3.20	4.00	4.35
7	2.90	3.50	3.80	3.15	3.17	4.20	4.05	3.27	3.05	3.10	3.85	4.07
8	2.60	3.60	4.90	3.10	3.15	4 05	4.10	3.23	3.03	3.10	3.58	3.95
9	2.45	3.70	4.70	3.07	3.20	4.00	3.85	3.20	3.10	3.00	3.40	3.70
10	2.33	3.75	4.30	3.05	3.15	3.80	3.65	3.17	3.05	2.95	3.45	3.67
11	2.80	3.00	4.10	3.20	3.10	3.70	3.67	3.15	3.00	2.85	3.47	3.55
12	4.30	3.80	3.80	3.40	3.00	3.40	3.63	3.13	2.85	3.00	3.50	3.50
13	4.25	7.95	3.60	3.30	3.00	3.45	4.80	3.25	2.80	3.13	3.47	3.47
14	3.93	7.05	3.45	3.25	2.90	3.30	4.00	3.30	3.40	3.10	3.38	3.47
15	3.80	6.55	3.37	3.00	2.85	3.20	4.03	3.17	4.65	2.90	3.35	3.49
16	4.45	5.87	3.40	3.95	2.87	7.23	3.80	3.20	5.27	2.80	3.32	3.50
17	4.10	4.95	3.50	4.30	2.85	6.10	3.70	3.35	3.90	2.85	3.30	3.47
18	3.80	4.30	3.70	5.60	2.83	5.70	3.65	3.45	3.80	2.83	3.31	3.45
19	3.60	3.47	3.75	5.75	2.80	4.75	3.63	3.40	3.50	2.80	3.35	3.44
20	4.20	3.40	4.40	5.80	2.77	4.70	3.60	3.30	3.20	2.75	3.37	3.70
21	4.10	3.80	4.20	6.35	2.65	4.67	3.57	3.20	3.15	2.70	3.40	5.11
22	4.00	4.90	4.10	7.40	2.47	4.80	3.55	3.13	3.13	3.80	3.37	4.48
23	3.80	4.70	3.70	5.10	2.30	4.93	3.65	3.15	3.10	8.50	3.33	4.40
24	3.75	4.60	3.60	4.60	2.60	6.60	3.70	3.20	3.05	7.45	3.28	4.35
25	3.65	4.40	3.40	4.55	3.05	5.95	3.75	3.40	3.20	6.20	4.30	4.20
26	3.45	3.50	4.30	4.43	3.10	5.80	3.87	3.35	2.70	4.80	6.45	4.12
27	3.30	3.60	4.00	4.20	3.00	5.70	4.45	3.25	2.75	4.15	5.27	3.85
28	3.20	3.80	3.85	3.90	2.80	4.65	3.85	3.20	2.80	4.00	4.70	3.80
29	2.95	......	3.80	3.70	2.73	4.10	3.55	3.13	2.90	3.70	4.35	3.80
30	2.90	......	3.60	3.60	2.67	4.00	3.93	3.20	2.90	3.63	4.05	3.75
31	2.85	......	3.53	......	2.80	......	3.80	3.30	......	3.60	......	4.45

FRENCH BROAD RIVER AT OLDTOWN, TENNESSEE.

This is one of the temporary stations established in connection with the general hydrographic study of the southern Appalachian region. Another temporary station was established on Pigeon River, a tributary of the French Broad, and many miscellaneous measurements were made on the French Broad and its tributaries, the results of which are given in Paper No. 49. The Oldtown station on the French Broad was established September 4, 1900, on the highway bridge across the river at that town, which is 2 miles north of Newport, Tennessee. The bridge is a 4-span iron structure, with wooden hand rails. The gage is securely nailed to the second span from the south end of the bridge. The 14-foot mark is the end of the rod, which is butted against the north side of the first strut from the south end of the span, on the downstream side. The outer rim of the pulley is 0.67 foot from the zero of the rod, and the distance between the end of the weight and the pointer on the wire is 25.82 feet. When the gage reads 1 foot, the water level is 20.33 feet below the top surface of the lower chord directly below the zero of the gage rod. The river is straight for a long distance above and below the bridge, and the velocity of the current is well distributed all the way across, though at the low stage at which measurement was made, some places had a velocity too small to give satisfactory results. Almost the entire distance across the bottom seems to be of fine sand. The observer is Jake Odell, Newport, Tennessee. During 1900 the following measurements were made by E. W. Myers and L. V. Branch:

September 4: Gage height, 1 foot; discharge, 867 second-feet.
November 2: Gage height, 1.26 feet; discharge, 1,653 second-feet.
December 15: Gage height, 1.30 feet; discharge, 1,976 second-feet.
December 26: Gage height, —— feet; discharge, 2,901 second-feet.

Daily gage height, in feet, of French Broad River at Oldtown, Tennessee, for 1900.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	......	......	1.20	1.60	17	4.00	.80	1.10	1.30
2	......	......	1.20	1.50	18	1.40	.80	1.10	1.20
3	......	......	1.50	1.40	19	1.10	.80	1.10	1.20
4	1.00	......	2.20	1.80	20	1.00	.80	1.10	1.20
5	1.00	......	1.70	2.80	21	1.00	.80	1.10	2.20
6	.90	......	1.60	2.20	22	1.00	.80	1.00	2.30
7	.90	......	1.40	1.80	23	(*a*)	2.20	1.00	......
8	.90	......	1.30	1.60	24	......	4.00	1.10	......
9	.80	......	1.30	1.70	25	......	3.80	1.20	......
10	.80	......	1.20	1.60	26	......	3.40	4.50	......
11	.80	......	1.20	1.50	27	......	1.80	3.00	......
12	.80	......	1.20	1.40	28	......	1.50	2.20	......
13	.70	......	1.20	1.40	29	......	1.40	1.80	......
14	1.10	......	1.10	1.30	30	......	1.20	1.70	......
15	1.20	0.80	1.10	1.30	31	......	1.20	......	......
16	2.90	0.80	1.10	1.30					

a No record September 23 to October 14, inclusive.

PIGEON RIVER AT NEWPORT, TENNESSEE.

This station was established September 4, 1900, on the wagon bridge at the upper end of the town of Newport, about 100 yards above the railroad bridge. The course of the river is straight for several hundred yards above and for about 50 yards below the bridge. The current at extreme low water is very sluggish. At even the lowest gage heights the water is very deep. The bottom is smooth, being of rock, in many places overlain with mud. The 15-foot mark of the rod, or the end, is abutted firmly against the east side of the first strut from the west end of the bridge, on the downstream side. The distance between the zero of the rod and the outer rim of the pulley wheel is 0.95 foot, and from the end of the weight to the pointer on the wire the distance is 32.89 feet. When the gage reading is 1 foot, the water level is 27.42 feet below the top surface of the lower chord directly beneath the zero of the gage rod. The rod is of hard pine, well painted and divided into feet and tenths. The drainage area is 655 square miles. The observer is H. M. Boyer, proprietor of a livery stable at Newport. During 1900 the following measurements were made by E. W. Myers and L. V. Branch:

September 4: Gage height, 1.00 foot; discharge, 356 second-feet.
November 2: Gage height, — foot; discharge, 544 second-feet.
December 15: Gage height, 1.28 feet; discharge, 691 second-feet.
December 26: Gage height, 2 feet; discharge, 935 second-feet.

Daily gage height, in feet, of Pigeon River at Newport, Tennessee, for 1900.

Day.	Sept.	Nov.	Dec.	Day.	Sept.	Nov.	Dec.	Day.	Sept.	Nov.	Dec.
1			1.40	12	0.60		1.30	23		1.10	2.40
2			1.50	13	.50		1.20	24		1.10	2.60
3			2.60	14	1.20		1.40	25		1.30	2.10
4			3.20	15	1.60		1.30	26		3.90	2.00
5	0.80		2.30	16	(*a*)		1.40	27		1.90	2.00
6	.70		2.10	17			1.30	28		1.80	2.00
7	.70		1.90	18			1.30	29		1.50	2.10
8	.60		1.70	19		1.00	1.40	30		1.40	2.50
9	.60		1.50	20		1.00	1.40	31			2.90
10	.50		1.50	21		.90	2.40				
11	.60		1.40	22		1.00	2.00				

a No record September 16 to November 18, inclusive.

TUCKASEGEE RIVER AT BRYSON, NORTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 167. Results of measurements during 1899 will be found in the Twenty-First Annual Report, Part IV, page 162. During 1900 the following measurements were made by E. W. Myers and R. E. Shuford:

Discharge measurements of Tuckasegee River at Bryson, North Carolina.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-feet.*	1900.	*Feet.*	*Sec.-feet.*
February 9	2.95	3,316	September 8	1.20	598
March 29	2.50	2,321	October 27	1.60	942
April 27	2.65	2,829	November 16	1.20	593
May 24	1.80	1,390	December 12	1.50	998
June 27	2.60	2,673	Do	1.50	903
July 7	2.00	1,472	December 26	1.60	960
August 3	1.60	920			

Daily gage height, in feet, of Tuckasegee River at Bryson, North Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.50	2.75	2.60	2.15	2.30	1.50	2.50	1.60	1.40	1.20	1.35	1.50
2	1.50	2.75	2.55	2.15	2.20	1.60	2.40	1.60	1.50	1.20	1.35	1.40
3	1.50	1.60	2.30	2.40	2.30	1.60	2.40	1.50	1.40	1.20	2.10	3.30
4	1.50	1.60	2.60	2.30	2.10	1.70	2.20	1.50	1.30	1.25	1.70	2.50
5	1.50	1.80	2.80	2.25	2.10	2.10	2.20	1.50	1.30	1.25	1.50	2.20
6	1.50	1.65	3.30	2.25	2.10	2.00	2.10	1.50	1.30	1.20	1.50	2.00
7	1.50	1.60	3.50	2.20	2.00	1.90	2.00	1.40	1.20	1.20	1.40	1.80
8	1.60	2.00	3.90	2.15	2.00	1.90	2.00	1.40	1.20	1.20	1.40	1.70
9	1.60	3.10	3.90	2.15	2.30	2.10	2.10	1.40	1.20	1.20	1.30	1.60
10	2.80	2.50	3.85	2.20	2.00	2.00	1.80	1.40	1.20	1.15	1.30	1.60
11	3.10	2.00	3.75	2.40	1.90	1.90	2.00	1.40	1.20	1.15	1.30	1.60
12	2.70	4.00	3.60	2.40	1.80	1.90	1.90	1.40	1.15	1.20	1.30	1.55
13	2.90	8.00	3.50	2.70	1.80	1.90	2.00	1.50	1.15	1.35	1.30	1.50
14	2.80	4.80	2.40	2.30	1.80	1.90	2.00	1.50	1.80	1.20	1.30	1.50
15	2.70	4.20	2.40	2.10	1.70	1.80	2.00	1.40	2.90	1.20	1.30	1.45
16	2.50	4.15	2.35	2.20	1.70	3.00	1.90	1.40	2.10	1.20	1.30	1.40
17	2.50	4.00	3.00	2.20	1.70	3.60	1.90	1.40	1.70	1.15	1 25	1.40
18	2.40	3.85	3.50	3.50	1.70	3.40	1.90	1.25	1.50	1.10	1.20	1.40
19	2.30	3.70	2.65	3.00	1.70	3.00	1.80	1.30	1.40	1.10	1.20	1.40
20	2.30	3.50	3.00	2.80	1.70	2.40	1.80	1.30	1.40	1.10	1.15	1.80
21	2.30	3.40	2.85	3.90	1.60	2.20	2.00	1.30	1.40	1.10	1.35	2.30
22	2.80	3.20	2.60	2.80	1.60	3.40	2.10	1.90	1.35	1.20	1.30	1.70
23	2.80	3.00	6.45	3.30	1.60	3.50	2.00	1.50	1.50	5.20	1.25	2.30
24	2.80	3.00	2.50	2.50	1.85	4.30	1.80	1.50	1.35	2.20	1.20	2.00
25	2.60	3.00	3.00	2.60	1.90	3.00	1.60	1.30	1.30	1.80	3.10	1.80
26	2.50	2.80	2.60	2.70	1.80	2.90	1.60	1.50	1.30	1.60	4.80	1.70
27	2.50	2.80	2.55	2.60	1.60	2.70	2.50	1.50	1.25	1.40	2.10	1.60
28	2.40	2.80	2.40	2.50	1.60	2.50	2.40	1.40	1.25	1.40	1.80	1.70
29	2.40	......	2.35	2.30	1.60	3.50	2.20	1.40	1.20	1.40	1.70	1.60
30	2.40	......	2.35	2.50	1.50	3.00	2.00	1.40	1.20	1.40	1.60	1.80
31	2.40	......	2.20	......	1.40	......	1.60	1.50	......	1.35	......	2.50

LITTLE TENNESSEE RIVER AT JUDSON, NORTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 168. Records of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 163. During 1900 the following measurements were made by E. W. Myers and R. A. Shuford:

February 10: Gage height, 4.55 feet; discharge, 3,726 second-feet.
March 30: Gage height, 4.40 feet; discharge, 3,179 second-feet.
April 28: Gage height, 4.55 feet; discharge, 3,785 second-feet.
May 25: Gage height, 3.50 feet; discharge, 1,744 second-feet.
June 28: Gage height, 5 feet; discharge, 4,644 second-feet.
August 4: Gage height, 3.45 feet; discharge, 1,668 second-feet.
November 17: Gage height, 2.88 feet; discharge, 1,008 second-feet.
December 27: Gage height, 3.40 feet; discharge, 1,414 second-feet.

Daily gage height, in feet, of Little Tennessee River at Judson, North Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.36	2.65	6.33	3.68	2.93	3.40	5.68	3.71	3.19	3.21	3.00	3.31
2	2.36	2.70	4.42	3.67	2.93	4.00	5.69	3.61	3.18	3.22	3.00	3.29
3	2.38	2.68	3.78	3.67	2.84	3.52	5.69	3.51	3.10	3.22	3.50	3.28
4	2.32	2.67	3.70	3.41	2.71	3.76	5.66	3.41	3.10	3.22	3.41	6.07
5	2.32	2.67	3.70	3.33	2.70	3.52	4.38	3.41	3.11	3.21	3.10	5.63
6	2.30	2.69	3.84	3.30	2.70	3.62	4.32	3.41	3.13	3.20	3.00	4.28
7	2.31	3.72	3.84	2.91	2.68	3.72	4.32	3.31	3.12	3.21	3.00	4.22
8	2.31	3.40	3.93	2.88	2.69	4.00	4.61	3.31	3.13	3.22	2.91	3.10
9	2.33	3.78	6.40	2.80	2.68	3.82	4.60	3.21	3.11	3.22	2.91	3.14
10	2.34	4.37	4.30	2.74	2.68	3.62	4.74	3.21	3.11	3.23	2.91	3.14
11	2.34	3.39	4.40	2.79	2.67	3.52	3.61	3.21	3.14	2.51	2.91	3.14
12	2.42	3.33	4.58	5.45	2.53	3.62	3.71	3.21	3.13	2.61	2.91	3.15
13	4.38	11.35	4.58	5.92	2.58	4.62	3.71	3.21	3.14	2.81	2.81	3.25
14	3.72	5.68	3.98	4.39	2.59	4.00	3.91	3.11	3.15	2.71	2.81	3.25
15	2.91	4.58	3.93	3.58	2.71	3.82	4.38	3.21	3.16	2.61	2.81	3.19
16	2.90	3.33	4.38	3.92	2.70	3.92	4.32	3.11	3.16	2.61	2.81	3.23
17	2.90	3.41	4.40	3.00	2.68	3.88	3.81	3.11	3.19	2.61	2.81	3.24
18	2.83	3.48	3.99	3.54	2.67	3.89	3.71	3.21	3.20	2.61	2.81	3.21
19	2.82	3.48	3.98	3.50	2.64	3.84	3.51	3.22	3.20	2.51	2.81	3.21
20	2.81	3.52	3.98	4.38	2.81	4.48	3.51	3.28	3.21	2.51	2.81	3.92
21	2.82	3.58	3.90	3.49	2.90	4.67	3.41	3.28	3.22	2.59	3.00	5.68
22	2.85	3.58	3.90	3.48	2.90	4.93	3.51	3.29	3.21	2.61	3.00	4.91
23	2.87	3.62	3.94	3.48	3.35	5.41	3.71	3.28	3.20	3.61	2.81	3.72
24	2.72	3.69	3.93	3.40	4.50	5.40	3.71	3.27	3.22	6.71	2.81	3.69
25	2.75	3.63	3.90	3.40	4.48	5.40	3.41	3.27	3.22	5.21	3.61	3.68
26	2.78	3.60	3.90	3.32	4.47	5.91	3.71	3.22	3.21	3.71	4.81	3.65
27	2.78	3.90	3.82	3.33	4.43	5.90	3.61	3.20	3.23	3.51	4.00	3.65
28	2.73	3.80	3.80	3.29	3.30	5.88	4.31	3.21	3.20	2.51	3.01	3.65
29	2.72	....	3.84	3.28	3.40	5.83	4.00	3.21	3.21	3.31	3.51	3.92
30	2.69	....	3.84	3.28	3.40	5.71	3.91	3.23	3.22	3.30	3.51	3.48
31	2.69	....	3.71	....	3.40	....	3.71	3.23	....	3.30	....	3.43

HIWASSEE RIVER AT MURPHY, NORTH CAROLINA.

This station is described in Water-Supply Paper No. 36, page 169. The observer is William Mingus, of Murphy. Records of measurements during 1899 will be found in the Twenty-first Annual Report, Part IV, page 165. During 1900 the following measurements were made by E. W. Myers and R. E. Shuford:

Discharge measurements of Hiwassee River at Murphy, North Carolina.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
February 11	6.10	1,534	September 9	5.05	345
February 14	7.95	4,567	November 18	5.20	443
April 29	6.10	1,466	December 13	5.53	762
May 26	5.52	755	December 13	5.45	698
June 29	7.10	3,405	December 28	5.70	865
July 8	5.90	1,155			

Daily gage height, in feet, of Hiwassee River at Murphy, North Carolina, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.50	5.12	7.00	5.90	6.10	5.40	6.80	5.80	5.35	5.00	5.20	5.40
2	5.20	5.30	6.50	5.90	6.00	5.40	6.60	5.40	5.20	4.90	5.25	5.45
3	5.51	5.35	6.25	5.90	6.00	5.60	7.00	5.40	5.15	5.00	6.20	5.40
4	5.30	5.40	6.10	6.70	5.90	5.80	6.40	5.40	5.10	5.10	5.60	7.20
5	5.30	5.60	6.00	6.10	5.90	5.50	6.20	5.30	5.20	5.10	5.40	6.40
6	5.20	5.40	6.00	6.05	5.80	6.10	6.00	5.30	5.15	5.05	5.35	6.00
7	5.20	5.40	7.00	6.00	5.70	6.00	5.90	5.30	5.10	5.00	5.35	5.80
8	5.20	5.40	7.50	5.90	5.70	6.10	5.80	5.20	5.05	5.30	5.30	5.75
9	5.20	6.72	7.40	5.85	5.70	6.10	6.20	5.20	5.05	5.10	5.25	5.60
10	5.20	6.02	6.90	5.80	5.70	6.30	5.70	5.20	5.00	5.05	5.25	5.60
11	5.30	6.10	6.60	6.10	5.70	6.10	5.70	5.20	5.00	5.00	5.20	5.50
12	6.30	6.10	6.40	6.30	5.65	6.10	5.80	5.20	5.00	4.90	5.25	5.50
13	5.80	12.60	6.30	6.10	5.60	6.60	5.80	5.20	5.00	5.30	5.20	5.45
14	5.60	7.70	6.12	6.00	5.60	6.10	5.70	5.20	5.05	5.10	5.25	5.45
15	5.60	7.15	6.05	6.00	5.60	5.80	5.60	5.20	7.00	5.00	5.20	5.40
16	5.50	6.50	6.30	5.90	5.50	5.80	5.60	5.10	6.45	5.00	5.15	5.40
17	5.40	6.20	6.00	5.80	5.40	6.20	5.60	5.30	5.70	4.90	5.20	5.40
18	5.45	5.90	6.00	6.20	5.50	6.00	5.60	5.20	5.45	4.80	5.15	5.30
19	5.90	5.90	6.85	6.70	5.70	6.30	5.50	5.10	5.35	5.00	5.20	5.30
20	6.60	5.80	7.40	6.40	5.50	6.10	5.50	5.10	5.35	4.90	5.15	5.80
21	6.20	6.00	6.90	7.10	5.40	5.90	5.50	5.10	5.25	4.90	5.20	6.70
22	5.90	6.40	6.60	6.80	5.40	5.80	5.60	5.10	5.00	5.00	5.30	5.90
23	5.80	6.15	6.40	6.70	5.40	6.30	5.70	5.30	5.40	4.90	5.20	5.80
24	5.65	6.00	6.35	6.50	5.60	6.60	5.60	5.90	5.20	7.10	5.15	6.00
25	5.60	6.00	6.40	6.55	5.50	6.50	5.40	5.30	5.20	6.00	5.30	5.80
26	5.60	6.00	6.40	6.55	5.60	7.00	5.50	5.40	5.20	5.70	6.70	5.70
27	5.50	5.90	6.30	6.30	5.50	7.20	5.70	5.20	5.15	5.60	6.00	5.65
28	5.40	5.85	6.30	6.20	5.50	7.10	5.90	5.15	5.15	5.40	5.70	5.60
29	5.40	......	6.05	6.20	5.40	7.00	5.70	5.15	5.10	5.30	5.60	5.70
30	5.40	......	6.10	6.10	5.40	6.80	5.80	5.15	5.05	5.20	5.50	......
31	5.50	......	6.00	......	5.40	......	5.60	5.15	......	5.25	......	......

HIWASSEE RIVER AT RELIANCE, TENNESSEE.

This station was established by O. P. Hall on August 17, 1900. The gage is a vertical timber, graduated to feet and tenths, spiked to a tree on the right bank of the river about 200 feet above the Atlanta, Knoxville and Northern Railroad bridge, and very near the ferry landing. Measurements are made from the railroad bridge, a new steel structure of three spans of 140 feet each, which has recently been substituted for the old wooden bridge. Bench mark No. 1 is a nail in a hickory tree on the right bank of the river, about 100 feet above the end of the bridge and 8.56 feet above the zero of the gage. Bench mark No. 2 is the base of rail 40 feet from the right-bank end of bridge, and is 24.70 feet above the zero of the gage. At ordinary stages the river is about 350 feet wide at this point, and the section is a fairly good one, but at low stages the current becomes very sluggish. The observer is C. V. Higdon, a ferryman who lives near the gage. During 1900 the following measurements were made by O. P. Hall:

August 17: Gage height, 1.12 feet; discharge, 1,123 second-feet.
September 3: Gage height, 1.16 feet; discharge, 1,159 second-feet.
November 30: Gage height, 1.72 feet; discharge, 1,985 second-feet.
December 19: Gage height, 1.42 feet; discharge, 1,442 second-feet.

Daily gage height, in feet, of Hiwassee River at Reliance, Tennessee, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	1.40	1.05	1.30	1.60	17	......	2.00	1.00	1.20	1.50
2	......	1.30	1.00	1.20	1.50	18	......	1.60	1.00	1.10	1.50
3	......	1.20	1.00	1.80	1.50	19	1.10	1.40	.90	1.10	1.40
4	......	1.05	1.00	1.30	2.80	20	1.05	1.30	.90	1.20	1.50
5	......	1.00	1.00	1.40	3.00	21	1.05	1.20	1.90	1.30	2.80
6	......	1.10	1.00	1.50	2.40	22	1.05	1.20	1.00	1.40	2.80
7	......	1.05	1.00	1.40	2.00	23	1.10	1.30	1.30	1.30	2.10
8	......	1.00	1.30	1.40	2.00	24	1.50	1.30	4.00	1.50	2.40
9	......	1.00	1.50	1.30	1.90	25	1.40	1.20	2.00	1.70	2.30
10	......	.90	1.20	1.30	1.80	26	1.30	1.10	1.50	4.50	2.00
11	......	.90	1.10	1.40	1.70	27	1.30	1.10	1.60	3.60	1.90
12	......	.90	1.10	1.30	1.60	28	1.15	1.05	1.50	2.00	1.90
13	......	.90	1.20	1.30	1.60	29	1.10	1.05	1.50	1.80	2.00
14	......	1.00	1.40	1.30	1.60	30	1.10	1.05	1.40	1.70	1.90
15	......	3.60	1.10	1.20	1.50	31	1.10	......	1.30	......	2.40
16	......	3.50	1.00	1.20	1.50						

HIWASSEE RIVER AT CHARLESTON, TENNESSEE.

This station was originally established by the United States Engineer Corps, but is now maintained as a half-year station by the United States Weather Bureau. It is described in Water-Supply Paper No. 36, pages 170 and 171, where will also be found the records of measurements made during 1899. During 1900 the following measurements were made by Max Hall:

March 14: Gage height, 3.50 feet; discharge, 6,044 second-feet.
April 25: Gage height, 4 feet; discharge, 7,078 second-feet.
December 8: Gage height, 2.65 feet; discharge, 4,729 second-feet.

Daily gage height, in feet, of Hiwassee River at Charleston, Tennessee, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.0	1.2	3.7	3.1	3.1	1.5	5.8	2.0	1.2	0.7	1.2	2.1
2	1.0	1.0	5.8	2.9	2.9	1.6	4.7	1.8	1.6	.7	1.2	1.9
3	.9	1.2	4.5	2.9	3.0	2.0	5.0	1.6	1.2	.7	1.7	1.8
4	.6	1.6	3.7	4.6	2.9	2.2	4.9	1.5	1.0	.7	3.9	2.5
5	.9	1.8	3.2	6.0	2.6	2.2	3.5	1.4	.9	.7	2.4	6.7
6	1.2	2.3	2.9	4.0	2.5	2.1	3.0	1.4	.9	.7	1.8	4.3
7	1.1	1.7	4.5	3.4	2.4	3.3	2.7	1.3	.9	.8	1.6	3.1
8	1.1	1.6	9.0	3.2	2.3	4.4	2.5	1.3	.8	1.2	1.4	2.8
9	1.1	2.9	11.5	3.0	2.3	3.5	2.5	1.2	.7	2.0	1.4	2.6
10	1.1	4.9	8.0	2.9	2.5	3.0	2.3	1.2	.7	1.3	1.3	2.3
11	1.4	3.2	6.0	3.0	2.3	3.1	2.2	1.1	.7	1.0	1.2	2.1
12	4.6	3.1	4.8	4.9	2.1	3.4	2.0	1.1	.6	1.1	1.2	2.0
13	5.0	14.2	4.0	4.6	2.0	3.7	2.2	1.1	.6	1.7	1.1	1.9
14	3.0	18.6	3.7	3.7	2.0	4.7	2.2	1.2	.6	1.4	1.1	1.8
15	2.4	9.2	3.4	3.3	1.9	3.2	2.1	1.2	3.0	1.2	1.1	1.8
16	2.0	6.2	3.9	3.0	1.9	2.8	1.9	1.1	6.6	1.0	1.1	1.7
17	1.8	4.7	4.1	3.7	1.8	4.0	1.8	1.0	3.3	.9	1.0	1.6
18	1.7	3.6	3.4	5.1	1.7	4.6	1.7	1.0	2.0	.8	1.0	1.6
19	2.4	3.0	3.3	5.2	1.9	3.6	1.7	1.1	1.5	.7	1.0	1.5
20	6.4	2.8	7.5	5.0	2.1	3.6	1.6	1.0	1.3	.7	1.1	1.5
21	5.4	2.7	9.0	5.4	1.8	2.7	1.6	.9	1.2	.7	1.2	3.1
22	3.7	5.1	6.0	6.4	1.7	2.3	1.6	.8	1.1	.7	1.3	3.8
23	2.9	5.0	5.0	5.3	1.6	2.6	1.8	1.0	1.2	1.3	1.4	2.8
24	2.5	3.7	4.5	4.6	1.7	4.2	2.3	1.2	1.3	9.0	1.2	4.1
25	2.3	4.2	4.0	4.3	2.0	4.8	1.8	2.4	1.1	3.8	1.3	3.6
26	2.1	3.8	6.0	4.0	2.0	5.0	1.6	1.5	1.0	2.3	10.0	2.9
27	1.9	3.3	5.2	3.9	2.1	5.3	2.7	1.4	.9	1.8	7.0	2.6
28	1.8	12.9	4.4	3.7	1.7	5.9	3.8	1.5	.9	1.7	4.0	2.4
29	1.7	......	3.9	3.5	1.6	5.7	3.7	1.2	.9	1.5	2.9	2.6
30	1.5	......	3.6	3.3	1.5	8.0	2.7	1.2	.8	1.4	2.3	2.6
31	1.4	......	3.3	......	1.5	......	2.4	1.0	......	1.3	......	3.9

TOCCOA RIVER NEAR BLUERIDGE, GEORGIA.

This station, which was established by B. M. Hall November 25, 1898, is at the Morganton bridge, about 4 miles east of the town of Blueridge. It is described in Water-Supply Paper No. 36, page 171. Records of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 166. During 1900 the following measurements were made by B. M. Hall and his assistants.

March 23: Gage height, 3.36 feet; discharge, 967 second-feet.
May 18: Gage height, 2.90 feet; discharge, 679 second-feet.
November 28: Gage height, 2.95 feet; discharge, 626 second-feet.
July 19: Gage height, 2.90 feet; discharge, 680 second-feet.
December 17: Gage height, 2.65 feet; discharge, 419 second-feet.

Daily gage height, in feet, of Toccoa River near Blueridge, Georgia, for 1900.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	3.1	3.6	....	4.3	3.6	2.6	2.5	3.4	2.6
2	....	3.1	3.5	....	4.3	3.5	2.6	2.5	3.4	3.0
3	....	3.1	3.5	....	4.2	3.4	2.6	2.5	3.4	3.6
4	....	3.0	3.4	....	4.2	3.4	2.6	2.6	3.4	3.6
5	....	3.0	3.5	....	4.1	3.4	2.6	2.6	3.4	3.5
6	....	3.0	3.5	....	3.6	3.4	2.6	2.6	3.3	3.5
7	....	3.0	3.4	....	3.6	3.4	2.6	2.6	3.3	3.4
8	....	3.0	3.4	....	3.5	3.4	2.6	2.6	3.3	3.4
9	....	3.0	3.4	....	3.5	3.3	2.6	2.6	3.2	3.3
10	....	3.0	3.3	....	3.5	3.3	2.6	2.8	3.2	3.3
11	....	3.4	3.1	....	3.4	3.3	2.6	2.8	3.1	3.2
12	....	3.2	3.0	....	3.4	3.2	2.6	2.9	3.1	3.2
13	....	3.0	3.0	....	3.4	3.2	3.0	2.9	3.1	3.0
14	....	3.0	3.0	....	3.3	3.2	3.4	2.8	3.1	3.0
15	....	3.0	3.0	....	3.3	3.1	4.0	2.8	3.1	2.8
16	....	3.0	2.8	....	3.3	2.8	3.6	2.6	3.0	2.8
17	....	3.3	2.8	....	3.3	2.8	3.4	2.6	3.0	2.8
18	....	3.5	2.6	....	3.2	2.8	3.4	2.6	3.0	2.8
19	....	3.5	3.6	....	3.2	2.8	3.2	2.6	3.0	2.8
20	....	3.4	(*a*)	....	3.2	2.8	3.2	2.6	3.0	2.7
21	....	3.3	....	....	3.1	2.8	3.0	2.6	3.0	2.7
22	....	3.3	....	....	3.1	3.0	3.0	2.9	2.8	2.6
23	3.4	3.3	....	....	3.6	3.0	2.8	8.6	2.7	2.6
24	3.5	3.2	....	....	3.5	3.0	2.8	6.0	2.7	2.6
25	3.6	3.5	....	....	3.5	2.8	2.6	5.4	2.7	2.6
26	3.5	3.5	....	....	3.5	2.8	2.5	4.0	2.7	2.6
27	3.5	3.6	....	5.0	4.0	2.8	2.5	3.6	2.6	3.0
28	3.4	3.5	....	5.0	4.0	2.7	2.5	3.6	2.6	3.0
29	3.3	3.4	....	4.5	3.8	2.7	2.5	3.6	2.6	3.0
30	3.2	3.6	....	4.3	3.8	2.7	2.5	3.5	2.6	2.8
31	3.2	....	....	....	3.6	2.6	....	3.4	....	2.8

a No record May 20 to June 26, inclusive.

TENNESSEE RIVER AT KNOXVILLE, TENNESSEE.

This station was originally established by the United States Weather Bureau at the old county highway bridge, which has been torn down and replaced by a new bridge. Instead of placing the gage at the new bridge, it was decided to move it down the river, in order to get below some shoals and wing dams which have been put in for boating. A temporary gage was put in at the Knoxville and Augusta Railroad bridge, a half mile below the highway bridge, and was used during the greater part of the year 1899. In the latter part of that year a new permanent gage was established, and readings from it began November 1, 1899. The new gage is located on the right bank of the river, just below the mouth of the West Knoxville Bayou and about 1,000 feet below the temporary gage at the Knoxville and Augusta Railroad bridge. The gage, which is graduated to feet and tenths, is in two sections; the first, a sloping section made of a 2-inch by 4-inch pine timber spiked on top of an 8-inch by 8-inch oak sill well bolted to piles and embedded in crushed stone, reading from —2 feet to 12 feet; the second, a vertical section of standard Weather Bureau pattern, brass scale, screwed to one of the bents of the railroad trestle across the West Knoxville Bayou, about 50 feet from the bank of the river and from the sloping gage, reading from 12 feet to 36.5 feet. The gage is fastened to the upstream post of the bent facing away from the river. The zero of the gage is 804.3 feet above sea level. The bench mark is a cross in the stone on the east corner of the base to the right-bank pier of the Knoxville and Augusta Railroad bridge, and is 806.7 feet above sea level and 2.4 feet above the zero of the gage. The gage was located for the United States Weather Bureau by the United States Engineer Corps. Daily records are kept by the United States Weather Bureau and are furnished to the Geological Survey. Measurements are made at the Cherokee highway bridge 2 miles below the new gage. This bridge is a three-span iron structure and is about 80 feet above low water. The width of the river at low water is 550 feet. The section is a good one, but the current is rather sluggish at low water. During 1900 the following measurements were made by Max Hall:

April 25: Gage height, 4.35 feet; discharge, 17,219 second-feet.
December 7: Gage height, 5.50 feet; discharge, 23,529 second-feet.

Daily gage height, in feet, of Tennessee River at Knoxville, Tennessee, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.7	0.8	3.9	4.2	2.7	1.2	3.8	2.7	1.2	0.6	1.1	3.0
2	.5	.7	8.4	3.9	2.6	1.1	2.9	2.2	1.2	.4	1.0	2.5
3	.4	.8	11.1	3.5	2.4	1.1	2.8	1.4	1.0	.4	1.1	2.2
4	.2	1.0	9.1	3.4	2.4	1.1	2.8	1.2	.7	.3	1.5	2.6
5	.8	1.3	6.1	4.5	2.4	1.5	2.7	1.2	.5	.2	3.6	4.1
6	.8	1.6	5.0	4.1	2.3	2.4	2.5	1.1	.4	.2	3.5	6.6
7	.9	1.9	4.0	3.5	2.2	2.5	2.0	1.0	.3	.7	2.5	5.9
8	.9	1.7	4.9	3.2	2.1	1.9	2.0	.8	.4	.8	2.1	5.2
9	1.0	3.0	9.5	3.0	2.0	2.2	1.7	.8	.3	.7	1.8	3.5
10	.9	4.1	10.1	2.8	2.0	2.2	1.6	.7	.2	.7	1.5	3.0
11	1.1	4.2	7.9	2.7	2.1	1.9	1.4	.6	.2	.5	1.3	2.7
12	2.4	3.7	6.4	2.7	2.1	1.8	1.3	.5	.1	.4	1.2	2.3
13	4.6	6.9	5.5	2.8	2.1	1.7	1.2	.9	.0	.3	1.1	2.0
14	4.7	12.4	4.7	2.9	1.9	2.0	1.3	.6	.3	.2	1.0	1.9
15	4.3	12.7	4.2	2.7	1.8	2.0	1.4	.8	.6	.2	1.0	1.8
16	2.9	8.9	4.0	2.5	1.7	2.2	1.3	1.4	1.1	.3	.9	1.7
17	2.2	7.4	4.6	2.3	1.6	4.0	1.3	1.0	3.3	.2	.8	1.6
18	2.0	5.6	4.6	2.2	1.5	7.8	1.2	.8	3.6	.2	.8	1.4
19	2.0	4.0	4.5	3.2	1.4	6.5	1.1	.7	2.2	.2	.8	1.3
20	2.6	3.3	6.0	4.7	1.4	5.1	1.0	.6	1.4	.1	.7	1.3
21	3.1	2.9	11.9	4.6	1.4	4.3	.9	.5	1.0	.1	.8	1.3
22	3.1	3.0	13.2	5.7	1.4	3.3	1.3	.4	1.0	.1	.8	1.8
23	2.9	3.2	9.4	6.4	1.4	2.7	1.2	.4	1.0	.0	.8	2.5
24	2.5	5.0	6.7	5.5	1.3	3.3	1.5	1.4	1.0	4.9	.8	2.5
25	2.0	5.0	5.5	4.7	1.3	3.6	1.5	1.5	1.0	9.4	.8	2.3
26	2.1	4.9	5.7	4.0	1.8	4.4	1.7	1.2	1.0	5.8	5.6	2.2
27	1.8	4.8	6.9	3.8	2.0	4.2	5.6	1.1	1.0	4.6	9.6	2.0
28	1.7	3.7	6.7	3.6	1.8	3.7	6.0	.9	.9	3.4	9.1	1.9
29	1.5	......	5.8	3.2	1.5	3.4	4.8	.9	.8	1.8	5.0	1.7
30	1.4	......	5.0	2.9	1.3	5.8	4.0	.7	.7	1.4	3.6	1.7
31	1.1	......	4.5	......	1.2	......	3.5	.9	......	1.3	......	1.8

TENNESSEE RIVER AT CHATTANOOGA, TENNESSEE.

This station was established in 1879, at the foot of Lookout street, just below Chattanooga Island, by the Signal Corps of the United States Army; but since July 1, 1891, it has been in charge of the Weather Bureau. During the year 1900 a new gage was established. It is a vertical timber bolted to the south side of the third stone pier from the south end of the bridge. Gage heights are obtained from L. M. Prindell, United States Weather Bureau observer. Records of measurements made during 1899 will be found in the Twenty-first Annual Report, Part IV, page 168. During 1900 the following measurements were made by Max Hall and others:

March 13: Gage height, 11.25 feet; discharge, 66,012 second-feet.
July 27: Gage height, 3.45 feet; discharge, 18,470 second-feet.

Daily gage height, in feet, of Tennessee River at Chattanooga, Tennessee, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.05	3.25	8.05	7.85	6.20	2.85	8.85	6.20	2.10	2.00	2.90	8.70
2	(a)	2.95	8.70	7.20	5.65	2.80	8.15	5.40	2.00	1.80	2.60	6.50
3	(a)	2.60	10.90	6.85	5.35	3.00	6.95	4.70	2.30	1.70	2.50	5.60
4	(a)	2.50	12.50	7.25	5.15	3.20	6.30	4.20	2.50	1.50	2.90	5.10
5	(a)	2.90	12.75	8.05	4.95	3.20	5.80	3.60	2.30	1.40	3.30	5.60
6	2.10	3.50	10.65	8.55	4.80	3.50	5.40	3.20	2.00	1.30	3.70	6.90
7	2.20	3.95	10.00	7.85	4.65	5.65	5.00	2.90	1.70	1.30	4.20	8.30
8	2.30	3.90	11.65	7.05	4.45	6.65	4.50	2.60	1.60	1.60	4.20	9.20
9	2.35	5.35	14.55	6.50	4.45	6.15	4.20	2.40	1.40	1.80	3.70	8.50
10	2.45	8.40	16.50	6.10	4.35	5.30	4.20	2.30	1.30	2.10	3.20	7.00
11	3.35	9.40	16.15	6.50	4.30	5.00	4.30	2.10	1.20	2.10	3.00	6.10
12	6.05	8.95	14.25	7.50	4.30	4.90	3.80	2.00	1.10	2.50	2.70	5.40
13	8.15	13.90	11.65	7.40	4.15	4.50	3.40	1.90	1.00	3.00	2.50	4.90
14	8.70	21.55	9.85	7.00	4.00	5.20	3.30	1.90	1.10	2.50	2.30	4.50
15	8.45	24.00	8.65	6.50	3.85	5.30	3.30	2.10	1.80	1.90	2.20	4.30
16	7.80	21.40	8.00	6.30	3.75	5.25	3.30	2.20	3.10	1.80	2.10	4.20
17	6.35	17.00	7.80	8.75	3.60	5.45	3.20	2.30	4.00	1.60	2.00	4.00
18	5.50	12.05	7.55	10.65	3.50	6.15	3.10	2.30	4.10	1.50	2.00	3.60
19	5.80	9.25	7.55	9.75	3.40	8.85	3.00	2.30	4.60	1.40	1.90	3.40
20	8.50	7.70	8.55	9.40	3.40	9.20	2.90	2.20	4.70	1.30	1.90	3.30
21	9.40	7.10	11.60	11.70	3.25	8.90	2.70	1.90	3.90	1.20	2.10	3.30
22	8.85	7.70	14.95	12.00	3.15	7.65	2.50	1.80	3.00	1.20	2.20	4.00
23	7.95	8.50	17.40	11.35	3.05	6.40	2.50	1.70	2.60	1.40	2.30	4.20
24	7.20	8.55	16.45	10.70	3.00	6.25	2.80	1.80	2.40	2.20	2.80	4.70
25	6.15	8.55	12.65	9.75	3.15	7.15	3.00	1.90	2.70	4.10	3.20	5.20
26	5.50	9.50	11.15	8.50	3.20	7.60	3.10	2.50	2.70	7.00	7.80	5.40
27	5.00	9.30	10.90	7.80	3.35	8.05	3.30	3.10	2.60	7.50	13.90	5.20
28	4.65	8.45	10.70	7.45	3.60	8.20	4.60	2.70	2.40	6.00	15.60	4.60
29	4.20	....	10.20	7.05	3.60	8.60	8.00	2.50	2.30	4.90	15.60	4.30
30	3.90	....	9.35	6.60	3.35	8.70	8.20	2.30	2.20	3.70	13.20	4.20
31	3.55	....	8.50	....	3.05	....	7.30	2.20	....	3.40	....	4.50

a Frozen.

[Continued in Water-Supply Paper No. 49, where will be found numerous miscellaneous measurements of streams in the southern Appalachian region.]

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 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, N. Y., 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.

Part II of the Nineteenth Annual contains a paper on "Principles and conditions of the movements of ground water," by F. H. King, and one on "Theoretical investigation of the motion of ground waters," by C. S. Slichter.

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.

1901.

Twenty-first Annual Report of the United States Geological Survey, 1899–1900, Part IV, Hydrography, 1900; octavo, 768 pp.

Contains a "Report of progress of stream measurements for the calendar year 1899," by F. H. Newell; "Preliminary description of the geology and water resources of the southern half of the Black Hills and adjoining regions in South Dakota and Wyoming," by N. H. Darton; and "The High Plains and their utilization," by W. D. Johnson.

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

The Director, U. S. Geol. 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. Underground waters of southeastern Nebraska, by N. H. Darton, 1898.
13. Irrigation systems in Texas, by W. F. Hutson, 1898.
14. New tests of pumps and water lifts used in irrigation, by O. P. Hood, 1898.

15, 16. Operations at river stations, 1897, Parts I, 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 Bighorn Mountains, by Elwood Mead, 1899.

24, 25. Water resources of the State of New York, Parts I, II, by G. W. Rafter, 1899.

26. Wells of southern Indiana (continuation of No. 21), by Frank Leverett, 1899.

27, 28. Operations at river stations, 1898, Parts I, 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. Geology and water resources of southeastern S. Dak., by J. E. Todd, 1900.

35–39. Operations at river stations, 1899, Parts I–V, 1900.

40. The Austin dam, by Thomas U. Taylor, 1900.

41, 42. The windmill: its efficiency and use, Parts I, II, by E. C. Murphy, 1901.

43. Conveyance of water in irrigation canals, etc., by Samuel Fortier, 1901.
44. Profiles of rivers, by Henry Gannett, 1901.
45. Water storage on Cache Creek, California, by Albert E. Chandler, 1901.
46. Reconn. of Kern and Yuba rivers, Cal., by F. H. Olmsted and M. Manson, 1901.

47–52. Operations at river stations, 1900, Parts I–VI, 1901.

Other papers are in various stages of preparation. 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 made for 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

THE DIRECTOR, UNITED STATES GEOLOGICAL SURVEY, WASHINGTON, D. C.

DEPARTMENT OF THE INTERIOR

WATER-SUPPLY

AND

IRRIGATION PAPERS

OF THE

UNITED STATES GEOLOGICAL SURVEY

No. 49

OPERATIONS AT RIVER STATIONS, 1900.—PART III

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 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; also 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.

(Continued on third page of cover.)

DEPARTMENT OF THE INTERIOR

WATER-SUPPLY

AND

IRRIGATION PAPERS

OF THE

UNITED STATES GEOLOGICAL SURVEY

No. 49

WASHINGTON
GOVERNMENT PRINTING OFFICE
1901

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

OPERATIONS AT RIVER STATIONS, 1900

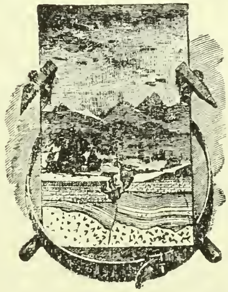
A REPORT OF THE

DIVISION OF HYDROGRAPHY

OF THE

UNITED STATES GEOLOGICAL SURVEY

PART III



WASHINGTON
GOVERNMENT PRINTING OFFICE
1901

CONTENTS.

OPERATIONS AT RIVER STATIONS, 1900.

PART III.

MEASUREMENTS AT RIVER STATIONS.[1]

MISCELLANEOUS MEASUREMENTS OF STREAMS IN SOUTHERN APPALACHIAN REGION.

A hydrographic investigation of the southern Appalachian region was made during the field season of 1900. A detailed report of the work will appear in a later publication. During the progress of the investigation a large number of measurements were made of various streams, as shown in the following tables. The tables are arranged in geographic order, commencing with the more northerly streams, which drain into the Atlantic Ocean, and ending with those which belong to the Gulf drainage.

Miscellaneous discharge measurements of Yadkin River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
June 21	Yadkin River	Wilkesboro, N. C	N. C. Curtis	26.73	780.0
June 23	do	do	do	26.14	1,737.0
July 4	do	do	do	26.83	663.0
July 12	do	do	do	27.05	488.2
Aug. 6	do	do	do	27.20	386.0
Oct. 1	do	do	do	27.20	369.1
Nov. 4	do	do	do	26.22	1,331.0
June 20	do	Second ford below Patterson's mill, North Carolina.	do	13.3	182.0
July 14	do	do	do	13.5	100.3
Aug. 7	do	do	do	13.4	76.2
Sept. 26	do	do	do	13.53	43.0
June 20	Elk Creek	One-fourth mile above ford, N. C.	do	2.4	119.0
July 13	do	do	do	2.43	61.0
Aug. 6	do	do	do	2.60	37.0
Sept. 26	do	do	do	2.61	30.0
June 21	Stony Creek	Footbridge at Colberts, North Carolina.	do	2.65	78.4
July 13	do	do	do	2.70	80.5
Aug. 6	do	do	do		50.0
Sept. 26	do	do	do	2.87	31.10
June 21	Louis Fork of Yadkin River.	Footbridge on Mount Pleasant road, North Carolina.	do	3.10	127.0
July 13	do	do	do	3.23	99.0
Aug. 6	do	do	do	3.30	69.0
Sept. 26	do	do	do	3.33	63.0

[1] Continued from Water-Supply Paper No. 48.

Miscellaneous discharge measurements of Yadkin River, etc.—Continued.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
June 23	Reddie River	North Wilkesboro, N. C	N. C. Curtis	24.73	218.1
July 12	do	do	do	25.15	98.1
Aug. 4	do	do	do		93.0
Oct. 1	do	do	do	25.25	60.2
June 23	Mulberry River	Trestle of Greensboro and Wilkesboro division of Southern R. R., North Carolina.	do	21.93	108.4
July 3	do	do	do	22.25	50.3
Aug. 4	do	do	do	22.50	39.25
Sept. 27	do	do	do	22.42	61.2
Nov. 2	do	do	do		55.0
June 25	Roaring River	Greensboro and Wilkesboro R. R. bridge, North Carolina.	do	23.68	520.2
July 9	do	do	do	25.45	161.4
Aug. 4	do	do	do	25.75	117.0
Sept. 27	do	do	do	25.13	109.0
Nov. 2	do	do	do	24.27	197.0
Sept. 27	Big Bugaboo Creek	Ford of road from Roaring River to Elkin, N. C.	do	1.28	30.0
June 25	Big Elkin River	Greensboro and Wilkesboro R. R. bridge, North Carolina.	do	24.53	65.0
July 9	do	do	do	25.95	29.0
Aug. 4	do	do	do		24.0
Sept. 27	do	do	do	26.22	27.0
June 26	Mitchell River	do	do	21.63	393.1
July 10	do	do	do	24.00	139.2
Aug. 3	do	do	do	24.25	119.0
Sept. 28	do	do	do	24.25	160.0
Nov. 1	do	do	do	23.89	216.0
June 26	Fisher River	Greensboro and Wilkesboro R. R. trestle, North Carolina.	do	20.93	549.0
July 10	do	do	do	23.38	172.0
Aug. 3	do	do	do	23.60	126.0
Sept. 28	do	do	do	23.72	119.0
Nov. 1	do	do	do	23.70	235.0
June 27	Ararat River	do	do	23.9	801.0
July 11	do	do	do	26.0	317.1
Aug. 2	do	do	do	26.25	265.44
Sept. 29	do	do	do	26.46	243.0
Oct. 31	do	do	do	25.66	307.0

Miscellaneous discharge measurements of Catawba River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
June 28	Catawba River	Oldfort, N. C	H. A. Pressey	10.10	53.0
Aug. 20	do	do	N. C. Curtis	12.70	11.0
Sept. 20	do	do	do	12.78	12.0
June 28	Mill Creek	do	H. A. Pressey	3.85	85.0
Aug. 20	do	do	N. C. Curtis	6.73	27.0
Sept. 20	do	do	do		13.0
June 28	Jarrett Creek	Near Oldfort, N. C	H. A. Pressey		17.0
Do	Curtis Creek	Two hundred feet above ford of Oldfort road, North Carolina.	do		82.11
Aug. 20	do	do	N. C. Curtis		16.50
June 28	Crib Creek	Near ford of main road, North Carolina.	H. A. Pressey	4.9	28.03
Aug. 28	do	do	N. C. Curtis		10.0
June 28	Clear Creek	Two hundred feet above ford of main road, North Carolina.	H. A. Pressey		25.25
Aug. 28	do	do	N. C. Curtis		12.0
June 14	Buck Creek	One-eighth mile above mouth at main ford, North Carolina.	H. A. Pressey		51.91
Aug. 20	do	do	N. C. Curtis	5.35	41.4
July 3	North Fork of Catawba River.	First ford above mouth, North Carolina.	H. A. Pressey		240.2
Aug. 18	do	do	N. C. Curtis		67.3
Sept. 21	do	do	do	3.18	61.69

Miscellaneous discharge measurements of Catawba River, etc.—Continued.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
June 15	Turkey Cove Creek	Just above second ford, North Carolina.	L. V. Branch	5.75	21.48
June 26	do	do	do	5.30	164.8
June 14	Muddy Creek	Bridgewater, N. C	H. A. Pressey	5.80	161.9
June 16	do	do	L. V. Branch	4.1	618.0
July 10	do	do	do	6.0	119.2
Aug. 17	do	do	N. C. Curtis	6.43	98.6
Sept. 21	do	do	do	6.34	101.7
June 14	Paddy Creek	Near Bridgewater, N. C	H. A. Pressey	11.3	19.78
June 16	do	do	L. V. Branch	5.4	203.67
July 10	do	do	do	11.55	11.5
Aug. 17	do	do	N. C. Curtis	12.35	7.0
June 21	Linville River	Linville, N. C	H. A. Pressey	14.83	21.0
June 24	do	do	do	14.23	90.22
June 14	Cane Creek	Lowest ford of main Morganton road, North Carolina.	do	5.72	18.58
June 18	do	do	L. V. Branch	5.85	28.45
Aug. 17	do	do	N. C. Curtis	6.3	7.2
June 14	Silver Creek	Near Morganton, N. C	L. V. Branch	6.84	124.0
Aug. 10	do	do	N. C. Curtis	8.30	48.4
Sept. 24	do	do	do	8.20	56.0
June 13	Upper Creek	One-fourth mile above mouth, North Carolina.	E. W. Myers	2.2	182.4
July 6	do	do	L. V. Branch	2.3	50.0
Aug. 8	do	do	N. C. Curtis		85.05
Sept. 24	do	do	do		60.0
June 20	do	Ford at Henderson's mill, North Carolina.	H. A. Pressey	12.9	20.42
Do	do	Upper Creek Falls, North Carolina.	do		27.0
Do	Steel Creek	Footbridge 100 yards above mouth, North Carolina.	do	3.20	100.21
Sept. 25	Johns River	Collettsville, N. C	N. C. Curtis	4.77	40.0
Nov. 6	do	do	do	4.47	135.0
Sept. 25	Mulberry Creek	At mouth, North Carolina	do	7.85	17.0
Nov. 6	do	do	do	7.95	39.0
Do	Wilson Creek	do	do	0.75	208.0
June 13	Lower Creek	Two miles above mouth, North Carolina	E. W. Myers	14.58	209.0
July 6	do	do	L. V. Branch		132.0
Aug. 8	do	do	N. C. Curtis		69.0
Sept. 24	do	do	do	15.38	56.0

Miscellaneous discharge measurements of Broad River (of the Carolinas) and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
Aug. 28	Broad River	Ford 1 mile above mouth of Second Broad River, North Carolina.	H. A. Pressey	5.95	649.0
Aug. 25	do	McClure's bridge, North Carolina.	N. C. Curtis	23.43	220.0
Oct. 18	do	do	do	22.67	434.0
Aug. 22	do	Near mouth of Buffalo Creek, North Carolina.	do	15.2	57.1
Oct. 5	do	do	do	14.59	145.4
Aug. 21	do	Bridge at Batcave post-office, N. C.	do		50.1
Do	do	do	do	10.15	48.0
Oct. 6	do	do	do	10.45	62.4
Aug. 21	Hickory Nut Creek	At mouth, North Carolina	do	4.80	15.2
Do	Reedy Patch Creek	do	do	5.75	13.0
Aug. 22	Buffalo Creek	Fifteen yards below main ford, North Carolina.	do	4.10	17.0
Do	Cove Creek	Bridge at Rutherfordton road, North Carolina.	do	18.65	69.3
Oct. 6	do	do	do	18.16	86.0
Aug. 25	Mountain Creek	Near mouth, North Carolina	do	6.83	55.3
Oct. 8	do	do	do	6.48	70.2
Aug. 25	Maple Creek	do	do	7.70	8.4

Miscellaneous discharge measurements of Broad River, etc.—Continued.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
Aug. 25	Green River	Cox's bridge, North Carolina	N. C. Curtis	22.9	299.0
Oct. 8	do	do	do	22.6	255.4
Sept. 3	do	Near Saluda, on Howard Gap road, North Carolina.	do	17.7	74.1
Do	Cove Creek	Near mouth, North Carolina	do	5.40	19.2
Aug. 31	White Oak Creek	One-half mile above mouth, North Carolina.	do	4.65	64.0
Aug. 23	Second Broad River	One and one-half miles east of Forest City, N. C.	do	20.8	153.3
Oct. 5	do	do	do	20.32	188.3
Aug. 24	do	Bridge on Rutherfordton-Morganton road, North Carolina.	do	7.35	55.0
Oct. 4	do	do	do	7.00	64.0
Aug. 24	Cane Creek	One mile above mouth, North Carolina.	do	5.43	17.0
Aug. 23	Cathey Creek	At mouth, North Carolina	do	3.35	42.0
Do	Hollins Creek	do	do	5.8	14.3
Aug. 24	Robersons Creek	do	do		24.0
Aug. 23	Puzzle Creek	Near mouth, North Carolina	do	6.70	10.0
Aug. 30	First Broad River	do	do	17.7	285.3
Oct. 10	do	do	do	16.2	266.4

Miscellaneous discharge measurements of South Saluda Creek and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
Sept. 7	South Saluda Creek	Freeman Bridge, below mouth of Middle Saluda Creek, North Carolina.	N. C. Curtis	14.1	223.0
Oct. 14	do	do	do	14.1	171.0
Sept. 7	do	Two miles above mouth of Middle Saluda Creek, North Carolina.	do	6.0	188.0
Oct. 14	do	do	do	6.0	134.0
Sept. 7	Middle Saluda Creek	One mile above mouth, North Carolina.	do	11.75	68.0
Oct. 13	do	do	do		55.0
Sept. 7	North Saluda Creek	Iron bridge at Marietta, N. C.	do	14.7	58.2
Oct. 13	do	do	do	14.17	80.0
Sept. 6	do	Bridge on Lima-Cleveland Mills road, North Carolina.	do	12.9	56.1
Do	do	Two miles below Humphrey's store, North Carolina.	do	14.2	26.1
Do	Fall Creek	Bridge on road to Lima, N. C.	do		*a* 15.0

a Estimated.

Miscellaneous discharge measurements of Tugaloo River tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				*Sec.-ft.*
Dec. 21	South Prong of Panther Creek.	Near Turnerville, Ga	J. C. Conn	8.8
Do	Panther Creek	do	do	33.5
Do	Tiger Creek	Nine miles north of Tallulah Falls, Ga.	do	18.2
Dec. 22	do	Six miles south of Clayton, Ga	do	11.8
Do	Scott Creek	Clayton, Ga	do	9.0
Do	Timpson Creek	Five miles from Clayton, Ga	do	12.2
Dec. 23	Tallulah River	Burton, Ga	do	263.1
Dec. 24	Stekoa Creek	One mile east of Clayton, Ga	do	9.9
Do	Chattooga River	Rogers Ford, Georgia	do	273.5

Miscellaneous discharge measurements of Broad River (of Georgia) and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				*Sec.-ft.*
Dec. 19	Grove Creek	Maysville, Ga	J. C. Conn	29.4
Do	Hickory Level Creek	do	do	20.3
Dec. 20	Little Hudson Creek	Homer, Ga	do	147.3
Do	Little Nails Creek	do	do	9.1
Dec. 26	North Broad River	Three and one-half miles south of Toccoa, Ga.	do	7.8
Do	Davis Creek	Four miles south of Toccoa, Ga	do	2.3
Do	Leatherwood Creek	Eight and one-half miles south of Toccoa, Ga.	do	8.3
Do	Little Leatherwood Creek.	Ten miles south of Toccoa, Ga	do	6.5
Do	Middle Broad River	Ten miles northeast of Homer, Ga	do	96.6
Do	Little Hudson River	One mile north of Homer, Ga	do	82.0
Dec. 27	Hickory Level Creek	Three miles south of Maysville, Ga	do	26.5
Do	Grove Creek	Two and one-half miles northeast of Maysville, Ga.	do	28.5

Miscellaneous discharge measurements of Savannah River tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
June 30	Hollow Creek	Kathwood, S. C	B. M. Hall		123.0
May 2	South Broad River	Near Carlton, Ga	Max Hall	3.20	200.0
Oct. 18	Broad River	Baker's ferry, about 25 miles below Carlton, Ga.	do	2.20	949.0

Miscellaneous discharge measurements of Oconee River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
Aug. 27	Oconee River	Carey, Ga	W. E. Hall	2.37	1,199.0
Dec. 27	do	do	Max Hall	3.00	1,566.0
Dec. 28	do	Milledgeville, Ga	do	3.44	2,349.0
Dec. 18	Appalachee River	Dacula, Ga	J. C. Conn		11.4
Dec. 19	Cedar Creek	Hoschton, Ga	do		27.3
Do	Walnut River	Pendergrass, Ga	do		66.8
Do	Middle Oconee River	do	do		70.3
Do	Hurricane Creek	Dry Pond, Ga	do		6.5
Do	North Oconee River	do	do		72.8
Dec. 27	do	do	do		103.8
Do	Hurricane Creek	do	do		3.2
Do	Middle Oconee River	Pendergrass, Ga	do		61.4

Miscellaneous discharge measurements of Ocmulgee River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				*Sec.-ft.*
Oct. 10	Yellow River	Near Stone Mountain, Ga	Max Hall	112.0
Dec. 18	Stone Mountain Creek.	Stone Mountain, Ga	J. C. Conn	18.1
Do	Haynes Creek	Snellville, Ga	do	2.0
Do	Big Creek	Tripp, Ga	do	3.9
Do	Shoal Creek	Bramlett Shoals, Georgia	do	9.3
Do	Alcovy River	do	do	33.7
Dec. 28	do	do	do	34.5
Do	Shoal Creek	do	do	8.5
Do	Yellow River	Annistown, Ga	do	151.7

Miscellaneous discharge measurements of Chattahoochee River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				Sec.-ft.
Aug. 20	Cane Creek	Near Dahlonega, Ga	W. E. Hall and H. G. Stokes.	28.6
Do	Yahoola Creek	do	do	66.0
Do	Chestatee River	do	do	287.0
Do	Singleton ditch	do	do	1.8
Do	Yahoola ditch	do	do	30.4
Do	Yahoola Creek	Five miles above Dahlonega, Ga	do	22.7
Do	Cane Creek	Five miles north of Dahlonega, Ga	do	13.3
Do	Wards Creek	At mouth, Georgia	do	5.0
Aug. 21	Charles Creek	Near Louisville, Ga	do	9.0
Do	Tates Creek	One mile above mouth, Georgia	do	8.0
Do	Mill Creek	Near mouth, Georgia	do	5.0
Do	Turner Creek	do	do	20.0
Do	Shoal Creek	Above mining ditch, Georgia	do	23.0
Do	Chestatee River	Below Turner Creek, Georgia	do	69.0
Aug. 22	Town Creek	Six miles above mouth, Georgia	do	23.0
Do	do	Two miles above mouth, Georgia	do	57.0
Do	Loud ditch	Near Henesey, Ga	do	7.3
Do	Jennies Creek	Near Pleasant Retreat, Ga	do	21.7
Do	E. Tessantee Creek	At mouth, Georgia	do	70.2
Do	Tessantee River	Near Pleasant Retreat, Ga	do	142.0
Do	Shoal Creek	Near mouth, Georgia	do	9.7
Aug. 23	Dukes Creek	Two miles above mouth, Georgia	do	55.0
Do	Chattahoochee River	Nacoochee, Ga	do	80.5
Do	Santee Creek	At mouth, Georgia	do	69.0
Do	Soque River	Porter Mills, Georgia	do	212.0
Do	Flat Shoals Creek	Johnson's mill, near West Point, Ga	Max Hall	113.0
Aug. 24	Little River Creek	Near Land, Georgia	W. E. Hall and H. G. Stokes.	12.3
Dec. 21	Glades Creek	Five miles northeast of Demorest, Ga.	J. C. Conn	62.9
Do	Hazel Creek	Demorest, Ga	do	92.7

Miscellaneous discharge measurements of Etowah River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				Sec.-ft.
Aug. 14	Little River	Arnold's mill, Georgia	W. E. Hall and H. G. Stokes.	56.3
Do	Smithwick Creek	Between Arnold's mill, Georgia, and Creighton, Ga.	do	8.0
Do	Buzzard Flopper Creek.	do	do	8.0
Do	Board Tree Creek	do	do	8.0
Do	Sittingdown Creek	Creighton, Ga	do	54.4
Aug. 15	Etowah River	Near Hightower, Ga	do	664.0
Do	Cogburns Creek	do	do	12.0
Do	Yellow Creek	Near mouth, Georgia	do	45.7
Do	Amicalola River	About 3 miles above mouth, Georgia	do	241.0
Aug. 16	Spriggs Creek	One mile below Summerour place, Georgia.	do	21.3
Do	Little Amicalola Creek.	Below Amicalola Falls, Georgia.	do	4.3
Do	Big Amicalola Creek	Near Afton post-office, Ga	do	83.0
Aug. 17	Spriggs Creek	Near Juno post-office, Ga	do	27.7
Do	Carder Creek	Near mouth, Georgia	do	16.2
Do	Parks Creek	do	do	16.0
Do	Pigeon Creek	Near Dawsonville, Ga	do	7.6
Do	Shoal Creek	do	do	34.6
Do	Etowah River	Near Auraria, Ga	do	257.0
Do	West Amicalola Creek.	Langston Ford, Georgia	B. M. Hall	15.9
Do	Crane Creek	Below Amicalola Falls, Georgia	do	6.5
Aug. 18	Carder Creek	Near Emma, Ga	do	9.0
Do	Spriggs Creek	At Spriggs Ford, Georgia	do	14.0
Do	Parks Creek	Near Parks place, Georgia	do	7.3
Do	Mill Creek	Near mouth, Georgia	W. E. Hall and H. G. Stokes.	34.0
Do	Nimblewill Creek	One mile above mouth, Georgia	do	40.6
Do	Etowah River	Below mouth of Nimblewill Creek, Georgia.	do	132.0
Aug. 21	Montgomery Creek	Near Randa, Ga	do	10.4
Sept. 25	Etowah River	Near Cartersville, Ga	Max Hall	a1,235.0
Do	Petits Creek	do	do	16.0
Do	Pumpkin Vine Creek	do	do	60.5
Nov. 15	Town Creek	Alice, Ga	O. P. Hall	6.7

a Gage height, 2 feet.

Miscellaneous discharge measurements of Coosawattee River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				*Sec.-ft.*
Aug. 13	Sugar Creek	Near Ramsey, Ga	O. P. Hall	4.0
Aug. 17	Clontz Creek	Southern's ford, Georgia	B. M. Hall	17.8
Oct. 18	Talking Rock Creek	Near Carters, Ga	O. P. Hall	91.0
Do	Harris Creek	Goble, Ga	do	3.4
Do	Worley Creek	At mouth, Georgia	do	6.5
Do	Crawfords Creek	do	do	5.0
Oct. 19	Tails Creek	do	do	27.0
Do	Flat Creek	do	do	19.0
Oct. 20	Cartecay River	Ellijay, Ga	do	165.0
Do	Ellijay River	do	do	129.0
Do	Cox Creek	do	do	2.2
Do	Mill Creek	Near Ellijay, Ga	do	3.0
Do	Clonegar Creek	Five miles above Ellijay, Ga	do	3.0
Do	Clear Creek	One mile above mouth, Georgia	do	7.5
Do	Turkey Creek	One mile above mouth of Clear Creek, Georgia.	do	12.9
Oct. 22	Lick Log Creek	Cartecay, Ga	do	16.3
Oct. 24	Anderson Creek	One mile above mouth, Georgia	do	70.0
Do	Tickanetley River	One mile above mouth of Anderson Creek, Georgia.	do	101.0
Do	Pumpkin Creek	Near Tickanetley, Ga	do	29.8
Do	Downing Creek	One and one-half miles above forks, Georgia.	do	23.6
Do	Rawlston Creek	Near mouth, Georgia	do	27.5
Do	Branch of Cartecay River.	Entering Cartecay River, 9 miles above Ellijay, Ga.	do	4.6
Do	Scrongetown Creek	Near mouth, 7 miles above Ellijay, Ga	do	7.7
Oct. 25	Owltown Creek	At mouth, 3 miles above Ellijay, Ga	do	15.0
Do	Big Turniptown Creek.	Above mouth of Little Turniptown Creek, Georgia.	do	17.4
Do	Little Turniptown Creek.	One mile above month, Georgia	do	1.9
Do	White Path Creek	At railroad crossing, Georgia	do	5.3
Do	Branch of Briar Creek.	Whitepath, Ga	do	.8
Do	Briar Creek	One and one-half miles north of Whitepath, Ga.	do	3.0
Do	Rock Creek	One mile above mouth, Georgia	do	32.5
Do	Cherry Log Creek	Near mouth, Georgia	do	21.9
Oct. 26	Boardtown Creek	do	do	28.1
Do	Parks Creek	At Boardtown road, Georgia	do	2.4
Do	Branch of Kells Creek.	Near mouth, Georgia	do	1.5
Do	Kells Creek	Above mouth, Georgia	do	10.6
Do	Branch of Ellijay River.	Near mouth, Georgia	do	3.0
Do	Ellijay River	At bridge 1½ miles above Ellijay, Ga	do	175.7
Oct. 27	Cartecay River	At railroad bridge at Ellijay, Ga	do	263.2
Do	Mountaintown Creek.	Above fork at Ratcliff, Ga	do	37.3
Do	Middle Prong of Mountaintown Creek.	Near mouth, Georgia	do	17.9
Do	West Prong of Mountaintown Creek.	Above mouth of Middle Prong, Georgia.	do	23.2

Miscellaneous discharge measurements of Conasauga River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				*Sec.-ft.*
May 15	Conasauga River	Near Resaca, Ga	O. P. Hall	420.0
Aug. 13	Rock Creek	Ramsey, Ga	do	7.4
Sept. 7	do	do	do	4.2
Aug. 13	Holly Creek	Near Fort Mountain, Georgia	do	13.8
Sept. 6	do	do	do	13.5
Aug. 13	Mill Creek	Dunn, Ga	do	3.0
Aug. 14	Sumach Creek	North Prong at Long Bridge, Georgia	do	3.2
Do	do	South Prong at Long Bridge, Georgia	do	3.6
Sept. 6	do	do	do	4.1
Do	do	North Prong at Long Bridge, Georgia	do	3.4
Aug. 14	Conasauga River	Alaculsy, Ga	do	16.2
Sept. 6	do	do	do	10.7
Aug. 14	Jacks River	Near Alaculsy, Ga	do	30.6
Sept. 5	do	do	do	24.8
Aug. 15	Sheets Creek	do	do	2.0

Miscellaneous discharge measurements of Coosa River tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				*Sec.-ft.*
Aug. 15	Talladega Creek	Kymulga, Ala	J. R. Hall	107.0
Aug. 16	Tallesschatchee Creek	Childersburg, Ala	do	102.0
Aug. 17	Hatchett Creek	Goodwater, Ala	do	84.0

Miscellaneous discharge measurements of Tallapoosa River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				*Sec. ft.*
Apr. 7	Tallapoosa River	Muscadine, Ala	J. C. Conn	475.0
Aug. 2	Longahatchee Creek	Meader's bridge, Alabama	J. R. Hall	125.0
Aug. 3	Blue Creek	Susanna, Ala	do	34.0
Aug. 28	Elkhatchee Creek	Island Home, Ala	do	40.0
Aug. 30	Timber Cut Creek	Welche's ferry, Alabama	do	18.6
Nov. 1	Tallapoosa Creek	Cherokee Bluff, Alabama	do	3,650.0
Dec. 12	Chattasafkee Creek	Dadeville, Ala	do	35.0
Do	Sandy Creek	Near Dadeville, Ala	do	145.0

Miscellaneous discharge measurements of New River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec. ft.*
July 18	South Fork of New River.	Riverside, N. C	N. C. Curtis	11.85	165.0
Oct. 25	do	do	do	11.00	741.1
July 23	Flannery Fork	Ford of Boone-Blowing Rock road, North Carolina.	do	6.35	10.4
Oct. 24	do	do	do	5.35	107.0
July 23	Middle Fork	Ford of Boone-Aho road, North Carolina.	do	5.70	24.4
Oct. 24	do	do	do		234.0
July 23	East Fork	do	do	5.70	10.4
Oct. 24	do	do	do	5.10	109.0
July 18	Meat Camp Creek	One-fourth mile below Moretz, N. C.	do	9.00	35.3
Oct. 25	do	do	do	8.65	89.0
July 24	Elk Creek	Elk crossroads, North Carolina.	do	8.00	10.0
July 18	Old Field Creek		do	6.1	19.4
July 24	Gap Creek	One-eighth mile above mouth, North Carolina.	do	4.85	23.4
July 19	Beaver Creek	At mouth, North Carolina	do	6.00	22.4
July 27	Mulberry Creek	Near mouth, North Carolina	do	5.1	109.0
Do	Prather Creek	One and one-half miles below Scottville, N. C.	do	8.6	25.0
July 21	North Fork of New River.	One mile below Creston, N. C	do	6.7	49.3
Oct. 26	do	do	do	6.0	194.0
July 20	do	One-half mile from Creston, N. C., on road to Solitude, N. C.	do	2.65	32.2
Do	Three Top Creek	Creston, N. C	do	6.75	130.0
July 21	do	do	do	7.25	37.0
July 20	Big Laurel Creek	One hundred yards above mouth, North Carolina.	do	6.40	26.2
Oct. 26	do	do	do	6.30	80.4
July 20	Buffalo Creek	One-eighth mile above mouth, North Carolina.	do	5.43	44.0
Oct. 26	do	do	do		67.0
July 25	Horse Creek	One-fourth mile above mouth, North Carolina.	do	6.6	34.3
Oct. 27	do	do	do	6.05	140.0
July 25	Helton Creek	Below Peasley's mill, North Carolina.	do	4.28	30.0
Oct. 27	do	do	do		105.0
July 28	Wilson Creek	Two miles above mouth, Virginia.	do	6.3	35.1
Oct. 28	do	do	do	6.1	78.0

Miscellaneous discharge measurements of New River, etc.—Continued.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
July 29	Fox Creek	One-fourth mile above mouth, Virginia.	N. C. Curtis		85.0
Oct. 28	do	do	do		144.0
July 31	Peach Bottom Creek	Two hundred yards above mouth, Virginia.	do	4.9	21.4
Oct. 29	do	do	do		36.0
July 31	Little River	Ford of Independence-Oldtown road, Virginia.	do	9.1	199.0
Oct. 29	do	do	do		318.2
July 30	Elk Creek	Two hundred yards above mouth, Virginia.	do	4.0	57.[illegible]

Miscellaneous discharge measurements of French Broad River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
Sept. 7	French Broad River	One half mile above Hot Springs, N. C.	L. V. Branch	19.35	938.0
Sept. 12	do	Alexander, N. C	E. W. Myers	17.15	840.0
Oct. 29	do	do	L. V. Branch	16.27	2,068.0
Sept. 18	do	Fanning Bridge, North Carolina.	N. C. Curtis	16.22	1,161.0
Oct. 17	do	do	do	16.95	614.0
Sept. 17	do	Penrose, N. C	do	19.8	1,160.0
Sept. 13	do	Near Carson Creek, N. C.	do	13.8	266.5
Oct. 15	do	do	do	13.9	206.5
Sept. 14	do	Eastatoe Bridge, North Carolina.	do	12.4	113.0
Oct. 15	do	do	do	11.21	102.4
Sept. 14	North Fork of French Broad River.	Two hundred yards above mouth of West Fork, North Carolina.	do		100.6
Oct. 15	do	do	do	13.2	51.8
Sept. 16	do	Bridge on Brevard-Webster road, North Carolina.	do	14.98	107.48
Do	do	Ford on road between Tucker and Shoal creeks, North Carolina.	do	7.3	75.0
Sept. 14	West Fork of French Broad River.	Near mouth, North Carolina	do	2.20	149.0
Oct. 15	do	do	do		62.0
Sept. 14	Middle Fork of French Broad River.	Bridge 20 yards above ford, North Carolina.	do	5.25	77.0
Do	South Fork of French Broad River.	Footbridge at ford of main road, North Carolina.	do	10.3	71.0
Oct. 15	East Fork of French Broad River.	Near mouth, North Carolina	do	10.2	46.0
Sept. 16	Tucker Creek	Two hundred yards above mouth, North Carolina.	do	4.61	28.0
Sept. 13	Cathey Creek	Ford of Brevard Jeptha road, North Carolina.	do	6.7	30.2
Sept. 17	King Creek	Brevard road, North Carolina.	do	4.71	15.46
Do	Davidson River	Near mouth, North Carolina	do	16.45	151.7
Oct. 16	do	do	do	16.75	70.20
Sept. 17	Little River	Three fourths mile above mouth, North Carolina.	do	13.66	182.8
Oct. 16	do	do	do	14.35	69.2
Sept. 17	Boylston Creek	Near mouth, North Carolina	do	5.35	28.6[illegible]
Do	Mills River	Bridge on Old Haywood road, North Carolina.	do	13.11	211.6[illegible]
Oct. 17	do	do	do	13.4	94.0
Sept. 18	Mud Creek	Near mouth, North Carolina	do	5.11	108.0
Do	Caney Creek	Bridge on Westfall's place, North Carolina.	do	10.1	60.0
Do	Avery Creek	Bridge on road from Mills River to Asheville, N. C.	do	6.56	11.31
Sept. 19	Hominy Creek	Asheville, N. C	do	15.1	80.0
Oct. 17	do	do	do	15.4	24.0
Sept. 19	Swannanoa River	Biltmore, N. C	do	2.91	76.33

Miscellaneous discharge measurements of French Broad River, etc.—Continued.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
Sept. 20	North Fork of Swannanoa River.	Three miles above Swannanoa post-office, N. C.	N. C. Curtis	16.07	21.45
Do	Flat Creek	Two miles below Black Mountain Station, N. C.	do	4.05	22.83
Sept. 12	Beaver Dam Creek	Fifty yards above mouth, North Carolina.	E. W. Myers	5.09	1.46
Oct. 30	do	do	L. V. Branch	5.08	4.10
Sept. 16	Lees Creek	Olivette, N. C	E. W. Myers	11.15	3.95
Oct. 30	do	do	L. V. Branch	10.95	2.29
Sept. 12	Newfound Creek	At mouth, North Carolina	E. W. Myers	17.75	9.41
Sept. 16	do	Three-fourths mile above mouth, North Carolina.	do	10.19	34.16
Oct. 30	do	do	L. V. Branch	10.44	20.23
Sept. 12	Reams Creek	At mouth, North Carolina	E. W. Myers	12.1	4.89
Oct. 30	do	do	L. V. Branch		9.0
Sept. 11	Flat Creek	do	E. W. Myers	18.05	5.33
Oct. 29	do	do	L. V. Branch	17.43	5.0
Sept. 12	Sandy Mush Creek	Bailey, N. C	E. W. Myers	9.73	21.72
Sept. 17	do	do	do	9.43	55.23
Oct. 30	do	do	L. V. Branch	9.53	45.0
Sept. 16	Turkey Creek	Blackwell Springs, N. C	E. W. Myers	7.97	35.24
Oct. 30	do	do	L. V. Branch	8.32	16.24
Sept. 17	Big Ivy River	One-eighth mile below mouth of Bull Creek, North Carolina.	E. W. Myers	2.55	47.59
Oct. 29	do	do	L. V. Branch	2.72	41.72
Sept. 8	Little Pine Creek	One hundred yards above mouth, North Carolina.	do	5.84	3.33
Oct. 31	do	do	do	5.76	6.0
Sept. 8	Pawpaw Creek	One mile above mouth, North Carolina.	do	4.6	0.35
Sept. 10	Walnut Creek	At mouth, North Carolina	do	23.24	1.36
Oct. 31	do	do	do	2.35	2.24
Sept. 8	Big Pine Creek	One hundred yards above mouth, North Carolina.	do	6.07	4.85
Oct. 31	do	do	do	6.01	4.45
Sept. 8	Laurel Creek	Two hundred yards above mouth, North Carolina.	do	16.13	49.0
Sept. 18	do	do	E. W. Myers	15.77	55.0
Sept. 7	Spring Creek	Near Hot Springs, N. C	L. V. Branch	2.00	15.0
Nov. 1	do	do	do	2.07	16.0
Sept. 7	Shutin Creek	do	do	2.61	0.45

Miscellaneous discharge measurements of Nolichucky River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec. ft.*
Aug. 23	Nolichucky River	Erwin, Tenn	L. V. Branch	20.67	770.0
Sept. 4	do	do	do	21.53	411.0
Aug. 24	Toe River	Near Huntdale, N. C	do	15.89	381.0
Oct. 17	do	do	do	16.12	301.0
July 2	North Toe River	Sprucepine, N. C	H. A. Pressey		323.0
Aug. 26	do	do	L. V. Branch	18.20	105.0
Oct. 21	do	do	do	18.37	78.0
Oct. 25	do	do	do	17.15	570.0
Aug. 27	do	Plumtree, N. C	do	7.55	79.0
Do	do	At ford of Linville-Cranberry road, North Carolina.	do	3.6	18.0
Do	Kentucky Fork of North Toe River.	At mouth, North Carolina	do	2.85	9.7
Do	White Oak Creek	do	do	2.26	3.36
Aug. 28	Horse Creek	do	E. Graves	5.55	9.03
Oct. 24	do	do	L. V. Branch	5.15	40.53
Aug. 27	Squirrel Creek	One-fourth mile above mouth, North Carolina.	do	3.12	11.2
Do	Roaring Creek	At mouth, North Carolina	do	7.89	15.57
Do	Plum Tree Creek	Plumtree, N. C	do	2.99	8.09
Do	Henson Creek	At mouth, North Carolina	do	6.94	4.8
Aug. 26	Threemile Creek	Near old post-office at Elsie, N. C.	do	5.38	2.63
Oct. 21	do	do	do	5.30	3.57
Aug. 25	Beaver Creek	Near Sprucepine, N. C	do	4.50	3.29
Oct. 21	do	do	do	4.29	3.08
Aug. 26	Grassy Creek	Sprucepine, N. C	do	5.21	6.09

Miscellaneous discharge measurements of Nolichucky River, etc.—Continued.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
Oct. 20	Grassy Creek	Sprucepine, N. C	L. V. Branch	5.13	9.15
Aug. 26	Bear Creek	Flatrock, N. C	do	3.76	4.67
Oct. 20	do	do	do	3.70	3.73
Aug. 25	Snow Creek	Wing, N. C	do	3.03	2.0
Do	Crabtree Creek	Ford of Burnsville-Sprucepine road, North Carolina.	do	7.97	15.2
Oct. 20	do	do	do	7.91	14.55
Aug. 25	Brush Creek	Lower ford of Burnsville-Sprucepine road, North Carolina.	do	1.39	4.37
Oct. 20	do	do	do	1.51	.72
Aug. 24	Cane Creek	One-half mile above mouth, North Carolina.	do	9.20	11.78
Oct. 19	do	do	do	9.26	9.92
Sept. 3	Pigeon Creek	At mouth, North Carolina	do	5.86	1.65
Oct. 19	do	do	do	5.85	1.26
Sept. 3	Jack Creek	do	do	6.09	8.71
Oct. 19	do	do	do	6.10	6.83
Aug. 24	Big Rock Creek	Ford of Huntdale-Bakersville road, North Carolina.	do	2.42	51.3
Oct. 19	do	do	do	2.64	24.5
Aug. 24	Pigeon Roost Creek	At mouth, North Carolina	do	7.39	14.5
Oct. 19	do	do	do	7.47	4.12
Aug. 23	Hollow Poplar Creek	Ford of Erwin-Bakersville road, North Carolina.	do	8.15	5.98
Oct. 16	do	do	do	8.26	2.61
Aug. 23	South Indian Creek	Near Erwin, Tenn	do	5.38	52.3
Sept. 4	do	do	do	5.49	33.2
Sept. 19	do	do	E. W. Myers	5.40	53.0
Aug. 23	Martin Creek	do	L. V. Branch	1.59	7.55
Sept. 4	do	do	do	1.68	6.45
Aug. 22	North Indian Creek	Erwin, Tenn	do	3.95	51.0
Sept. 4	do	do	do	4.19	22.0
Sept. 19	do	do	E. W. Myers	4.05	29.7
Oct. 16	do	do	L. V. Branch	4.18	26.13
Aug. 22	do	Unicoi, Tenn	do	4.58	37.9
Do	Rock Creek	One hundred yards above mouth, Tennessee.	do	3.69	6.37
July 1	South Toe River	Ford of Micaville-Sprucepine road, North Carolina.	H. A. Pressey		220.8
Aug. 25	do	do	L. V. Branch	8.08	79.8
Aug. 30	do	do	do	7.98	86.23
Oct. 27	do	do	do	7.23	282.9
Aug. 31	do	One mile above mouth of Three Fork Creek, North Carolina.	do	4.34	26.0
Oct. 26	do	do	do	3.30	101.0
Aug. 31	Three Fork Creek	One-fourth mile above mouth, North Carolina.	do	1.49	9.49
Do	Rock Creek	Ford of Micaville-Marion road, North Carolina.	do	1.96	6.92
Oct. 26	do	do	do	1.62	28.68
Aug. 31	Middle Creek	do	do	3.94	3.78
Oct. 26	do	do	do	3.64	9.20
Aug. 31	Colbert Creek	do	do	3.87	2.51
Oct. 26	do	do	do	3.50	7.24
Aug. 30	Locust Creek	At mouth, North Carolina	do	1.98	3.83
Oct. 26	do	do	do	1.87	7.96
Aug. 30	Whiteoak Creek	do	do	4.66	4.40
Oct. 26	do	do	do	4.28	19.86
Aug. 30	Brown Creek	Ford of Micaville-Marion road, North Carolina.	do	3.02	4.94
Oct. 26	do	do	do	2.85	9.43
Aug. 30	Little Crabtree Creek.	Just above lower ford of Micaville-Sprucepine road, North Carollna.	do	4.28	17.54
Oct. 27	do	do	do	4.23	21.67
Aug. 30	Cane Branch	Ford of Micaville-Marion road, North Carolina.	do	3.92	2.98
Oct. 26	do	do	do	3.78	8.59
Aug. 24	Caney River	Huntdale, N. C	do	3.69	89.9
Sept. 3	do	do	do	3.82	62.77
Oct. 17	do	do	do	3.83	58.3
Sept. 1	do	Near Big Tom Wilson's, North Carolina.	do	1.33	17.15
Oct. 18	do	do	do	1.34	13.9
Sept. 1	Elk Fork Creek	do	do	1.24	4.78
Oct. 18	do	do	do	1.28	1.49
Sept. 1	Cattail Branch	Near Burnsville, N. C	do	2.78	2.77
Oct. 18	do	do	do	2.64	4.69

Miscellaneous discharge measurements of Nolichucky River, etc.—Continued.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
Sept. 1	Bowlen Creek	Near Burnsville, N. C	L. V. Branch	5.03	3.45
Oct. 18	do	do	do	4.97	4.02
Sept. 2	Price Creek	do	do	2.48	9.46
Oct. 18	do	do	do	2.53	8.35
Sept. 2	Bald Creek	do	do	4.56	16.25
Oct. 18	do	do	do	4.56	9.97
Sept. 2	Elk Shoal Creek	At mouth, North Carolina	do	1.63	1.29
Do	Bald Mountain Creek.	One mile above mouth, North Carolina.	do	3.43	19.7
Oct. 17	do	do	do	3.55	10.6
Sept. 2	Little Bald Mountain Creek.	At mouth, North Carolina	do	4.91	2.12
Oct. 17	do	do	do	4.90	2.61
Sept. 2	Big Creek	do	do	2.83	5.67
Oct. 17	do	do	do	2.89	2.0

Miscellaneous discharge measurements of South Fork of Holston River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
July 23	South Fork of Holston River.	Below mouth of Middle Fork, Virginia.	L. V. Branch	3.06	228.0
Oct. 3	do	do	E. W. Myers	3.21	199.0
July 28	do	Below mouth of Laurel Fork, Virginia.	do	2.60	652.0
Oct. 3	do	do	do	3.39	149.0
July 28	do	Above mouth of Laurel Fork, Virginia.	do	1.51	101.0
Oct. 3	do	do	do		48.0
July 27	do	Rye Valley, Virginia	do	6.96	20.0
Oct. 1	do	do	do		5.0
July 27	Jim Scot Branch	At mouth, Virginia	do		4.12
Oct. 1	do	do	do		0.5
July 27	Pomer Creek	do	do	2.1	39.0
Oct. 1	do	do	do	2.29	5.0
July 27	Hogtrough Creek	Lower ford of main road, Virginia.	do	.87	9.0
Oct. 2	do	do	do		1.0
July 27	St. Clair Creek	At mouth, Virginia	do	5.76	8.27
Oct. 2	do	do	do	5.94	2.0
July 27	Grose Creek	do	L. V. Branch	3.88	2.0
Oct. 2	do	do		(*a*)	
July 27	Mill Creek	One mile above mouth, Virginia.	do	4.32	18.0
Oct. 2	do	do	E. W. Myers	4.43	13.03
July 28	Rush Creek	Ford 100 yards above mouth, Virginia.	L. V. Branch	3.63	4.20
Oct. 2	do	do	E. W. Myers		2.0
July 28	Laurel Fork of Holston River.	One-half mile below Damascus, Va.	L. V. Branch	3.56	351.0
Oct. 3	do	do	E. W. Myers	4.61	88.14
July 29	do	Near Laurel bloomery, Tennessee.	do	5.12	61.0
Do	do	One-half mile above Laurel bloomery, Tennessee.	do	2.06	23.0
Do	Atcheson Creek	Near head of Laurel, Tenn	do	1.82	4.32
Do	White Top Creek	At mouth, Virginia	do	5.47	100.0
Oct. 2	do	do	do	5.72	34.3
July 28	Beaver Dam Creek	Damascus, Va	do	11.36	189.0
Oct. 3	do	do	do	12.26	32.4
July 23	Fifteenmile Creek	At mouth, Virginia	L. V. Branch	4.45	7.37
Sept. 27	do	do	E. W. Myers	4.23	10.46
July 21	Denton Valley Creek	do	L. V. Branch	5.73	6.0
Sept. 27	do	do	E. W. Myers	5.73	4.04
July 21	Wolf Creek	Lower ford of main road up the river, Virginia.	do	2.35	7.0
July 23	do	do	L. V. Branch	2.36	7.0
Sept. 27	do	do	E. W. Myers	2.21	12.24
July 21	Spring Creek	One mile above mouth, Virginia.	L. V. Branch	.90	13.0
Sept. 27	do	do	E. W. Myers		10.0

a Almost dry.

Miscellaneous discharge measurements of South Fork of Holston River, etc.—Cont'd.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
July 21	Jacobs Creek	At mouth, Tennessee	L. V. Branch	9.1	2.07
Sept. 27	do	do	E. W. Myers		2.0
July 21	Sharp Creek	do	do	5.36	1.16
Sept. 26	do	do	do	5.33	1.19
July 20	Fishdam Creek	do	do	5.25	5.85
Sept. 26	do	do	L. V. Branch	5.26	2.47
July 20	Jonah Creek	do	do	11.06	4.0
Sept. 25	do	do	E. W. Myers	11.42	4.0
July 20	Riddle Creek	do	do	12.19	2.0
Sept. 25	do	do	do	11.13	3.0
Do	Thomas Creek	Below railroad bridge, Tennessee.	do		2.46
July 29	Sinking Creek	At mouth, Tennessee	do	4.92	11.0
Sept. 25	do	do	do	4.42	9.09
July 20	do	One half mile above Paperville, Tenn.	L. V. Branch	3.6	3.48
Sept. 25	Hatcher Creek	One-half mile above mouth, Tennessee.	E. W. Myers	5.92	0.34
July 24	Middle Holston	Five miles above mouth, Virginia.	do	5.96	172.0
Sept. 28	do	do	do	6.21	100.0
July 25	Middle Fork of Holston River.	Sevenmile ford, Virginia	L. V. Branch	13.00	71.23
Do	do	Above mouth of Bear Creek, Virginia.	do	6.23	18.0
Oct. 1	do	do	do	7.69	11.0
July 25	Bear Creek	At mouth, Virginia	do	6.99	2.01
Oct. 1	do	do	E. W. Myers	6.90	3.0
July 25	Staleys Creek	Marion, Va	L. V. Branch	9.26	14.32
Do	Hungry Mother Creek.	Ford of main road from Marion, Va.	do	1.18	2.45
Oct. 1	do	do	E. W. Myers	1.17	2.36
July 25	Byars Creek	At mouth, Virginia	L. V. Branch	1.52	4.0
Sept. 29	do	do	E. W. Myers	1.58	2.24
July 25	Walker Creek	Fifty yards above mouth, Virginia.	do	4.90	3.0
Sept. 29	do	do	do	4.89	9.0
July 23	Huttons Branch	At mouth, Virginia	L. V. Branch	4.45	5.0
Sept. 29	do	do	E. W. Myers	4.43	5.0
Do	Halls Creek	do	do	1.73	17.36
Do	Cedar Creek	do	do		3.42
July 24	Hogthief Creek	One-half mile above mouth, Virginia.	L. V. Branch	5.0	5.0
Sept. 29	do	do	E. W. Myers		5.0

Miscellaneous discharge measurements of Watauga River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
July 16	Watauga River	Elizabethton, Tenn	E. W. Myers	15.87	450.0
Aug. 2	do	do	L. V. Branch	15.77	593.0
Aug. 16	do	do	do	16.03	403.0
Oct. 5	do	do	E. W. Myers	16.03	348.0
Nov. 7	do	do	L. V. Branch	15.27	993.0
Dec. 28	do	do	E. W. Myers	15.68	533.0
Dec. 31	do	do	Ernest Graves	15.22	973.0
July 16	do	Watauga Falls, N. C	N. C. Curtis		79.0
Aug. 10	do	do	L. V. Branch	6.62	53.0
Oct. 7	do	do	E. W. Myers	6.52	66.0
Aug. 11	do	One mile above Shull's mill, North Carolina.	L. V. Branch	4.05	19.0
Oct. 7	do	do	E. W. Myers	3.78	23.0
Aug. 10	Boone Fork of Watauga River.	Shull's mill, North Carolina	L. V. Branch	2.3	12.0
Oct. 7	do	do	E. W. Myers	2.11	13.0
Aug. 11	Moody Mill Creek	At mouth, North Carolina	L. V. Branch	3.2	4.0
Aug. 10	Laurel Creek (upper).	do	do	2.62	10.0
Oct. 7	do	do	E. W. Myers	2.87	6.0
Aug. 10	Dutch Creek	Valle Cruces, N. C	L. V. Branch	7.42	11.0
Oct. 7	do	do	E. W. Myers	7.37	6.0
Aug. 10	Cove Creek	At mouth, North Carolina	L. V. Branch	5.24	12.0
Oct. 7	do	do	E. W. Myers	5.15	14.0

Miscellaneous discharge measurements of Watauga River, etc.—Continued.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
Aug. 12	Cove Creek	Above mouth of Brushy Fork, North Carolina.	L. V. Branch	4.31	23.0
Do	Brushy Fork of Cove Creek.	At mouth, North Carolina	do	2.06	5.19
Do	Rockhouse Creek	do	do	2.17	16.3
Oct. 18	do	do	E. W. Myers		0.8
Aug. 10	Laurel Creek (lower)	do	L. V. Branch	10.62	4.0
Oct. 7	do	do	E. W. Myers		3.09
Aug. 9	Beaver Dam Creek	Near Leander, N. C	L. V. Branch	5.59	7.0
Oct. 6	do	do	E. W. Myers		8.0
Aug. 9	Beech Creek	Above mouth of Fogey Creek, North Carolina.	L. V. Branch	5.6	7.3
Oct. 6	do	do	E. W. Myers	5.7	7.4
Aug. 9	Fogey Creek	At mouth, North Carolina	L. V. Branch	2.94	1.4
Oct. 6	do	do	E. W. Myers	3.02	2.4
Aug. 9	Big Dry Run	One-eighth mile above mouth, North Carolina.	L. V. Branch	1.55	0.85
Aug. 6	Elk Creek	One-half mile below mouth of the Little Elk, Tennessee.	do	7.21	64.0
Aug. 11	South Fork of Elk Creek.	At Banners Elk, North Carolina.	do	11.96	9.38
Oct. 8	do	do	E. W. Myers	11.82	8.48
Aug. 12	North Fork of Elk Creek.	do	L. V. Branch	5.61	7.0
Oct. 8	do	do	E. W. Myers	5.64	4.0
Aug. 4	Cranberry Creek	Cranberry, N. C	L. V. Branch	6.95	5.09
Do	Blevins Creek	do	do	6.03	5.05
Aug. 6	Little Elk Creek	At mouth, North Carolina	do	1.2	6.0
Do	Dark Ridge Creek	One-half mile above mouth, Tennessee.	do	4.65	3.0
July 30	Roan Creek	Above mouth of Mill Creek, Tennessee.	E. W. Myers	5.7	60.3
Aug. 13	do	Key Station, Tenn	L. V. Branch	4.85	5.2
Do	Forge Creek	Near mouth, Tennessee	do	4.53	7.0
July 29	Town Creek	At Shoun crossroads, Tennessee.	do	3.48	29.2
Aug. 13	do	do	do	3.82	6.0
July 30	Mill Creek	At mouth, Tennessee	E. W. Myers	9.48	13.0
Do	Doe Creek	Mouth of Doe (town), Tenn	do	5.23	59.0
Aug. 13	do	do	L. V. Branch	5.49	26.2
Oct. 9	do	do	E. W. Myers	5.46	28.38
Aug. 13	do	Ivyspring post-office, Tennessee.	L. V. Branch	5.94	9.0
Aug. 3	Stony Creek	One-half mile above mouth, Tennessee.	do	6.95	44.0
Oct. 5	do	do	E. W. Myers	7.59	16.0
Dec. 31	do	do	Ernest Graves	4.60	48.0
Aug. 2	Doe River	Above Elizabethton, Tenn	L. V. Branch	5.94	143.4
Aug. 17	do	do	do	6.20	106.0
Oct. 5	do	do	E. W. Myers	6.23	82.0
Dec. 31	do	do	Ernest Graves	5.23	304.0
Aug. 3	do	Near Allentown, Tenn	L. V. Branch	5.56	72.0
Aug. 18	do	do	do	5.81	50.0
Oct. 5	do	do	E. W. Myers	5.85	39.3
Aug. 3	do	Two miles below Roan Mountain, Tennessee.	L. V. Branch	8.46	41.3
Do	Shell Creek	At mouth, Tennessee	do	2.35	14.0
Do	Wilson Creek	One mile above mouth, Tennessee.	do	3.67	5.0
Do	Little Doe River	Allentown, Tenn	do	4.42	35.0
Oct. 5	do	do	E. W. Myers	4.78	17.0
Dec. 29	do	do	do	4.30	28.3
Aug. 3	Laurel Fork of Doe River.	do	L. V. Branch	5.19	30.0
Aug. 17	do	do	do	5.50	15.0
Oct. 5	do	do	E. W. Myers	5.67	9.0
Dec. 29	do	do	do	5.05	27.0
Aug. 2	Gap Creek	At mouth, Tennessee	L. V. Branch	4.00	7.0
Oct. 4	do	do	E. W. Myers	4.12	3.0
Aug. 2	Buffalo Creek	do	L. V. Branch	5.85	20.0
Oct. 4	do	do	E. W. Myers	5.92	10.0
Aug. 2	Sinking Creek	Lower ford of Johnson City—Elizabethton road, Tennessee.	L. V. Branch	3.73	5.0
Oct. 4	do	do	E. W. Myers	3.75	4.0
July 19	Brush Creek	Near Carter, Tenn	L. V. Branch	6.77	10.03
Aug. 16	do	do	do	6.82	9.47
Sept. 24	do	do	E. W. Myers	6.94	5.14

Miscellaneous discharge measurements of tributaries of Tennessee River above Hiwassee River.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				*Sec.-ft.*
Aug. 20	Tellico River	Tellico Plains, Tenn	O. P. Hall	82.0
Do	Cane Creek	Belltown, Tenn	do	2.0
Do	Ball Play Creek	Tariffville, Tenn	do	2.2
Do	Citico Creek	Lillian, Tenn	do	17.2
Sept. 1	do	do	do	15.8
Aug. 20	Mulberry Creek	Ipe, Tenn	do	5.5
Aug. 21	Little Tennessee River.	Chilhowee, Tenn	do	1,751.0
Sept. 1	do	do	do	2,115.0
Aug. 21	Abrams Creek	do	do	40.2
Aug. 31	do	do	do	35.2
Aug. 22	Hesse Creek	Millers, Tenn	do	4.8
Aug. 23	Big Spring Creek	Tuckaleechee Cove, Tenn	do	4.3
Do	Near Prong of Little River.	do	do	29.5
Do	Main Prong of Little River.	do	do	92.6
Aug. 30	do	do	do	112.5
Aug. 24	Walden Creek	Henderson Springs, Tenn	do	26.1
Aug. 30	do	do	do	6.2
Aug. 24	Little Cove Creek	do	do	2.5
Do	West Fork of Little Pigeon River.	do	do	95.2
Aug. 25	do	Sevierville, Tenn	do	88.0
Aug. 29	do	do	do	51.5
Aug. 25	East Fork of Little Pigeon River.	do	do	178.4
Do	Middle Creek	do	do	1.0
Do	Bird Creek	Bird Creek, Tenn	do	3.0
Aug. 29	do	do	do	1.5
Aug. 25	Middle Fork of Little Pigeon River.	Richison, Tenn	do	126.8
Aug. 28	do	do	do	68.9
Aug. 27	East Fork of Little Pigeon River.	East Fork, Tenn	do	10.3
Aug. 28	do	do	do	9.1
Aug. 27	Cosby Creek	Cosby, Tenn	do	23.5
Aug. 28	do	Bison, Tenn	do	27.4
Aug. 27	Big Pigeon River	do	do	453.8

Miscellaneous discharge measurements of Hiwassee River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Gage height.	Discharge.
1900.				*Feet.*	*Sec.-ft.*
July 26	Choestoe Creek	Choestoe, Ga	W. E. Hall and H. G. Stokes.		17.3
Do	Nottely River	do	do		46.8
July 27	Level Land Creek	do	do		29.5
Do	Stink Creek	Caldwell, Ga	do		22.8
Do	Town Creek	do	do		55.6
Do	Arququah Creek	do	do		18.8
Do	Wolf Creek	do	do		20.0
July 28	Butternut Creek	Blairsville, Ga	do		29.3
Do	Coosa Creek	Coosa Creek, Georgia	do		99.6
Do	Nottely River	Blairsville, Ga	do	1.60	505.1
July 30	Young Cone Creek	Near mouth, Georgia	do		81.3
Do	Ivy Log Creek	Ivy Log, Ga	do		32.7
Do	Camp Creek	Camp Creek, Georgia	do		13.7
July 31	Nottely River	Thompson's bridge, Georgia	do	1.40	462.0
Do	Moccasin Creek	Ivy Log, Ga	do		12.8
Do	Rapier Creek	Ranger, N. C	do		22.0
Do	Nottely River	do	do	1.40	500.4
Aug. 1	Brasstown Creek	Brasstown, Ga	do		94.4
Aug. 2	Long Bullet Creek	Twine, N. C	do		11.9
Do	Hog Creek	Hiwassee, Ga	do		15.0
Do	Bell Creek	do	do		20.6
Do	Hiwassee River	do	do		337.8
Aug. 3	Scataway Creek	Visage, Ga	do		3.2
Do	Hightower Creek	Osborn, Ga	do		73.0
Do	Fodder Creek	Hiwassee, Ga	do		19.0
Do	Owl Creek	do	do		12.3
Do	Mill Creek	do	do		22.3
Aug. 4	Centers Creek	Mountain Scene, Ga	do		23.9
Do	High Shoals Creek	do	do		18.5

Miscellaneous discharge measurements of Hiwassee River, etc.—Continued.

Date.	Stream	Locality.	Hydrographer.	Discharge.
1900.				*Sec.-ft.*
Aug. 17	Lost Creek	Near Reliance, Tenn	O. P. Hall	7.7
Sept. 4	do	do	do	6.5
Aug. 17	Ellis Creek	do	do	2.0
Do	Spring Creek	At mouth, Tennessee	do	6.8
Sept. 4	do	do	do	4.3
Aug. 18	Childers Creek	Near Reliance, Tenn	do	6.8
Do	Spring Creek	Springtown, Tenn	do	4.0
Do	Conasauga Creek	Mecca, Tenn	do	25.0
Sept. 3	do	Near Jalapa, Tenn	do	20.2

Miscellaneous discharge measurements of Toccoa (Okoee)[a] River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
		GEORGIA.		
1900.				*Sec.-ft.*
July 19	Weavers Creek	Near Blueridge	W. E. Hall and H. G. Stokes.	10.0
Do	Starr Creek	Near Morganton	do	13.6
Do	German Creek	do	do	13.0
Do	Wilscots Creek	Near Wilscots	do	26.0
Do	Persimmon Creek		do	8.0
July 20	Toccoa River	Dial	do	384.2
Do	Noontootly Creek	Near mouth	do	126.0
Do	Big Creek	Three miles from Noontootly Creek	do	52.0
July 23	Skeinah Creek	One mile above mouth	do	15.6
Do	Rock Creek	Near mouth	do	46.0
Do	Coopers Creek	One mile above mouth	do	102.0
July 24	Toccoa River	Gaddistown	do	102.0
Do	Suches Creek	Near Gaddistown	do	27.0
Do	Mill Creek	One mile above mouth	do	22.0
Do	Toccoa River	One-half mile above Mill Creek	do	19.6
		TENNESSEE.		
Aug. 15	Sylco Creek	At mouth	O. P. Hall	3.8
Do	Greasy Creek	do	do	11.3
Aug. 16	Okoee (Toccoa) River.	Parksville	do	734.0
Do	Bakers Creek	do	do	4.0
Sept. 4	Greasy Creek	Above mouth of Rock Creek	do	5.1
Sept. 5	Okoee (Toccoa) River.	Parksville	do	667.0

[a] After entering Tennessee the Toccoa is known as Okoee River.

OLENTANGY RIVER AT COLUMBUS, OHIO.

This station was established November 22, 1898, at the Fifth avenue bridge, Columbus. It is described in Water-Supply Paper No. 36, page 175. The observations of river heights are made under the general direction of Prof. C. N. Brown, of the Ohio State University. Records of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 169. A number of measurements made in the latter part of 1899 were not published in the foregoing reports, and they, together with a measurement made on March 8, 1900, are given in the following list:

October 13, 1899: Gage height, 1 foot; discharge, 7 second-feet.
October 13, 1899: Gage height, 1 foot; discharge, 7 second-feet.
Octoben 14, 1899: Gage height, 1 foot; discharge, 7 second-feet.

October 20, 1899: Gage height, 1 foot; discharge, 7 second-feet.
November 17, 1899: Gage height, 1.20 feet; discharge, 44 second-feet.
December 2, 1899: Gage height, 1.10 feet; discharge, 15 second-feet.
March 8, 1900: Gage height, 5.42 feet; discharge, 5,039 second-feet.

Daily gage height, in feet, of Olentangy River at Columbus, Ohio, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.80	1.80	2.90	2.25	1.40	1.50	1.10	1.35	1.60	1.00	1.00	1.70
2	1.80	1.80	2.80	2.60	1.40	1.90	1.10	1.20	1.60	1.00	1.00	1.50
3	1.80	1.80	2.80	2.35	1.40	1.90	1.10	1.20	1.45	1.00	1.00	1.30
4	1.80	1.80	2.80	2.15	1.40	1.90	1.10	1.10	1.20	1.00	1.00	1.25
5	1.80	1.80	2.90	1.90	1.40	1.60	1.10	1.10	1.20	1.00	1.00	1.20
6	1.80	1.80	5.55	1.75	1.30	1.40	1.10	1.10	1.10	1.00	1.00	1.20
7	1.80	1.70	6.90	1.60	1.30	1.35	1.10	1.10	1.00	1.00	1.00	1.20
8	1.80	2.15	4.75	1.30	1.30	1.30	1.10	1.10	1.00	1.00	1.00	1.30
9	1.80	3.85	3.65	1.30	1.25	1.20	1.10	1.10	1.00	1.00	1.00	1.30
10	1.80	3.10	3.15	1.35	1.20	1.20	1.10	1.10	1.00	1.00	1.00	1.30
11	1.80	2.15	2.80	1.40	1.20	1.20	1.10	1.10	1.00	1.00	1.00	1.30
12	2.35	1.85	2.65	1.40	1.20	1.20	1.10	1.10	1.00	1.00	1.00	1.30
13	3.10	3.45	2.15	1.50	1.20	1.20	1.10	1.00	1.00	1.00	1.00	1.30
14	2.50	3.90	1.95	1.50	1.20	1.20	1.10	1.00	1.00	1.00	1.00	1.60
15	2.25	3.00	1.75	1.50	1.20	1.20	1.10	1.00	1.00	1.00	1.00	1.60
16	2.50	1.90	1.60	1.50	1.20	1.45	1.10	1.00	1.00	1.00	1.00	1.60
17	2.85	1.80	1.60	1.55	1.20	1.60	1.10	1.00	1.00	1.00	1.00	1.60
18	2.55	1.80	1.60	2.20	1.20	1.35	1.10	1.00	1.00	1.00	1.00	1.55
19	2.20	1.80	1.60	2.90	1.20	1.20	1.30	1.00	1.00	1.00	1.00	1.30
20	3.40	1.80	1.60	2.30	1.20	1.10	1.25	1.35	1.00	1.00	1.00	1.30
21	4.00	1.80	1.60	1.90	1.20	1.10	1.10	1.20	1.00	1.00	1.05	1.30
22	3.20	2.40	1.60	3.65	1.20	1.10	1.00	1.20	1.00	1.00	1.10	1.20
23	2.40	3.20	1.60	3.65	1.20	1.10	1.00	1.20	1.00	1.10	1.10	1.20
24	1.95	2.55	1.60	3.05	1.20	1.20	1.00	2.15	1.00	1.05	1.20	1.20
25	1.80	1.80	1.60	2.60	1.20	1.20	1.05	1.80	1.00	1.00	1.80	1.20
26	1.80	1.80	1.60	2.05	1.20	1.20	1.30	1.70	1.00	1.00	2.35	1.20
27	1.80	1.80	1.60	1.80	1.20	1.20	1.40	2.90	1.00	1.00	2.65	1.20
28	1.80	2.50	1.60	1.50	1.20	1.30	1.90	3.20	1.00	1.00	2.20	1.20
29	1.80	....	1.60	1.40	1.20	1.30	1.80	3.00	1.10	1.00	1.80	1.20
30	1.80	....	1.60	1.40	1.30	1.25	1.70	2.20	1.00	1.00	1.70	1.20
31	1.80	....	1.70	....	1.35	....	1.65	1.85	....	1.00	....	1.20

SCIOTO RIVER AT COLUMBUS, OHIO.

This station was established November 22, 1898, at the Grandview avenue bridge, Columbus. It is described in Water-Supply Paper No. 36, page 176. The observations are made under the general direction of Prof. C. N. Brown, of the Ohio State University. Measurements for the year 1899 will be found in the Twenty-first Annual Report, Part IV, page 170. A number of measurements made in the latter part of 1899 were not published in the foregoing reports, and they, together with the measurements made in 1900, are given in the following table:

Discharge measurements of Scioto River at Columbus, Ohio.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 13, 1899	9.10	14	Dec. 2, 1899	9.40	43
Oct. 14, 1899	9.10	13	Jan. 18, 1900	11.90	1,328
Oct. 20, 1899	9.20	14	Feb. 15, 1900	12.90	2,391
Nov. 17, 1899	9.30	33	Mar. 7, 1900	17.37	8,581
Nov. 30, 1899	9.30	37			

Daily gage height, in feet, of Scioto River at Columbus, Ohio, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	9.75	10.45	12.55	12.15	10.20	9.60	9.40	9.90	9.45	9.25	9.15	10.60
2	9.70	10.40	13.00	12.70	10.15	9.60	9.40	9.60	9.30	9.20	9.15	10.35
3	9.65	10.35	12.60	12.90	10.10	9.70	9.30	9.45	9.30	9.20	9.10	10.15
4	9.50	10.30	12.60	12.40	10.05	9.90	9.30	9.30	9.20	9.30	9.20	10.05
5	9.50	10.30	12.65	11.85	10.00	9.95	9.20	9.25	9.20	9.20	9.10	9.95
6	9.45	10.30	16.65	11.35	9.95	10.00	9.20	9.10	9.10	9.15	9.15	9.85
7	9.50	10.35	17.50	11.10	9.90	9.95	9.20	9.20	9.20	9.00	9.20	9.80
8	9.55	11.50	16.05	10.85	9.90	9.90	9.20	9.10	9.15	9.00	9.20	9.80
9	9.60	14.00	15.80	10.65	9.90	9.80	9.20	9.15	9.10	9.20	9.05	9.85
10	9.60	13.25	15.15	10.50	9.80	10.20	9.10	9.25	9.10	9.20	9.10	9.90
11	9.70	12.75	14.40	10.40	9.90	10.45	9.10	9.10	9.00	9.20	9.10	9.75
12	9.75	12.15	13.60	10.40	9.90	10.30	9.10	9.00	9.00	9.40	9.10	9.65
13	11.30	13.55	12.95	10.60	9.90	10.05	9.10	9.00	8.95	9.65	9.15	9.65
14	11.40	13.75	12.30	10.95	9.80	9.75	9.15	8.90	8.90	9.50	9.20	9.45
15	11.35	12.95	11.80	10.90	9.70	9.55	9.10	9.00	8.95	9.35	9.20	9.40
16	11.45	12.50	11.40	10.80	9.70	9.45	9.10	9.25	9.00	9.30	9.20	9.40
17	12.15	11.45	10.90	10.75	9.70	9.45	9.20	9.15	9.00	9.25	9.20	9.40
18	11.95	10.95	10.90	11.80	9.75	9.60	9.10	9.05	9.20	9.20	9.20	9.40
19	11.75	11.25	11.00	12.65	9.65	9.50	9.05	8.90	9.00	9.15	9.20	9.40
20	13.35	10.85	11.15	12.20	9.50	9.45	9.45	9.55	8.90	9.10	9.25	9.35
21	15.25	10.75	11.10	11.65	9.60	9.40	9.30	9.65	8.80	8.10	9.30	9.30
22	14.20	11.90	10.85	12.50	9.60	9.40	9.20	9.50	8.80	9.10	9.30	9.35
23	13.55	12.65	10.70	12.15	9.60	9.30	9.10	9.30	8.70	9.20	9.80	9.40
24	13.15	13.05	10.60	11.90	9.55	9.00	10.15	9.80	8.75	9.20	10.15	9.40
25	12.35	12.30	10.60	11.60	9.50	9.00	9.40	10.05	8.85	9.20	10.65	9.40
26	11.70	12.85	10.80	11.15	9.50	9.05	9.15	10.30	8.90	9.15	11.70	9.35
27	11.10	12.95	10.80	10.80	9.50	9.10	9.05	10.25	8.90	9.00	11.55	9.30
28	10.70	12.65	10.75	10.55	9.50	9.25	9.10	10.05	8.90	9.05	11.50	9.30
29	10.65	......	10.80	10.45	9.50	9.50	9.10	9.95	9.05	9.05	11.40	9.35
30	10.50	......	10.90	10.35	9.50	9.35	10.40	9.80	9.30	9.00	11.10	9.35
31	10.85	......	10.80	......	9.50	......	9.90	9.70	......	9.10	......	9.35

MAUMEE RIVER NEAR WATERVILLE, OHIO.

This station was established on November 19, 1898, by H. A. Pressey and B. H. Flynn. It is located at the highway bridge near Waterville, the gagings being made on the downstream side. It is described in Water-Supply Paper No. 36, pages 178 and 179, where will also be found the results of the discharge measurements made during 1899. During 1900 the following measurements were made by B. H. Flynn:

July 26: Gage height, 3.30 feet; discharge, 2,143 second-feet.

November 24: Gage height, 4.85 feet; discharge, 6,784 second-feet.

Daily gage height, in feet, of Maumee River near Waterville, Ohio, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.00	3.70	3.60	5.40	3.55	3.80	2.70	3.30	2.45	2.10	2.20	4.35
2	4.25	3.60	3.50	5.40	3.30	4.05	2.60	3.25	2.50	2.20	2.20	4.70
3	4.45	3.60	3.55	5.55	3.30	4.45	2.65	3.10	2.35	2.30	2.30	4.45
4	4.50	3.85	3.80	5.60	2.90	4.45	2.75	2.90	2.25	2.20	2.35	4.25
5	4.50	4.05	4.35	5.75	2.80	4.15	2.80	2.80	2.20	2.25	2.40	4.05
6	4.70	4.25	4.75	5.90	2.80	3.90	2.80	2.70	2.10	2.15	2.55	3.80
7	4.35	4.40	5.35	5.50	2.90	3.40	2.50	2.50	2.20	2.15	2.55	3.75
8	3.90	4.80	5.95	4.90	3.05	3.30	3.20	2.40	2.20	2.10	2.40	3.45
9	3.50	5.55	7.90	4.25	3.10	3.50	3.80	2.40	2.15	2.20	2.35	3.55
10	3.05	6.60	11.40	3.85	3.00	3.70	4.25	2.65	2.20	2.20	2.30	3.10
11	2.90	7.05	11.80	3.55	2.90	3.80	4.30	2.75	2.20	2.20	2.30	3.00
12	3.35	6.65	10.10	3.60	2.70	4.35	4.05	2.45	2.10	2.35	2.25	3.00
13	3.50	6.25	8.60	3.95	2.70	4.60	3.65	2.30	2.15	2.40	2.20	3.00
14	3.50	6.55	7.85	4.00	2.70	4.35	3.60	2.30	2.10	2.50	2.25	3.20
15	3.55	6.40	6.80	4.20	2.80	4.00	3.50	2.20	2.10	2.40	2.30	2.95
16	3.40	6.75	6.10	4.35	2.65	3.90	3.40	2.20	2.10	2.35	2.35	2.85
17	3.30	6.05	6.00	4.60	2.60	3.55	3.35	2.10	2.10	2.30	2.35	2.80
18	3.20	4.80	5.65	5.00	2.50	3.50	3.70	2.10	2.10	2.20	2.45	2.70
19	3.55	3.40	6.80	5.35	2.60	3.30	3.60	2.10	2.10	2.10	2.65	2.65
20	4.05	3.35	6.75	5.05	2.65	3.20	3.50	2.10	2.10	2.15	3.45	2.55
21	4.80	3.50	6.55	5.00	2.65	3.00	3.65	2.10	2.10	2.15	4.15	2.50
22	5.05	3.50	6.70	5.75	2.50	3.00	3.80	2.25	2.10	2.10	4.80	2.50
23	5.30	3.60	6.70	6.10	2.55	3.35	3.75	2.65	2.10	2.20	5.25	2.50
24	5.00	3.85	6.85	6.00	2.50	3.85	3.30	3.00	2.10	2.20	5.35	2.50
25	5.20	4.05	6.65	5.70	2.50	4.50	3.10	3.20	2.10	2.20	5.40	2.35
26	5.10	4.45	6.40	5.25	2.45	4.55	3.30	3.30	2.10	2.20	5.30	2.40
27	4.65	4.10	6.30	4.85	2.40	4.15	3.15	3.15	2.10	2.20	5.25	2.70
28	4.35	3.85	5.90	4.20	2.45	3.65	2.95	2.75	2.10	2.20	4.95	2.75
29	4.00	......	5.35	3.90	2.60	3.15	2.90	2.70	2.10	2.20	4.55	2.55
30	3.60	......	5.00	3.80	3.10	2.75	2.75	2.45	2.10	2.20	4.20	2.70
31	3.60	......	5.25	......	3.70	......	3.15	2.40	......	2.20	......	2.70

SANDUSKY RIVER NEAR MEXICO, OHIO.

This station was established November 17, 1898, at the highway bridge near Mexico, about 40 miles above Fremont, Ohio. It was abandoned November 17, 1900. Only one measurement was made in 1899, when, at a gage height of 5.40 feet, the discharge was 1,386 second-feet. During 1900 the following measurements were made by B. H. Flynn:

July 25: Gage height. 1.75 feet; discharge, 133 second-feet.
November 22: Gage height, 1.80 feet; discharge, 225 second-feet.

Daily gage height, in feet, of Sandusky River near Mexico, Ohio, for 1900.

Day.	Jan.	Feb.	Mar	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	1.5	2.0	4.4	3.2	1.9	1.9	1.6	2.0	1.7	1.3	0.9
2	1.5	1.9	6.4	4.6	1.8	2.1	1.5	1.9	1.6	1.4	.8
3	1.4	1.7	6.3	5.0	1.8	2.7	1.4	1.7	1.5	1.6	.8
4	1.3	1.8	6.3	4.3	1.8	2.4	1.3	1.6	1.4	1.6	.8
5	1.2	1.9	6.8	4.0	1.7	2.1	1.4	1.4	1.3	1.5	1.0
6	1.1	1.9	9.6	3.4	1.6	1.9	1.5	1.3	1.3	1.5	.9
7	1.1	1.8	15.5	3.0	1.6	2.0	1.3	1.1	1.1	1.5	1.0
8	1.0	4.2	15.3	2.8	1.6	2.2	1.2	1.1	1.2	2.2	1.0
9	1.0	7.7	14.5	2.5	1.7	2.1	1.3	1.0	1.2	2.1	1.0
10	.9	7.6	10.9	2.3	1.6	2.1	1.2	1.0	1.3	1.9	.9
11	2.3	5.3	9.1	2.2	1.7	2.1	1.2	1.0	1.4	1.8	1.0
12	3.5	3.7	7.4	2.7	1.7	1.9	1.1	.7	1.7	1.7	1.0
13	4.2	5.6	5.5	3.4	1.7	1.8	1.0	.9	1.5	1.6	1.1
14	4.0	8.3	4.8	3.3	1.6	1.7	1.0	.8	1.4	1.5	1.0
15	4.3	7.3	4.0	3.3	1.5	1.6	.9	.7	1.3	1.5	.9
16	4.8	4.5	3.6	2.9	1.5	1.6	1.0	1.1	1.1	1.4	.9
17	5.7	3.9	3.1	2.7	1.4	1.5	.9	1.3	1.0	1.3	(*a*)
18	5.2	3.7	2.8	4.3	1.4	1.5	.8	1.5	1.0	1.3	......
19	4.2	3.2	2.8	5.3	1.4	1.5	.8	1.5	1.0	1.2	......
20	3.7	2.7	2.7	4.9	1.4	1.5	1.0	1.6	1.0	1.1	......
21	7.9	2.4	2.6	3.6	1.3	1.6	.9	3.3	1.1	1.1	......
22	7.8	3.4	2.3	3.3	1.2	1.6	.9	2.9	1.2	1.1	......
23	6.1	3.7	2.4	4.0	1.3	1.6	.8	2.5	1.1	1.1	......
24	4.7	4.6	2.3	4.5	1.2	1.5	.8	5.0	1.1	1.1	......
25	3.9	4.2	2.2	4.0	1.2	1.5	1.3	5.9	1.0	1.2	......
26	3.1	4.1	2.3	3.3	1.1	1.6	2.6	4.6	.8	1.2	......
27	2.8	4.0	2.7	2.6	1.1	1.5	2.5	4.1	.8	1.1	......
28	2.6	3.9	2.7	2.3	1.4	1.6	2.4	5.2	.7	1.0	......
29	2.3	....	2.8	2.0	1.5	1.9	2.0	4.8	.8	1.0	......
30	2.0	....	2.9	1.9	1.6	1.7	1.8	2.5	.9	1.0	......
31	2.1	....	2.8	....	1.7	....	1.9	2.0	....	.9	......

a Gage destroyed.

SANDUSKY RIVER AT FREMONT, OHIO.

This station, which was established November 18, 1898, by H. A. Pressey and B. H. Flynn, is at the bridge of the Lake Shore Railroad at Fremont. It is described in Water-Supply Paper No. 36, page 181. One measurement was made in 1899—gage height, 2.32 feet; discharge, 1,784 second-feet. The following measurements were made during 1900:

July 26: Gage height, 2.75 feet; discharge. 2,316 second-feet.
November 23: Gage height, 1.60 feet; discharge, 463 second-feet.

Daily gage height, in feet, of Sandusky River at Fremont, Ohio, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.95	0.65	1.95	1.20	0.60	1.50	0.85	1.40	1.00	1.10	1.00	1.75
2	.95	.65	2.70	1.70	.50	1.60	.85	1.30	.95	1.20	1.05	1.70
3	.95	.60	2.75	1.70	.40	1.65	.85	1.20	.95	1.10	.90	1.60
4	.90	.65	2.85	1.60	.40	1.70	.80	1.10	1.00	1.05	.80	1.35
5	.90	.65	2.90	1.60	.40	1.60	.75	.90	1.50	1.10	.85	1.30
6	.90	.75	4.65	1.50	.30	1.50	.65	.80	1.65	1.20	.80	1.35
7	.90	.75	6.45	1.20	.30	1.60	.70	.80	1.65	1.20	.85	1.20
8	.90	2.35	6.90	1.00	.30	1.60	.85	.80	1.65	1.10	.80	1.40
9	.90	3.30	5.70	.90	.35	1.50	.95	.90	1.75	1.20	.85	1.30
10	.90	2.80	5.30	.80	.40	1.50	.95	.85	1.70	1.15	.90	1.25
11	.95	2.15	3.55	.80	.40	1.60	.90	.65	1.70	1.10	.85	1.20
12	1.05	1.45	2.35	1.35	.30	1.50	.75	.60	1.65	1.05	.85	1.15
13	1.40	3.30	1.65	1.50	.30	1.40	.75	.75	1.65	1.05	.75	1.10
14	1.95	3.35	1.55	1.40	.30	1.50	.65	.75	1.70	.90	.80	1.05
15	2.00	2.70	1.80	1.30	.30	1.45	.50	.80	1.65	.85	.75	1.00
16	2.15	1.85	1.40	1.20	.20	1.20	.60	.75	1.75	.80	.70	1.15
17	2.15	1.15	1.20	1.30	.25	1.20	.50	.75	1.60	.95	.80	1.20
18	2.05	.80	1.20	2.15	.30	1.20	.60	1.10	1.70	1.00	.75	1.15
19	1.75	.95	1.40	2.20	.20	1.20	.55	1.05	1.65	.85	.80	1.10
20	2.00	.85	1.30	1.80	.20	1.10	.40	1.15	1.75	.80	1.10	1.00
21	3.20	.85	1.10	1.60	.20	1.10	.40	2.75	1.80	.90	1.50	1.00
22	2.95	1.35	1.10	1.45	.10	1.20	.40	2.55	1.75	.95	1.70	1.05
23	2.40	1.50	1.00	1.85	.25	1.20	.90	2.20	1.60	1.10	1.80	1.10
24	1.85	1.55	.90	1.95	.25	1.10	1.05	2.75	1.40	1.00	1.85	1.00
25	1.55	1.60	.90	1.75	1.10	1.10	1.70	3.75	1.25	1.05	2.10	1.05
26	1.35	1.70	.90	1.35	1.30	1.00	2.35	3.05	1.10	1.10	2.30	1.15
27	1.25	1.65	.90	1.05	1.30	.90	1.75	2.80	1.00	1.05	2.60	1.15
28	.85	1.80	1.10	.90	1.40	.95	1.70	2.00	1.10	1.00	2.20	1.10
29	.70	....	1.10	.70	1.40	.90	1.50	1.50	1.00	.90	2.00	1.00
30	.70	....	1.00	.70	1.40	.80	1.50	1.45	1.00	.85	1.90	1.00
31	.70	....	1.00	....	1.40	....	1.50	1.00	....	1.00	....	.90

SENECA RIVER AT BALDWINSVILLE, NEW YORK.

Records of the stations on the New York streams which belong to the coast drainage will be found in Water-Supply Paper No. 47, pages 42 to 80. A number of the streams of that State on which stations have been established belong to the Great Lakes drainage, and following the geographic arrangement which has been determined upon for the publication of the records contained in these reports, the records for these stations are inserted on this and the following pages. The methods employed in the gaging of these streams is discussed on pages 37 to 41 of Water-Supply Paper No. 47, where will also be found a list of the gaging stations in New York State, a table of the current-meter measurements made during 1900, a table of the drainage areas, and other interesting information.

The gaging station on Seneca River at Baldwinsville is described in Water-Supply Paper No. 36, page 183. This river drains the central lake region of New York. The outlets of Otisco, Skaneateles, and Owasco lakes are crossed by Erie Canal, and a portion of their flow is intercepted for water-supply purposes. Water from Lake Erie feeds the main canal as far as Port Byron. Some of this water is discharged into Seneca River, and thence is delivered into Lake Ontario.

The upper reaches of Seneca River are canalized, forming the Cayuga and Seneca canals, while dams on the lower portion admit of slack-water navigation, forming a part of Oswego Canal. During the summer but little water flows over the dam at Baldwinsville. In times of low water the mills are allowed to run a certain number of hours during the day, or until the supply accumulated in the pond above the dam is drawn down to a certain level. The water is diverted through three power canals, and is conducted to the water wheels by means of short lateral channels. The loss through leakage of wheel gates, flumes, and penstocks is considerable.

The following current-meter measurements were made at Baldwinsville:

	Second-feet.
June 11, 1900:	
Amos race	193.5
Oswego Canal	504.5
Main stream at railroad bridge[1]	1,183.0
Total flow	1,881.0
September 11, 1900 (no water flowing over dam):	
South Side Canal	475.0
Oswego Canal	317.0
Amos race	127.0
Total flow	919.0

The Baldwinsville record shows a relatively low run-off for this stream. The 1900 record is withheld for the present, additional measurements to determine leakage, etc., being needed.

CHITTENANGO CREEK AT BRIDGEPORT, NEW YORK.

This station is described in Water-Supply Paper No. 36, page 184. A current-meter measurement was made at a highway bridge below the inflow of Butternut Creek, near Bridgeport, on June 16, 1900, and the total flow of Chittenango Creek at that point was found to be 95 second-feet. The stage of the stream, as shown by the record kept at Bridgeport, was uniform for several days. The mean flow, as computed from the gage readings, was 95 second-feet for June 15 and 16. There is no opportunity to measure separately the discharge through the turbines or the leakage of the dam at this station, and an allowance of 15 second-feet has been made for the leakage of the dam and the dike leading to the old sawmill. The sawmill, situated on the left side of the stream, runs very irregularly. The water wheels are old, and the penstocks leak considerably. On June 16 a current-meter measurement was made in the headrace leading to the sawmill. The water wheels were running, and the flow was found to be 14.4 second-feet.

The relatively low run-off from the watershed of Chittenango Creek, as shown in the accompanying tables, may be attributed to the diversion of a portion of the flow to supply the summit level of Erie Canal.

State dams are located on the main stream at Chittenango, and on its two tributaries, Limestone Creek and Butternut Creek. Cazenovia Lake, Erieville, De Ruyter, and Jamesville reservoirs impound stor-

[1] Including South Side Canal.

age, by which the flow is regulated to some extent. Water is also diverted from Tioghnioga River, entering the Orville feeder through Limestone Creek.

Additional information in regard to this creek will be found in Water-Supply Paper No. 47, pages 37 to 41, in a paper entitled "Methods employed in the gaging of New York streams during the year 1900."

Daily discharge, in second-feet, of Chittenango Creek at Bridgeport, New York, for 1898.

[Drainage area, 307 square miles.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	....	180	562	427	18	a 53	284	500	a 605
2	....	a 205	559	360	19	119	297	506	678
3	....	171	434	348	20	139	320	a 675	669
4	(a)	172	358	a 385	21	117	269	728	793
5	....	156	379	471	22	111	463	623	1,155
6	....	309	a 385	414	23	115	a 465	593	1,293
7	....	235	331	404	24	135	487	569	1,401
8	....	204	359	320	25	a 85	472	490	a 1,075
9	....	a 130	386	261	26	142	352	442	857
10	....	165	474	265	27	149	867	a 465	726
11	(a)	194	1,339	a 465	28	214	972	523	541
12	....	196	1,571	434	29	154	661	413	480
13	....	197	a 1,265	454	30	198	a 565	421	630
14	....	181	921	442	31	....	519	....	630
15	....	354	790	450					
16	82	a 335	694	472	Mean	129	344	612	597
17	116	299	615	619					

a Sunday.

Daily discharge, in second-feet, of Chittenango Creek at Bridgeport, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	a 515	520	632	837	447	426	116	84	81	a 75	60	113
2	571	484	473	a 795	357	346	a 55	79	49	90	145	127
3	636	440	385	752	310	234	97	169	a 45	91	145	a 143
4	737	465	520	861	172	a 105	113	126	133	90	160	159
5	1,067	a 385	a1,260	866	172	184	132	134	81	80	a 165	149
6	1,310	356	1,331	864	157	229	99	a 70	76	141	228	151
7	1,282	342	1,475	857	a 95	229	123	125	74	89	128	166
8	a1,135	465	1,069	1,420	172	244	132	125	96	a 45	120	179
9	724	385	860	a1,675	172	192	a 45	134	96	107	108	155
10	486	385	852	1,369	227	147	89	79	a 15	117	65	a 168
11	473	385	659	1,306	237	a 70	262	62	71	101	46	181
12	623	a 385	a 565	1,274	172	169	271	44	96	101	a 35	211
13	849	538	1,196	1,597	172	192	162	a 15	92	85	72	326
14	738	524	1,061	1,737	a 165	182	169	141	56	72	57	395
15	a1,260	462	970	1,614	180	109	99	125	88	a 15	65	395
16	1,280	362	665	a1,405	174	184	a 70	103	79	84	60	374
17	1,101	449	634	1,339	250	192	101	87	a 25	30	88	a 355
18	632	354	526	1,221	310	a 70	221	76	89	38	57	466
19	390	a 385	a 565	859	374	152	210	91	74	38	a 25	706
20	395	541	736	861	374	84	204	a 25	96	45	83	588
21	389	444	766	629	a 385	92	152	120	117	47	70	298
22	a 385	619	962	447	281	100	117	109	39	a 15	78	304
23	399	950	1,061	a 165	265	124	a 70	96	84	60	100	254
24	372	1,074	1,345	627	252	134	102	....	a 25	68	102	a 200
25	311	1,314	1,061	527	197	a 70	102	....	67	43	110	139
26	362	a1,015	a 885	456	195	141	122	....	49	57	a 25	238
27	308	645	626	331	227	109	110	(a)	112	48	109	261
28	332	755	760	279	a 225	109	88	....	119	25	133	201
29	a 385	....	1,075	359	312	84	109	56	96	a 20	114	249
30	448	....	1,360	a 295	333	91	a 45	96	79	65	105	244
31	637	....	1,360	....	229	....	141	112	....	65	....	a 240
Mean	662	551	893	921	245	161	123	96	76	64	95	281

a Sunday.

Daily discharge, in second-feet, of Chittenango Creek at Bridgeport, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	161	467	774	*a* 1,230	266	106	*a* 38	107	91	67	108	*a* 608
2	247	581	671	1,394	268	80	91	108	*a* 53	108	100	355
3	242	581	605	1,447	245	*a* 70	99	68	75	67	82	356
4	263	*a* 595	*a* 595	1,447	245	134	33	80	79	75	*a* 34	288
5	318	580	792	1,342	237	125	82	*a* 38	55	75	67	865
6	379	507	776	1,327	*a* 215	132	153	103	67	91	70	1,330
7	*a* 275	502	892	1,318	295	117	132	40	55	*a* 38	73	1,150
8	374	1,437	591	*a* 1,365	287	88	*a* 130	40	33	100	105	*a* 1,035
9	292	959	583	1,433	295	105	156	49	*a* 33	102	130	690
10	307	1,313	511	1,255	245	*a* 70	77	73	87	114	86	400
11	307	*a* 1,115	*a* 425	1,072	237	116	88	65	60	115	*a* 34	330
12	302	771	463	853	218	108	63	*a* 37	72	136	102	335
13	373	1,187	441	667	*a* 165	67	66	38	37	72	87	480
14	*a* 275	1,700	383	675	247	96	*a* 80	120	57	*a* 42	106	456
15	373	1,445	367	*a* 595	259	95	42	89	65	98	98	*a* 452
16	422	1,188	383	544	283	95	96	92	*a* 15	94	106	425
17	504	985	375	667	268	*a* 70	160	83	70	89	105	497
18	599	*a* 275	*a* 355	620	280	117	136	96	62	63	*a* 45	538
19	971	187	603	1,703	237	73	101	*a* 53	53	77	153	421
20	1,540	189	589	801	*a* 215	107	136	63	111	57	169	423
21	*a* 1,485	242	603	880	222	92	134	83	70	*a* 42	136	431
22	1,445	987	788	*a* 785	166	69	*a* 105	66	117	86	139	*a* 358
23	1,195	992	782	860	171	78	129	124	*a* 53	58	111	378
24	1,074	1,005	1,003	770	136	*a* 43	100	44	79	100	113	844
25	422	*a* 790	*a* 1,115	577	118	116	101	92	62	96	*a* 45	1,231
26	429	706	788	436	98	81	252	*a* 38	84	94	1,255	452
27	764	591	707	355	*a* 40	73	172	75	99	75	1,953	606
28	*a* 790	591	982	268	150	78	117	95	117	*a* 33	1,835	618
29	522	....	1,090	*a* 275	92	133	*a* 105	86	108	75	1,272	*a* 442
30	372	....	1,221	370	117	71	124	70	*a* 33	90	1,105	275
31	372	....	1,351	....	90	....	133	66	....	85	....	347
Mean	561	725	697	911	207	93	110	73	68	81	327	562

a Sunday.

ONEIDA CREEK AT KENWOOD, NEW YORK.

A description of this station, which is located at the silk-mill dam in Kenwood, will be found in Water-Supply Paper No. 36, page 186. There is no leakage of the dam, and only a slight leakage of the flume and head gates, which has been taken at 2 second-feet. The flow over a wasteway near the mill is computed by means of Francis's formula. A second spillway in the canal bank near the dam has a broad, irregular crest, over which water sometimes flows. A discharge curve for this spillway has been prepared, using coefficients from the Cornell experiments for dam with a broad, flat crest.[1]

Current-meter measurements were made to check the calculated flow at Kenwood, with the following results:

		Second-feet.
June 1, 1900:		
Total flow at Oneida Castle		36.6
Flow over dam, crest gage reading 0.15 foot	19	
Flow through turbine, 11.75 feet head, one-third gate	15	
Flow over wasteway near mill	1	
Assumed leakage	2	
Total flow (computed)		37.0
September 17, 1900:		
Total flow measured in headrace		20.0
Flow through turbine, one-third gate	15	
Assumed leakage	2	
Total flow (computed)		17.0

[1] See Proc. Am. Soc. C. E., March, 1900, p. 282.

At Oneida is a State dam diverting water for the supply of the summit level of Erie Canal. No measurements of diversion to the feeder have been made. Practically the entire flow of Oneida Creek, less leakage of the dam, is taken for this purpose during the low-water season.

Additional information in regard to this creek will be found in Water-Supply Paper No. 47, pages 37 to 41, in a paper entitled "Methods employed in the gaging of New York streams during the year 1900."

Daily discharge, in second-feet, of Oneida Creek at Kenwood, New York, for 1898.

[Drainage area, 59 square miles.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	....	90	70	18	75	102	*a* 69
2	(*a*)	72	63	19	75	115	40
3	....	70	80	20	75	*a* 121	60
4	....	65	*a* 76	21	70	123	205
5	112	60	82	22	110	109	170
6	58	*a* 58	65	23	*a* 100	123	240
7	60	60	60	24	100	100	173
8	58	58	55	25	75	86	*a* 136
9	*a* 45	51	45	26	120	93	100
10	23	265	50	27	180	*a* 77	80
11	23	274	*a* 50	28	129	61	50
12	30	172	50	29	133	76	70
13	27	*a* 140	45	30	*a* 100	64	101
14	51	119	50	31	100	......	101
15	110	123	55				
16	*a* 100	106	101	Mean	83	105	90
17	102	106	108				

a Sunday.

Daily discharge, in second-feet, of Oneida Creek at Kenwood, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Oct.	Nov.	Dec.
1	*a* 76	50	115	122	71	46	18	*a* 15	144	23
2	96	65	96	*a* 115	60	36	*a* 20	21	69	29
3	108	80	115	116	60	36	20	21	56	*a* 25
4	210	72	112	96	59	*a* 35	20	21	66	27
5	300	*a* 59	*a* 157	122	54	31	30	21	*a* 55	29
6	160	50	22	131	55	31	34	21	44	29
7	143	50	202	166	*a* 48	31	21	24	40	25
8	*a* 114	50	168	334	53	24	41	*a* 18	26	33
9	95	35	128	*a* 260	53	24	*a* 40	24	26	41
10	80	37	75	214	53	24	51	24	24	*a* 25
11	138	100	90	196	54	*a* 25	26	21	26	97
12	180	*a* 74	*a* 149	496	59	26	24	24	*a* 27	70
13	205	56	235	416	59	26	24	24	28	70
14	273	37	157	406	*a* 48	26	24	24	26	91
15	*a* 225	47	123	341	53	51	21	*a* 19	22	82
16	183	42	140	*a* 260	60	41	*a* 20	25	26	73
17	135	39	144	196	61	36	31	25	26	*a* 30
18	101	41	133	166	68	*a* 30	28	25	22	30
19	75	*a* 40	*a* 157	166	66	26	26	24	*a* 25	97
20	65	52	198	144	91	31	26	24	28	79
21	67	160	135	136	*a* 80	26	24	25	24	92
22	*a* 57	365	157	110	82	26	25	*a* 25	26	80
23	55	232	254	*a* 102	63	31	*a* 25	25	24	68
24	75	147	183	96	54	31	26	25	26	*a* 55
25	85	99	190	91	66	*a* 31	21	24	24	70
26	60	*a* 161	*a* 170	110	43	31	21	25	*a* 25	35
27	55	232	157	110	43	31	20	24	26	39
28	42	122	123	91	*a* 71	24	21	25	26	27
29	*a* 43	....	230	86	108	24	18	*a* 26	26	34
30	51	....	183	*a* 93	76	21	*a* 20	29	26	27
31	75	....	165	....	59	....	21	31	....	*a* 34
Mean	117	93	157	183	62	30	25	23	33	60

a Sunday.

NOTE.—No record for August and September.

Daily discharge, in second-feet, of Oneida Creek at Kenwood, New York, for 1900.

Day.	Jan.	Mar.	Apr.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	....	98	(*a*)	19	(*a*)	27	15	17	26	71
2	29	194	290	18	29	22	(*a*)	17	26	*a* 63
3	26	99	208	(*a*)	25	16	15	14	16	55
4	34	(*a*)	154	23	....	16	15	14	*a* 16	126
5	29	135	149	20	22	(*a*)	15	17	16	193
6	40	191	313	17	25	16	16	17	18	160
7	(*a*)	223	382	23	32	13	19	(*a*)	16	160
8	86	140	(*a*)	43	(*a*)	15	14	14	40	138
9	54	150	220	52	42	14	(*a*)	35	32	*a* 149
10	51	199	200	(*a*)	31	....	15	18	37	160
11	47	(*a*)	195	30	24	25	15	17	*a* 35	138
12	60	98	212	23	22	(*a*)	15	17	33	108
13	47	124	201	17	22	14	15	19	26	108
14	(*a*)	100	204	17	25	15	14	*a* 13	22	88
15	45	67	(*a*)	17	(*a*)	16	14	25	22	88
16	104	52	172	27	31	18	(*a*)	23	19	*a* 123
17	81	62	218	(*a*)	54	20	17	25	22	158
18	76	*a* 48	302	17	46	32	15	19	*a* 30	160
19	364	148	268	19	38	(*a*)	15	19	37	138
20	304	394	224	17	34	17	13	19	50	138
21	(*a*)	262	177	17	40	14	19	*a* 17	50	108
22	196	259	(*a*)	14	(*a*)	14	19	17	50	88
23	89	259	234	14	34	13	(*a*)	17	46	*a* 162
24	209	102	160	(*a*)	28	13	17	23	43	237
25	161	(*a*)	134	19	27	32	17	25	*a* 337	176
26	101	82	102	16	80	(*a*)	15	19	632	132
27	....	154	85	19	55	28	17	17	353	126
28	*a* 30	128	88	14	36	31	17	(*a*)	282	108
29	46	128	(*a*)	19	(*a*)	28	15	19	225	96
30	45	128	61	26	31	20	*a* 11	19	168	*a* 97
31	47	118	....	....	28	19	17	23	....	98
Mean	92	148	198	21	38	19	16	19	91	127

a Sunday.

NOTE.—No record for February and May.

WEST BRANCH OF FISH CREEK AT McCONNELLSVILLE, NEW YORK.

This station is described in Water-Supply Paper No. 36, page 186. During the summer the flashboards are on the dam, and Francis's formula is used in computing the flow. At other times a discharge curve derived from Cornell experiments is used. Three water wheels are in use. Two are 54-inch wheels built by the Camden Water Wheel Works, and are usually run ten hours a day, at a nearly constant gate opening.

Current-meter measurements of the discharge of one of these wheels under light and heavy load gave the following results:

June 2, 1900, discharge, 43.2 second-feet.
September 6, 1900, discharge, 51.8 second-feet.

Ten dams located on this stream furnish power to 17 mills.

Additional information in regard to this creek will be found in Water-Supply Paper No. 47, pages 37 to 41, in a paper entitled "Methods employed in the gaging of New York streams during the year 1900."

Daily discharge, in second-feet, of West Branch of Fish Creek at McConnellsville, New York, for 1898.

[Drainage area, 187 square miles.]

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	......	137	365	237	18	*a* 50	346	365	*a* 120
2	......	*a* 50	319	245	19	98	227	365	187
3	......	111	292	217	20	81	190	*a* 370	157
4	......	121	172	*a* 195	21	57	172	371	190
5	......	130	155	182	22	55	467	220	287
6	......	137	*a* 120	182	23	57	*a* 700	216	317
7	......	131	146	196	24	332	750	300	468
8	......	122	138	182	25	*a* 360	624	329	*a* 390
9	......	*a* 65	135	199	26	197	434	319	285
10	......	102	557	180	27	231	1,097	*a* 255	285
11	......	81	1,562	*a* 140	28	181	871	299	225
12	......	87	997	199	29	181	686	251	170
13	100	124	*a* 700	186	30	147	*a* 440	172	120
14	90	134	734	212	31	......	464	......	120
15	96	397	434	162					
16	47	*a* 360	514	157	Mean	134	333	384	210
17	47	562	365	147					

a Sunday.

Daily discharge, in second-feet, of West Branch of Fish Creek at McConnellsville, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	*a* 120	228	402	586	273	18	615	133	567	1,644	189
2	126	183	402	*a* 520	313	19	615	*a* 120	*a* 485	1,434	374
3	194	183	438	601	243	20	530	183	505	1,174	374
4	261	172	595	601	184	21	495	198	433	1,085	*a* 255
5	321	*a* 120	*a* 700	601	184	22	*a* 360	258	442	1,045	303
6	396	212	956	591	184	23	314	338	443	*a* 940	244
7	396	156	856	689	*a* 120	24	425	438	442	664	194
8	*a* 285	156	700	1,557	183	25	350	438	442	564	189
9	325	147	856	*a* 2,110	154	26	325	*a* 360	*a* 360	470	174
10	422	136	583	1,690	154	27	338	403	552	366	134
11	502	117	546	1,724	183	28	308	403	599	366	*a* 50
12	587	*a* 80	*a* 700	2,055	243	29	*a* 225	......	599	364	700
13	873	99	1,178	2,440	194	30	278	......	599	*a* 220	455
14	873	132	1,178	2,920	*a* 120	31	278	......	599	......	483
15	*a* 795	94	1,178	3,040	189						
16	787	131	972	*a* 2.410	189	Mean	435	206	648	1,206	239
17	735	148	782	1,720	189						

a Sunday.

Daily discharge, in second-feet, of West Branch of Fish Creek at McConnellsville, New York, for 1900.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	278	96	*a*52	60	48	69	157	160
2	255	78	78	60	*a*10	54	144	117
3	232	*a*28	78	60	20	49	133	144
4	243	70	52	58	50	65	93	122
5	243	58	52	*a*10	50	65	132	257
6	*a*205	70	96	50	60	64	104	201
7	225	70	80	50	60	*a*34	143	169
8	165	88	*a*52	50	28	39	217	150
9	185	90	78	50	*a*10	39	180	117
10	185	*a*52	78	58	50	59	163	118
11	185	78	78	50	50	55	110	133
12	172	70	70	*a*30	60	54	107	127
13	*a*105	60	70	56	60	64	107	127
14	148	68	60	168	60	*a*36	132	137
15	140	78	*a*10	98	58	71	112	97
16	135	86	60	61	*a*10	76	101	82
17	125	*a*52	60	64	60	76	86	121
18	120	72	70	48	60	46	78	112
19	106	58	60	*a*19	55	86	144	95
20	*a*75	78	60	30	55	71	207	58
21	104	70	60	50	196	*a*60	224	50
22	104	70	*a*10	50	239	106	239	28
23	96	68	60	60	*a*128	116	246	31
24	96	*a*28	50	55	87	218	231	31
25	86	70	64	30	87	148	196	31
26	86	70	60	*a*19	66	134	330	31
27	*a*38	70	76	60	66	140	355	51
28	82	70	26	134	66	*a*128	223	51
29	71	70	*a*36	76	50	150	187	31
30	52	68	60	50	*a*58	150	179	31
31	88	......	60	50	......	206	......	58
Mean	143	68	60	57	65	88	168	99

a Sunday.

OSWEGO RIVER ABOVE MINETTO, NEW YORK.

Oswego River is formed by the junction of Oneida and Seneca rivers at Three River Point. It has extensive natural storage in Oneida Lake, which covers an area of 80 square miles, and in the Finger Lakes of central New York, which it drains. Certain tributary lakes serve also as reservoirs for the water supply of the middle division of Erie Canal, and a portion of the flow is diverted for this purpose.

Oswego River has been canalized by the construction of dams, affording slack-water navigation on a part of the stream. In all there are 7 dams on the river. Surplus water at the State dams supplies power to numerous mills situated on the adjacent banks. Lateral canals and locks carry boats around the dams and connect with backwater from the next succeeding dam in each instance.

In establishing a gaging station it was impossible to measure the entire stream in a single channel, since, in order to avoid slack water from dams, it was necessary to select a site where the river is paralleled by the canal. A cable station was established September 14, 1900, 3 miles above Minetto, and below the State dam at Battle Island. A gage board was placed one-fourth mile upstream from the cable. A weight gage is used, being suspended from a framework projecting over the water beyond the low-water margin. The position of the weight when the gage reads zero has been determined with reference to a fixed bench mark. The gage is so arranged that the readings are reversed, thus, 8.00 would be extreme low water, and when the water rises the readings are less. Morning and evening readings are taken, usually twelve hours apart, and the average of the two readings is given in the table.

A current-meter measurement was made at the cable station on September 15. The mean gage height during the measurement was 5.4 feet, and the discharge 1,677 second-feet. This does not include the diversion through Oswego Canal. The lowest water on this stream usually occurs Sundays, due to the stopping of water wheels and the consequent refilling of ponds.

In this connection reference may be made to the gaging record which was maintained by the United States Board of Engineers on Deep Waterways on Oswego River at the Oswego Falls dam from November, 1898, to May, 1899, inclusive. A description of this station will be found in Water-Supply Paper No. 36, page 188.

The drainage areas tributary to Oswego River at the different gaging stations are as follows:

Drainage areas of Oswego River.

	Square miles.
At mouth	5,002
At high dam near Oswego	5,000
At cable station	4,990
At Fulton	4,916

Additional information in regard to this river will be found in Water-Supply Paper No. 47, pages 37 to 41, in a paper entitled "Methods employed in the gaging of New York streams during the year 1900."

Daily gage height, in feet, of Oswego River above Minetto, New York, for 1900.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	......	5.65	4.90	0.70	17	6.20	5.08	4.55	c 0.35
2	......	5.65	4.90	.85	18	5.65	5.15	5.70	c .70
3	......	5.58	5.75	.50	19	5.82	5.18	4.75	c .50
4	......	5.55	5.75	.50	20	5.60	4.70	4.25	c .45
5	......	5.55	5.00	c .65	21	5.52	6.15	4.25	c .40
6	......	5.55	4.75	c 1.50	22	5.55	5.40	(a)	c .45
7	......	6.15	4.66	c 1.50	23	5.28	4.85	(a)	c .35
8	......	5.05	4.70	c 1.59	24	5.60	5.55	(a)	c .40
9	......	5.30	4.80	c 1.35	25	6.10	5.55	(a)	c .15
10	......	5.55	4.90	c 1.15	26	5.80	5.50	b 3.05	c .25
11	......	5.35	5.50	c 1.05	27	5.65	5.50	2.25	.10
12	......	5.20	4.50	c .85	28	5.72	6.45	1.60	.40
13	......	5.15	4.60	c .85	29	5.70	5.05	1.15	.55
14	5.72	5.60	4.55	c .50	30	5.75	4.95	.60	.65
15	5.70	5.52	4.55	c .30	31	......	4.80	......	.80
16	6.50	5.30	4.60	c .30					

a No record. *b* New weight gage. *c* Used board gage.

OSWEGO RIVER AT HIGH DAM NEAR OSWEGO, NEW YORK.

A description of this station, with tables of daily gage heights, will be found in Water-Supply Paper No. 36, page 189. The dam is of masonry, with a crest 365.5 feet long. Flashboards are maintained on the dam during the greater part of the year. When flashboards are on, the flow over the dam has been computed by means of Francis's formula, with a constant coefficient of 3.33. In estimating the flow over the dam when flashboards are removed a discharge curve has been prepared, using coefficients in the weir formula derived from Cornell University experiment No. 3,[1] and taking into consideration irregularities in the profile of the crest.

A headrace at the left end of the dam diverts water to supply power to an electric-light plant and to the waterworks pumping station. There are 8 water wheels in use. A regular record of the run of the water wheels has not been kept, and the diversion for this purpose has been estimated from current-meter measurements in the headrace.

Power diversions at high dam near Oswego.

Date.	Working head on wheels.	Measured discharge.
1900.	*Feet.*	*Sec.-feet.*
June 12	13	323
September 15	14	352

Three pairs of water wheels, which were in operation when the foregoing measurements were made, are run twenty-four hours a day. Taking the average of the foregoing measurements and adding 105 second-feet for the additional pair of wheels, the diversion for water power has been estimated at 450 second-feet, as a round figure.

The flow from an auxiliary spillway in the end of the headrace has been calculated from the weir formula, using coefficients derived by Bazin for a dam having a similar crest section.

Some uncertainty attaches to the record at this station during the spring months, owing to the carrying away of the flashboards by high water at dates not definitely ascertained.

In the accompanying tables of monthly and daily mean flow no allowance has been made for diversion to Oswego Canal.

Additional information will be found in Water-Supply Paper No. 47, pages 37 to 41, in a paper entitled "Methods employed in the gaging of New York streams during the year 1900."

[1] See Proc. Am. Soc. C. E., March, 1900, p. 274.

Daily discharge, in second-feet, of Oswego River at high dam near Oswego, New York, for 1897.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12,150	....	4,500	1,470	a3,300	1,760	1,200	1,020	3,000
2	11,550	a7,750	4,620	2,650	3,300	....	1,150	1,260	3,000
3	10,950	7,550	4,620	2,480	....	1,760	(a)	1,430	3,220
4	(a)	7,250	4,620	(a)	3,300	1,670	850	1,430	2,950
5	10,950	7,220	....	2,480	3,050	(a)	1,050	1,320	a3,850
6	10,950	6,900	a4,520	2,400	....	1,550	1,100	1,430	....
7	10,950	6,800	4,520	2,150	2,870	1,760	1,100	(a)	3,620
8	10,750	....	4,400	1,750	(a)	1,670	970	1,370	3,620
9	11,650	a6,600	4,400	1,820	2,150	1,840	920	1,430	4,400
10	....	6,400	4,400	1,750	2,330	1,670	(a)	1,570	4,550
11	a11,550	6,400	4,400	(a)	2,330	720	1,050	1,430	4,800
12	11,550	....	....	2,300	2,500	(a)	1,050	1,430	(a)
13	11,550	6,275	a4,400	1,670	2,330	1,100	960	1,320	4,650
14	10,950	6,150	4,170	1,480	2,450	1,270	1,220	a1,320	4,550
15	10,950	....	4,170	1,670	(a)	1,150	1,100	....	5,500
16	10,750	a6,275	4,150	1,830	2,150	1,200	1,150	1,630	5,400
17	....	6,275	3,900	1,830	2,500	1,020	(a)	1,750	5,500
18	a10,200	6,275	3,770	(a)	2,500	970	750	1,850	5,500
19	9,800	5,900	....	1,980	2,330	(a)	1,100	2,020	(a)
20	9,550	5,650	a3,610	1,900	2,330	850	1,300	2,020	5,500
21	9,350	5,650	3,070	1,980	2,250	880	....	(a)	5,100
22	9,250	....	3,070	1,830	(a)	920	1,220	2,120	4,780
23	9,100	a5,520	2,870	1,900	2,000	920	1,220	1,850	4,780
24	8,900	5,250	2,870	1,670	1,900	920	(a)	2,120	3,630
25	a8,100	5,520	2,670	(a)	1,900	1,100	1,150	2,120	3,200
26	8,100	5,250	....	2,480	1,850	(a)	1,100	2,120	(a)
27	8,100	5,150	a2,870	2,660	1,850	1,020	1,050	2,870	3,850
28	8,100	5,150	2,550	2,660	1,850	1,350	1,100	(a)	3,420
29	8,060	....	2,970	3,500	(a)	970	1,020	3,650	2,900
30	7,500	a5,500	2,720	3,170	1,760	1,050	1,020	3,650	3,620
31	....	5,500	....	3,240	2,160	....	(a)	....	3,430
Mean	10,048	6,166	3,801	2,174	2,370	1,244	1,076	1,821	4,168

a Sunday.

Daily discharge, in second-feet, of Oswego River at high dam near Oswego, New York, for 1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,600	5,520	10,350	9,400	(a)	6,430	2,780	780	1,480	....	3,250	3,900
2	(a)	5,520	10,200	9,250	8,250	....	2,780	780	1,480	a1,470	3,250	3,900
3	3,000	5,520	9,900	(a)	8,080	6,540	(a)	780	1,400	....	3,250	....
4	2,600	5,000	9,600	8,750	8,850	5,630	....	1,200	a950	1,470	3,250	a4,700
5	3,320	5,000	9,250	8,620	8,900	a5,630	....	950	1,330	1,400	....	3,900
6	2,900	(a)	(a)	8,300	8,960	5,630	....	850	1,260	....	a3,050	3,450
7	3,430	5,520	8,820	8,080	9,120	5,630	1,480	a850	1,260	1,330	3,220	3,900
8	3,220	5,000	8,960	7,800	(a)	4,880	....	1,070	1,770	....	3,050	3,350
9	(a)	5,100	8,960	7,500	9,120	4,880	....	850	1,700	a1,400	3,250	3,150
10	2,820	5,100	8,960	(a)	8,960	4,650	a1,200	850	1,770	1,260	4,800	....
11	2,820	5,100	9,100	7,370	8,670	4,650	1,200	770	a1,480	1,200	4,900	a3,260
12	3,220	6,550	9,400	6,950	....	a4,650	1,330	680	1,630	1,200	....	3,260
13	4,770	(a)	(a)	6,650	8,370	4,400	1,950	630	1,770	860	a5,800	2,300
14	5,100	5,400	10,200	6,650	8,370	4,170	1,950	a900	1,480	....	5,800	2,100
15	5,500	5,100	10,350	6,420	a8,280	4,100	....	680	1,330	....	5,530	2,470
16	(a)	4,600	10,350	6,420	....	....	....	850	1,330	a1,770	5,300	2,650
17	6,280	6,750	10,550	(a)	....	3,770	(a)	850	1,760	1,630	5,200	....
18	5,400	7,080	10,350	6,080	7,370	3,770	....	850	a1,200	1,770	5,050	a2,850
19	5,400	7,080	10,350	5,900	7,370	a3,500	....	850	1,200	1,770	....	2,650
20	5,400	(a)	(a)	6,700	....	3,500	....	850	1,200	1,950	a5,050	2,850
21	6,150	7,350	10,350	6,000	....	3,500	....	a760	1,200	1,950	5,050	3,900
22	6,400	7,350	10,550	5,900	(a)	3,300	....	900	1,200	....	5,300	4,580
23	(a)	7,750	10,550	5,900	6,850	3,300	....	850	1,200	a2,460	4,900	5,650
24	7,880	8,150	10,350	(a)	....	3,170	(a)	760	1,330	2,850	4,770	....
25	7,880	8,150	10,350	8,080	....	....	....	830	a1,400	2,850	4,770	a5,800
26	5,950	8,150	10,200	8,500	6,670	(a)	....	1,480	930	2,920	....	5,800
27	7,600	(a)	(a)	8,960	....	....	....	1,320	1,330	3,050	a4,580	5,650
28	6,550	7,880	9,880	9,100	....	2,970	....	a1,320	1,200	3,360	4,580	4,770
29	6,550	....	9,880	8,900	(a)	2,850	....	1,320	1,330	3,250	4,350	5,300
30	(a)	....	9,750	8,850	....	2,780	....	1,130	1,400	(a)	4,350	5,300
31	4,550	....	9,750	....	6,550	....	(a)	1,130	....	3,250	....	....
Mean	4,896	6,238	9,898	7,578	8,161	8,331	1,834	925	1,377	2,018	4,452	3,899

a Sunday.

Daily discharge, in second-feet, of Oswego River at high dam near Oswego, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	a4,450	2,750	3,670	6,300	9,600	5,370	......	580	670	a540	1,100	650
2	4,020	2,570	3,900	(a)	9,600	5,370	a1,000	650	......	650	1,100	......
3	4,450	2,750	4,120	6,550	9,600	......	......	650	a450	650	1,350	a980
4	5,170	......	4,120	6,550	......	a4,400	1,000	650	580	580	......	980
5	......	a2,370	a5,050	6,550	8,650	4,400	1,000	......	540	580	a1,350	780
6	5,580	2,370	850	6,550	......	3,950	780	a650	510	580	1,500	980
7	4,700	2,300	5,300	6,300	a6,950	1,230	650	650	650	......	1,350	900
8	a4,100	1,070	4,800	......	8,080	1,000	......	545	540	(a)	980	980
9	3,250	530	4,580	a8,530	7,520	780	a1,000	650	......	540	1,350	......
10	3,050	630	4,580	8,250	6,960	......	900	580	a2,670	540	980	a1,360
11	3,250	......	......	8,530	6,960	a900	1,000	650	510	540	......	1,100
12	3,250	a630	a5,050	8,800	......	900	780	......	450	540	a1,350	1,980
13	3,900	1,630	5,050	8,800	......	720	780	a580	520	480	980	1,100
14	......	1,950	4,800	8,550	a6,150	1,800	650	540	650	510	1,100	1,500
15	a5,530	2,370	4,900	......	6,150	1,800	......	580	480	(a)	980	1.500
16	5,650	2,660	5,050	a8,530	6,420	1,800	a900	650	450	510	980	......
17	5,650	2,470	4,900	8,530	6,420	......	720	650	(a)	480	980	a2,500
18	5,280	......	......	8,530	6,420	a1,800	650	450	......	580	......	2,500
19	5,170	a2,470	a4,580	8,250	6,150	1,650	650	......	480	460	a1,100	2,700
20	5,280	2,750	4,580	8,530	......	1,650	650	a450	540	540	980	2,500
21	......	2,850	4,700	7,670	a6,150	1,500	580	540	450	......	1,100	2,700
22	a4,780	3,260	......	......	6,150	1,500	......	650	480	a650	980	2,500
23	4,780	3,260	5,050	a7,550	6,150	1,230	a650	580	......	650	980	......
24	4,580	3,260	4,900	7,200	6,150	......	650	540	a450	650	......	a2,500
25	5,050	......	......	6,820	5,630	a1,500	580	580	540	580	......	2,500
26	5,180	a3,910	a5,650	6,820	5,400	1,800	......	580	540	540	(a)	1,500
27	2,300	3,800	5,650	6,680	......	1,500	650	a540	540	650	980	1,500
28	3,050	3,800	5,550	6,820	a5,400	......	580	540	540	......	980	1,120
29	a2,300	......	6,550	......	5,400	780	......	990	540	a900	980	780
30	2,650	......	6,830	a9,900	5,400	720	a580	800	......	650	780	1,820
31	2,650	......	6,830	......	5,400	......	580	650	......	650	......	(a)
Mean	4,252	2,475	4,874	7,684	6,754	2,002	748	612	615	585	1,095	1,612

a Sunday.

Daily discharge, in second-feet, of Oswego River at high dam near Oswego, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,820	2,880	4,140	a11,600	11,480	4,880	a2,000	650	......	720	1,220	......
2	1,360	2,880	1,970	12,250	11,150	4,880	1,840	720	a650	780	1,220	a7,450
3	1,360	......	3,930	12,250	10,550	a4,650	1,060	980	650	780	980	6,950
4	1,820	a4,600	a3,930	12,250	9,900	4,180	1,410	......	650	780	(a)	8,530
5	1,500	3,700	4,600	12,600	9,600	3,980	2,150	a780	650	780	1,220	8,530
6	......	3,250	4,600	12,600	a8,980	3,980	3,500	650	720	......	1,220	8,800
7	a1,820	3,700	4,800	......	8,980	3,980	......	650	720	a900	1,220	9,130
8	1,820	5,050	4,600	a17,550	9,900	4,180	a650	720	......	900	1,500	9,130
9	2,150	5,300	4,600	16,800	8,980	3,500	580	650	a720	900	1,220	a8,250
10	1,820	......	......	16,450	8,670	a3,300	460	650	650	900	1,650	8,530
11	1,820	a5,550	a4,140	16,040	8,670	3,300	580	650	650	900	(a)	7,700
12	......	7,960	4,350	16,040	8,080	3,080	550	a650	580	980	a1,500	7,700
13	......	6,320	4,140	16,040	(a)	3,080	510	650	580	......	......	7,200
14	a1,970	7,130	4,350	......	8,080	3,080	......	......	580	a720	1,500	6,400
15	1,970	6,320	4,350	a15,330	7,800	2,880	a780	980	......	720	1,500	......
16	1,650	6,850	4,140	14,940	7,250	......	720	580	a650	780	1,500	a5,880
17	......	6,050	......	14,940	7,250	a3,500	780	650	580	780	......	4,850
18	2,720	a6,050	a3,930	14,600	6,950	2,880	780	......	580	980	a1,500	6,120
19	3,250	......	4,140	14,250	......	2,700	780	a650	580	......	1,500	5,880
20	......	5,050	4,140	14,600	a6,420	2,700	780	720	780	780	1,650	5,880
21	a6,320	5,050	4,600	......	6,420	2,500	......	650	780	a780	1,820	5,880
22	6,600	5,350	5,300	a14,250	5,900	2,320	a780	650	......	780	1,650	......
23	6,320	4,600	5,550	13,850	6,420	......	720	580	a780	980	1,650	a6,660
24	5,800	......	6,600	13,850	5,900	a2,320	720	580	550	900	......	6,120
25	5,550	a1,970	a6,320	12,780	5,530	1,840	900	......	720	780	a2,880	6,400
26	2,880	1,360	6,600	12,450	5,150	2,000	780	a720	780	900	5,050	6,400
27	......	2,880	6,600	12,450	a5,150	2,000	720	580	780	......	5,800	6,400
28	a4,140	1,820	6,850	......	5,150	2,000	720	580	......	a900	5,800	6,120
29	3,700	......	7,670	a12,100	4,880	2,000	a580	550	......	980	6,850	......
30	3,700	......	8,820	11,780	4,880	2,000	580	550	a720	980	6,850	a5,880
31	......	......	......	......	......	......	650	650	......	980	......	5,880
Mean	3,077	4,653	4,991	14,025	7,645	3,132	966	669	670	853	2,418	6,990

a Sunday.

SALMON RIVER ABOVE PULASKI, NEW YORK.

A current-meter station was established on this stream September 5, 1900. It is located at a highway bridge 2 miles from the village of Pulaski. The stream bed is of gravel, the banks are bold, and the channel bottom is nearly flat. The gage board is attached to the center pier of the bridge, and readings are taken twice daily, at 6 a. m. and at 7 p. m. The mean of the two observations for each day is given in the table. A current-meter measurement made on September 4 showed a discharge of 103 second-feet. The mean gage reading during the measurement was 1.03 feet. There are 3 dams at Pulaski, furnishing power to 14 establishments. The total effective head obtained varies, with the stage of the stream, from 24 feet to 36 feet.

There is an undeveloped power, with a precipitous fall of 110 feet, at Salmon Falls. In November, 1898, a gaging station was established by the United States Board of Engineers on Deep Waterways 1 mile above these falls, but it was abandoned in June, 1899. A description of the station will be found in Water-Supply Paper No. 36, page 190. The drainage above the abandoned gaging station is 191 square miles, while that above the bridge station near Pulaski is 264 square miles.

Additional information regarding this river will be found in Water-Supply Paper No. 47, pages 37 to 41, in a paper entitled "Methods employed in the gaging of New York streams during the year 1900."

Daily gage height, in feet, of Salmon River above Pulaski, New York, for 1900.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	......	1.60	1.20	2.50	17	1.00	1.40	1.50	1.30
2	......	1.50	1.20	2.30	18	1.00	1.40	1.70	1.30
3	......	1.35	1.85	2.20	19	1.00	1.35	2.55	1.60
4	......	1.25	1.80	2.50	20	1.00	1.35	4.20	1.95
5	1.00	1.20	1.75	2.75	21	2.15	1.30	4.30	1.40
6	1.00	1.05	1.90	2.45	22	2.25	1.25	3.65	1.45
7	1.00	1.10	1.90	2.30	23	1.75	1.25	3.10	1.60
8	1.00	1.35	2.75	2.15	24	1.65	1.45	2.45	2.25
9	1.00	1.85	2.55	1.65	25	1.55	2.00	2.50	2.50
10	1.00	1.80	2.25	1.50	26	1.35	1.95	3.50	2.40
11	.90	1.60	1.90	1.50	27	1.25	1.85	4.70	2.20
12	.90	1.50	1.90	1.40	28	1.25	1.85	3.75	2.20
13	.90	1.40	1.80	1.40	29	1.25	1.70	3.35	2.10
14	.90	1.40	1.80	1.40	30	1.45	1.75	2.55	2.20
15	.95	1.30	1.70	1.35	31	......	1.75	......	2.30
16	1.00	1.40	1.50	1.30					

MOOSE RIVER AT MOOSE RIVER, NEW YORK.

On June 5, 1900, a gaging station was established on this stream at Moose River, 4 miles below the McKeever railroad station. The section of the channel chosen to be spanned by a cableway has a width of 225 feet, with a nearly flat gravel bottom. A vertical gage board was attached to a pile driven out in the stream beyond the low-water margin and protected from ice and logs by a floating boom anchored upstream.

Moose River is characterized throughout its entire course by rifts and rapids. Topographically the watershed is rocky, precipitous, and mostly timbered. The drainage area above the gaging station is 346 square miles. An area of 41 square miles in the headwaters is subject to regulation by storage, controlled by a State dam at Old Forge, at the foot of the Fulton Lakes. There are numerous undeveloped water powers on the stream, including two falls near Lyonsdale, where a head of 30 or more feet might be obtained, and another (Millers Falls) of nearly equal height below the town of Moose River. Water power is developed at 8 dams, a total fall of 225 feet being utilized, the aggregate capacity of the turbines installed being more than 7,000 horsepower.[1]

No current-meter measurements have thus far been made. Gage readings are taken twice daily, morning and evening, and the mean of the two readings for each day is given in the accompanying table.

Additional information in regard to this river will be found in Water-Supply Paper No. 47, pages 37 to 41, in a paper entitled "Methods employed in the gaging of New York streams during the year 1900."

Daily gage height, in feet, of Moose River at Moose River, New York, for 1900.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	......	0.50	0.85	0.90	0.70	1.15	17	0.92	0.80	1.20	0.70	0.75	2.05
2	......	.60	.70	.80	.75	1.20	18	.65	.75	1.00	.65	.60	2.30
3	......	.25	.70	.65	.80	1.05	19	.60	.85	.85	.60	.65	1.70
4	......	.35	.60	.55	.70	.95	20	.80	.90	.60	.55	.75	3.95
5	2.00	.30	.50	.60	.60	.85	21	.95	.80	.60	.80	.75	4.45
6	1.55	.35	.55	.55	.60	1.10	22	.90	.65	.60	1.20	.70	4.10
7	1.25	.70	.60	.55	.60	1.10	23	.80	.55	.50	1.55	.70	3.70
8	1.20	.85	.55	.60	.65	2.25	24	.70	.60	.45	1.30	1.30	3.35
9	1.95	.75	.55	.65	.60	3.10	25	.80	.85	.55	1.05	2.00	3.20
10	1.55	.70	.60	.70	.60	2.50	26	.60	3.05	.65	.90	1.65	3.05
11	1.40	.65	.70	.55	.65	1.75	27	.40	1.85	1.75	.90	1.30	3.65
12	1.20	.90	.65	.55	.55	1.15	28	.30	1.20	2.00	.85	1.30	3.75
13	1.08	.90	.80	.55	.45	.95	29	.50	.90	1.35	.70	1.25	3.55
14	1.05	.80	1.80	.50	.45	.90	30	.55	.75	1.40	.80	1.25	3.20
15	.82	.75	1.75	.40	.70	1.25	31	......	.70	.95	......	1.30	......
16	1.05	.70	1.25	.70	.85	1.75							

BEAVER RIVER, NEW YORK.

Beaver River rises in the western part of Hamilton County, crosses Herkimer County, and emerges from the Adirondacks at the town of Number Four, on the Lewis County line. The flow from the tributary watershed above Beaver, comprising an area of 153 square miles, or 47.5 per cent of the entire drainage area, is regulated by storage in the Beaver Flow or Stillwater, an artificial lake formed by a timber dam 16 feet high. In addition to the reservoir formed by the State dam at Beaver, there are within this region more than 50 natural lakes, including Red Horse Chain, so that a comparatively uniform flow is maintained throughout the summer season.

An examination of Beaver River with reference to facilities for gaging was made early in July, 1900. The almost continuous rapids in the upper reaches of the stream limit the desirable sites for gaging stations to the stream channel below Beaver Falls, 4 miles from its confluence with Black River at Castorland. Arrangements were made for the establishment of a cable station, but owing to the presence of log rafts in the stream during the greater portion of the summer the record has not yet been started.

From the State dam at Beaver to the town of Number Four, a distance of 10 miles, the stream consists of numerous bowlder rapids, alternating with short stretches of smooth water. Above Beaver Lake there is a high fall, forming a descent of 60 feet within a distance of 400 or 500 feet. From the foot of Beaver Lake to Belfort, a distance of 12 miles, the stream channel continues rocky and precipitous, although the adjacent watershed is sandy and for the most part covered with timber. Eagle Falls, 2 miles below Beaver Lake, consists of a series of cascades, aggregating a descent of 75 feet. There are a number of other undeveloped water powers in this vicinity.

Water power is developed at Beaver Falls, at Croghan, and at Belfort, aggregating 4,400 horsepower, at five dams, and utilizing a fall of 133 feet. There is also an abandoned power at Tisses Falls, below Belfort, where a total head of 60 feet could be obtained. Power is developed at Belfort, under a head of 50 feet, for the generation of electricity which is transmitted to adjacent towns, a distance of 16 miles.

Rainfall and other meteorological records have been kept since January, 1889, at Number Four, in the heart of the timber-covered portion of the watershed.

Additional information regarding this river will be found in Water-Supply Paper No. 47, pages 37 to 41, in a paper entitled "Methods employed in the gaging of New York streams during the year 1900."

BLACK RIVER AT HUNTINGTONVILLE DAM, NEAR WATERTOWN, NEW YORK.

A description of this station, including tables of daily gage heights, will be found in Water-Supply Paper No. 36, page 191. The entire flow of Black River at this point, aside from leakage and a slight diversion for the municipal water supply of Watertown, passes over the Huntingtonville dam. Two or more readings of the crest gage are taken daily, and the mean of the readings from midnight to midnight has been used in estimating the mean daily flow. In computing the flow over the dam, an allowance of 200 second-feet has been made for leakage through seams and crevices in the limestone rock underlying the dam. This amount has been arrived at from an estimate of the size of the orifices and the head on the same, when the water was drawn down in the summer of 1897.

There is no way to check direct the flow during high water immediately below the dam, but a current-meter measurement was made at Glenpark Bridge on June 6, 1900, which gave a total flow of 2,175 second-feet.

The mean daily flow for the years 1897, 1898, 1899, and 1900 is given in the accompanying tables. It does not represent the total water-yielding capacity of the tributary drainage area, inasmuch as a portion of the flow from the headwaters is diverted to the Forestport feeder to supply Black River Canal. Storage reservoirs, to compensate water-power users, are maintained by the State of New York on Beaver and Moose rivers, the principal tributaries of Black River. Owing to flood-water storage, diversion, and the effect of mills starting and stopping irregularly, the regimen of this stream is far from natural. Measurements of the amount of diversion of Black River below Forestport reservoir have been made by Mr. E. C. Murphy, for the New York State canal survey.

The highest water observed while the record has been kept was on the morning of April 21, 1900, the reading of the crest gage being 108.41 feet, and the corresponding flow 30,150 second-feet, equivalent to a flow of 16 second-feet per square mile of tributary drainage.

This stream is of great importance as a source of water power, having 22 dams in its lower stretch of 18 miles, furnishing, in round numbers, 60,000 horsepower to 80 mills along its banks, which employ an aggregate of 3,900 persons.

Additional information will be found in Water-Supply Paper No. 47, pages 37 to 41, in a paper entitled "Methods employed in the gaging of New York streams during the year 1900."

Daily discharge, in second-feet, of Black River at Huntingtonville dam, New York, for 1897.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.	Dec.
1	....	1,220	5,050	8,550	3,362	978	*a*1,710	....	598	6,812
2	....	....	5,170	*a*7,692	2,865	956	1,606	....	872	5,850
3	....	....	5,850	6,514	2,300	1,066	1,580	....	1,738	2,835
4	....	....	*a*6,176	5,890	2,835	*a*890	1,292	....	2,610	2,455
5	....	2,060	8,020	6,602	3,328	782	990	....	2,362	*a*3,420
6	....	2,865	8,650	6,218	*a*3,095	646	782	....	1,850	4,665
7	....	*a*3,230	9,590	5,970	2,579	1,066	630	....	*a*1,850	5,290
8	....	3,396	10,916	4,739	2,300	710	*a*362	....	2,120	5,490
9	....	3,600	11,540	*a*3,705	2,000	678	536	....	2,150	5,770
10	....	4,230	11,540	2,900	4,484	746	630	....	2,800	5,850
11	....	5,650	*a*10,500	2,900	6,176	*a*536	2,930	....	4,374	7,428
12	....	5,970	8,750	2,455	6,428	582	6,812	....	4,411	*a*7,692
13	....	6,602	7,340	2,515	*a*5,970	836	7,252	....	4,850	7,120
14	....	*a*6,260	6,856	3,029	4,411	614	5,850	1,044	*a*4,020	6,680
15	....	5,650	7,120	4,592	3,362	1,110	*a*3,420	1,220	3,670	7,252
16	....	5,130	7,924	*a*5,170	2,770	1,198	2,362	2,455	3,029	8,668
17	....	4,390	8,850	4,665	2,424	1,110	1,710	*a*854	4,125	8,500
18	....	3,950	*a*9,240	4,125	2,030	*a*1,000	2,000	1,176	5,170	8,308
19	....	3,880	9,690	3,328	1,658	934	2,424	1,110	5,210	*a*6,092
20	....	2,240	9,390	3,062	*a*1,460	978	1,804	956	3,950	3,420
21	....	*a*8,600	9,690	2,485	2,090	1,000	1,292	854	*a*2,930	3,195
22	1,460	8,550	9,290	2,642	2,706	890	*a*1,022	800	3,362	3,195
23	1,460	10,916	8,260	*a*3,095	2,270	728	978	782	2,835	3,130
24	2,610	16,500	7,648	2,424	1,804	630	694	*a*480	2,150	2,770
25	1,850	4,250	*a*9,144	2,515	1,388	*a*480	522	956	1,850	2,393
26	3,420	12,080	11,176	3,950	1,198	1,000	566	746	3,396	*a*2,515
27	....	10,760	12,640	4,776	*a*978	934	582	782	6,218	2,270
28	....	*a*7,924	14,142	4,374	1,198	890	322	854	*a*9,144	2,180
29	....	6,176	13,806	4,020	978	1,220	*a*1,254	710	9,890	2,060
30	....	5,450	10,552	*a*3,775	934	1,940	....	710	8,116	2,000
31	....	5,450	....	3,600	....	2,000	....	*a*678	....	1,804
Mean	2,160	6,317	9,484	4,267	2,713	879	2,280	954	4,155	4,725

a Sunday.

NOTE.—No record from September 1 to October 13, inclusive.

Daily discharge, in second-feet, of Black River at Huntingtonville dam, New York, for 1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,738	2,770	2,300	7,340	a4,411	2,770	1,436	1,110	1,244	1,556	3,095	2,548
2	a2,270	2,930	2,610	6,646	3,362	2,362	1,316	1,580	1,220	a1,022	2,706	2,455
3	1,940	2,835	2,300	a5,050	3,530	2,030	a872	1,132	1,110	1,088	2,610	2,455
4	2,000	2,610	2,300	3,950	3,705	1,804	800	1,292	a330	1,110	2,393	a2,240
5	2,120	2,770	2,150	3,600	3,915	a1,738	1,110	1,460	1,340	1,412	2,300	2,300
6	2,000	a2,455	a2,150	3,600	4,776	1,556	1,088	1,880	1,766	2,770	a2,210	2,240
7	1,850	2,610	2,150	3,420	4,411	1,532	1,176	a1,710	1,684	3,420	3,095	1,940
8	1,580	2,610	2,210	3,362	a3,420	1,340	1,022	1,580	2,060	2,865	2,930	1,804
9	a1,850	2,455	2,674	3,095	2,770	1,176	956	1,244	1,940	a1,910	2,930	1,658
10	1,804	2,300	3,420	a3,029	2,930	1,244	a728	1,110	1,804	1,940	2,930	1,684
11	1,804	3,195	6,386	3,029	2,455	1,484	836	1,110	a1,460	1,684	8,404	a1,532
12	1,766	3,900	12,360	2,800	1,940	a1.292	1,000	1,176	1,484	1,364	9,240	1,804
13	3,029	a8,164	a18,200	2,642	3,600	1,340	1,000	1,340	1,292	1,292	a9,144	1,804
14	4,300	7,340	23,300	2,706	3,800	1,804	978	a1,268	956	1,606	8,750	1,850
15	4,665	6,470	27,900	2,930	a3,328	2,150	1,000	630	1,000	2,706	7,472	1,850
16	a4,448	5,450	23,700	2,900	2,642	2,030	1,000	1,244	890	a3,500	6,176	1,880
17	4,265	4,484	17,950	a2,548	2,610	1,804	a956	1,000	872	4,411	4,592	2,000
18	3,880	3,950	14,800	2,240	2,362	1,532	1,000	890	a508	3,775	3,880	a1,850
19	3,530	3,600	13,750	2,548	2,150	a1,154	1,436	956	800	2,996	3,260	1,940
20	3,420	a3,362	a12,304	2,865	2,548	1,850	1,154	934	818	2,706	a2,963	2,090
21	4,300	3,775	12,804	3,775	2,865	2,150	1,220	a956	1,132	2,674	3,294	2,090
22	5,650	3,985	13,582	4,265	a2,706	2,000	1,220	818	1,044	2,963	3,294	2,548
23	a5,650	3,915	13,032	5,250	2,424	1,804	1,220	1,110	890	a4,374	3,029	4,230
24	6,176	3,600	11,280	a6,386	2,548	1,658	a934	2,150	1,460	5,480	3,294	5,610
25	5,970	3,230	9,390	7,252	2,770	1,340	1,292	2,610	a2,738	4,592	2,800	a5,450
26	5,530	2,930	8,260	8,950	2,865	a1,220	2,000	3,095	2,865	4,055	2,548	5,130
27	4,739	a2,770	a6,900	10,140	3,775	1,066	1,710	3,130	2,770	5,570	a1,658	4,300
28	3,950	3,095	6,176	9,690	4,055	1,340	1,340	a2,706	2,393	6,680	2,030	3,420
29	3,396	....	6,302	7,780	a3,362	1,316	1,364	2,000	2,770	6,558	2,331	3,095
30	a2,900	....	7,340	5,850	3,230	1,292	1,292	1,460	1,850	5,250	2,610	3,705
31	2,930	....	7,924	....	3,130	....	a1,508	1,658	....	3,950	....	4,813
Mean	3,402	3,806	9,609	4,654	3,174	1,639	1,128	1,495	1,483	3,138	3,932	2,720

a Sunday.

Daily discharge, in second-feet, of Black River at Huntingtonville dam, New York, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,230	1,940	3,565	4,125	18,000	3,095	1,460	956	978	a 956	2,240	1,176
2	3,985	2,090	3,260	a 3,915	16,150	2,393	a1,022	1,000	1,244	956	3,420	1,198
3	3,396	2,030	3,230	3,800	14,800	2,240	1,000	1,110	a 630	1,460	4,055	a1,412
4	3,600	2,000	3,328	3,565	13,694	a1,804	956	1,000	1,110	1,340	3,230	2,090
5	10,396	a2,000	a3,880	3,600	12,080	1,658	1,388	854	480	1,176	a2,900	2,060
6	9,740	2,000	5,170	3,985	9,490	1,710	1,436	a 678	1,000	1,022	2,706	1,658
7	8,750	2,000	5,970	4,520	a7,516	1,658	1,580	800	890	1,022	2,393	1,460
8	a8,750	2,000	5,530	6,900	5,090	1,532	1,460	890	1,022	a 678	1,850	1,220
9	7,972	2,000	5,090	a 8,116	4,125	1,340	a1,176	1,000	1,066	1,044	1,832	1,198
10	6,812	1,984	4,592	8,308	3,705	1,532	1,880	854	a1,022	854	1,460	a1,110
11	5,450	1,850	4,125	8,950	3,362	a1,220	1,340	728	1,220	956	1,412	1,658
12	4,484	a1,984	a5,210	10,656	3,705	1,532	2,150	678	678	800	a1,066	4,850
13	4,055	2,240	8,164	11,072	3,880	1,340	1,738	a 710	1,340	818	1,436	8,404
14	3,950	2,240	8,020	12,136	a3,260	1,340	1,532	728	630	818	1,132	8,404
15	a4,702	2,240	7,736	13,694	2,930	1,132	1,412	1,044	694	a 818	1,220	7,928
16	5,810	2,150	6,900	a13,806	3,029	1,460	a1,022	1,110	1,176	694	1,364	5,650
17	5,890	2,210	6,680	14,086	3,095	1,460	934	1,066	a 764	1,000	1,460	a2,706
18	5,450	1,984	5,850	14,086	3,705	a1,460	1,000	1,606	1,220	978	1,460	3,294
19	5,250	a1,850	a5,250	14,700	3,029	1,658	1,292	1,000	1,176	1,044	a1,066	4,702
20	3,095	2,000	4,629	17,400	3,775	1,340	956	a 710	710	1,088	1,110	5,450
21	3,740	2,090	4,665	20,900	a4,484	1,220	956	522	800	854	1,244	6,470
22	a3,362	2,362	4,629	24,400	4,337	1,220	1,000	1,000	1,066	a 522	1,176	6,680
23	3,195	2,963	4,665	a24,950	3,775	1,220	a 978	890	710	1,000	1,066	5,050
24	2,930	3,465	5,050	25,000	3,500	1,340	1,220	854	a 630	956	1,198	a4,337
25	2,770	3,420	4,930	24,850	2,900	a1,268	1,340	1,244	1,198	1,066	1,110	4,300
26	2,900	a3,095	a4,776	24,950	2,424	1,292	1,132	1,110	1,110	1,110	a 782	2,930
27	2,610	3,420	4,592	24,300	2,485	1,532	1,044	a 854	1,198	1,110	1,088	2,548
28	2,393	3,530	4,230	23,450	a2,393	1,340	1,088	872	1,198	1,110	1,132	2,300
29	a2,000	....	4,090	22,250	2,362	1,176	836	890	1,198	a1,066	1,066	2,240
30	2,300	....	4,592	a20,350	3,362	1,340	a 550	1,000	1,532	1,292	912	2,240
31	2,120	....	4,195	....	3,420	....	458	956	....	1,940	....	a1,804
Mean	4,712	2,326	5,051	13,894	5,609	1,528	1,205	897	990	1,018	1,652	3,501

a Sunday.

Daily discharge, in second-feet, of Black River at Huntingtonville dam, New York, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,766	2,300	2,865	*a*3,800	11,280	2,000	*a*978	1,340	1,240	780	1,610	9,900
2	1,710	2,300	2,610	4,265	11,020	1,710	978	1,110	*a*1,200	1,440	1,535	8,000
3	1,710	2,240	2,579	5,370	10,812	2,000	1,000	1,220	1,010	1,200	1,440	6,400
4	1,710	*a*2,060	*a*2,770	6,050	9,740	*a*2,060	854	1,000	(*b*)	960	1,120	5,650
5	1,710	2,060	2,770	7,384	9,000	2,200	1,000	*a*854	......	1,120	1,370	5,700
6	1,710	2,150	2,930	7,560	*a*7,780	2,000	1,110	694	......	1,200	1,120	5,650
7	*a*1,710	2,200	2,865	9,740	6,900	2,150	1,110	1,000	......	*a*780	1,245	5,700
8	2,300	2,150	2,674	*a*12,192	6,050	2,424	*a*764	1,154	......	1,010	......	4,900
9	2,362	4,850	2,930	10,760	5,650	2,579	1,268	690	(*a*)	960	......	4,180
10	2,362	5,850	2,930	10,760	6,602	2,485	1,244	820	......	1,240	......	3,300
11	2,240	*a*5,770	*a*2,674	10,240	7,560	*a*2,610	1,340	780	760	980	2,990	3,460
12	2,150	5,250	2,930	10,344	6,050	2,000	1,268	*a*1,610	740	870	2,895	3.145
13	2,270	6,344	2,674	9,490	*a*5,770	2,030	1,532	1,010	780	780	2,475	2,990
14	*a*1,710	11,458	2,610	7,340	5,650	1,766	1,580	1,490	780	*a*580	2,120	2,780
15	1,940	12,304	2,610	*a*6,386	5,250	1,580	*a*1,198	1,730	740	820	2,250	3,080
16	1,850	14,030	2.610	7,208	5,250	1,580	1,460	1,680	*a*390	780	1,485	2,200
17	1,580	13,470	2,610	9,096	5,650	1,268	1,220	1,535	740	1,010	1,780	2,780
18	1,710	*a*11,280	*a*2,548	10,604	5,530	*a*1,154	1,268	1,240	1,120	1,050	1,680	2,255
19	1,940	9,590	2,610	20,100	5,250	1,460	1,340	*a*2,120	1,100	1,050	3,900	2,595
20	2,930	7,924	2,610	27,050	*a*5,170	1,364	1,766	1,010	1,120	1,050	8,600	2,830
21	*a*5,930	5.770	2,610	30,000	4,930	1,044	1,580	1,240	980	*a*740	9,175	2,780
22	6,260	5.130	3,420	*a*29,500	4,374	1,044	*a*1,460	1,200	980	960	8,900	2,535
23	5,850	5,130	4,020	27,700	4,265	1,110	1,556	810	*a*1,055	1,240	8,600	2,535
24	5,770	4,850	3,915	25,200	3,705	1,110	1,766	480	1,240	1,440	7,820	3.640
25	4,850	*a*4,230	*a*3,600	23,300	3,161	*a*1,176	1,340	810	1,780	1,980	6,280	5,450
26	4,125	3,775	3.600	21,750	3,420	1,340	1,220	*a*500	1,490	2,340	6,680	5,280
27	3,670	3,095	3,260	20,000	*a*2,706	978	2,150	780	1,295	2,120	9,900	4,900
28	*a*3,420	2,996	3,260	17,050	2,485	836	1,850	780	1,200	*a*1,605	12,250	4,220
29	3,195	......	3,260	*a*14,800	2,150	764	*a*1,316	1,780	915	1,860	13,900	3,810
30	2,865	......	3,260	12,752	2,000	1,044	1,268	1,440	*a*800	1,885	12,250	......
31	2,548	......	3,465	......	1,904	......	1,176	1,240	......	1,935	......	......
Mean	2,834	5,734	2,970	13,926	5,711	1,630	1,321	1,134	1,020	1,218	5,014	4,230

a Sunday. *b* Sluice gates open.

GRAND RIVER, MICHIGAN.[1]

This is the largest stream in the State. Its drainage basin, which includes a total area of 5,572 square miles, is situated in the central portion of the lower peninsula, and drains into Lake Michigan. It lies in the southern border of the pine belt and is for the most part cleared. Occasional tracts of forest remain, however, as, for example, Slocum's Grove, in Muskegon County, which forms a part of the drainage basin of Crockery Creek, and contains between 4,000 and 5,000 acres of hard-wood and hemlock timber, now being lumbered. The basin is overlain with glacial drift deposits, including sand, clay, overwash, gravel, and till, with outcroppings of rock at rare intervals. A stratum of limestone, said to be 52 feet thick, appears in the east side of the bed of Grand River at Grand Rapids, 100 feet above the Pearl street bridge. It dips in a northeasterly direction, at a slope of 50 feet to the mile, and does not appear in the west side canal. The watershed receives an annual rainfall varying from 25 inches in the region of the headwaters to 30 or 35 inches near the mouth of the river. From the foot of the rapids formed by the limestone ledge at Grand Rapids to the mouth of the river at Lake Michigan the flow is

[1] Report of Robert E. Horton.

very sluggish; the fall in this portion is given below, from levels run by Mr. Fred Morley, United States assistant engineer.

Fall of Grand River between Grand Rapids and its mouth.

Section.	Distance.	Fall.
	Miles.	*Feet.*
Grand Rapids to Grandville	6.0	2.85
Grandville to Lamont	11.5	2.92
Lamont to Grand Haven	21.64	0.43
Total	39.14	6.20

In the upper half of this stretch of the river the immediate banks of the stream are high, sometimes forming natural levees at elevations greater than that of the adjacent flood plain. Mr. Morley states that below Lamont bayous and low swamps are common between the river banks and the foothills bordering the valley. The valley as a whole is narrow; gravel bluffs from 50 to 60 feet high occasionally stand close to the stream. The river below Grand Rapids has been adjudged navigable, and a project has been formed for its canalization, the plan being for a waterway, with a navigable depth of 10 feet, connecting the city of Grand Rapids with Lake Michigan.

The drainage areas of the main stream and its tributaries at various points are given in the following table:

Drainage areas of Grand River and its tributaries.

Stream.	Location.	Area.
		Sq. mi.
Grand River	Above Lansing	756
Red Cedar River	Above mouth	472
Grand River	Below mouth of Red Cedar River	1,229
Do	Above Portland	1,404
Lookingglass River	Above mouth	306
Grand River	Below mouth of Lookingglass River	1,710
Do	Above Lyons	1,748
Maple River	Above Maple Rapids	459
Do	Above mouth	919
Grand River	Below mouth of Maple River	2,667
Do	At Ionia	2,818
Do	Above Lowell	2,971
Flat River	At mouth	602
Grand River	Below mouth of Flat River	3,573
Thornapple River	Above mouth	824
Grand River	Above Grand Rapids water-power dam	4,883
Do	Above mouth	5,572

The watershed is comparatively flat. The total fall of the river from the extreme headwaters to the mouth, a distance of more than 200 miles, is about 350 feet.

Fall and slope of Grand River.

Location.	Elevation above mean tide.	Approximate fall.		Approximate distance.	
		To mouth of stream.	Between points.	From mouth.	Between points.
	Feet.	*Feet.*	*Feet.*	*Miles.*	*Miles.*
Grand Haven	581.3	0.0	0.0	0	0
Grand Rapids *a*	587.5	6.2	6.2	39	39
Lowell	635.0	53.7	47.5	67	28
Ionia	640.0	58.7	5.0	83	16
Portland	710.0	128.7	70.0	106	23
Lansing	825.0	243.7	115.0	138	32
Jackson	915.0	333.7	90.0	192	54

a Foot of rapids.

The northwestern and southeastern portions of the watershed are thickly interspersed with small lakes. A considerable number of these have no surface outlets, and their drainage basins do not contribute to the run-off of the river except through ground water.

The water of Grand River is hard. Samples collected on June 20, 1899, showed the following analyses:[1]

Analyses of water from Grand River and tributary streams, in parts per million.

Stream.	Location.	Total residue.	Chlorine.	Free ammonia.	Albuminoid ammonia.	Temporary hardness.
Grand River	Grand Rapids pumping station.	281.6	4.0	0.112	0.320	240
Thornapple River	At Cascade	280.0	4.3	.094	.208	250
Muskegon River	Above Big Rapids	184.0	1.9	.052	.344	170
Bailey Creek (spring fed)		245.6	1.7	.006	.096	225

Grand River serves as a source of water supply to the city of Grand Rapids. The average daily consumption of that city for the year 1899–1900 was 13,693,499 gallons a day, equivalent to a flow of 21.3 second-feet. The population in 1900 was 87,565.[2]

In connection with proposed improvements for navigation, gaging stations have been established at various points on Grand River below Grand Rapids. All gages are set with their zeros at the Lake Michigan datum, 581.28 feet above mean tide of the New York harbor deep-sea levels. Since 1890 observations have been taken at different stages of the stream, notably during high water, with a view to determining its slope. Cross sections have also been made, and these data will, when completed, form a basis for computing the flow of the river by means of Kutter's formula.

[1] Report of Consulting Engineers to Pure Water Commissioners of the City of Grand Rapids Michigan, 1899.

[2] Report of Board of Public Works, Grand Rapids, 1900.

The results of the gage readings for the year 1891, referred to the Lake Michigan datum, are given in the following table:

Gage heights, in feet, of Grand River at various points.

Month.	Mean gage heights.				Highest observed.				Lowest observed.			
	Grand Rapids.	Grandville.	Lamont.	Grand Haven.	Grand Rapids.	Grandville.	Lamont.	Grand Haven.	Grand Rapids.	Grandville.	Lamont.	Grand Haven.
1891.												
January	8.16	4.93	1.81	−0.70	9.74	6.38	2.37	+0.42	7.19	4.08	1.27	−1.28
February	8.95	5.90	2.72	− .93	13.64	10.68	6.67	− .13	7.04	4.28	1.37	−1.68
March	11.91	9.48	5.35	− .79	16.64	14.08	8.87	− .29	8.99	6.18	2.77	−1.53
April	11.45	8.52	4.65	− .47	14.49	11.48	6.87	+ .17	8.29	5.18	2.17	−1.08
May	6.93	3.62	.92	− .35	8.19	5.08	2.17	+ .17	6.24	2.78	.37	− .90
June	6.45	2.99	.66	− .25	6.99	3.78	1.07	+ .72	5.74	2.38	.37	− .69
July	5.77	2.51	.37	− .63	6.49	3.18	.77	+ .27	5.16	2.08	.07	− .91
August	5.33	2.12	.09	− .41	6.34	3.08	.87	+ .02	4.92	1.78	− .13	− .72
September	5.60	2.51	.26	− .32	5.14	3.08	.77	+ .02	5.12	1.73	− .23	−1.29

Float measurements of the flow of Grand River were made by Mr. Morley during the low-water period of 1891, as follows:[1] July 21, 5.52 miles below Grand Rapids; August 18, 16.68 miles below Grand Rapids. Rod floats were run across the stream at intervals of 10 feet, and were timed while passing downstream a distance of 100 feet. From these measurements the minimum flow of 1891 was estimated at 981.5 second-feet, the corresponding stage on the Grand Rapids gage being 5.67 feet.

In addition to the foregoing, Mr. Morley calculated the flow at various stages, from measured slopes and sections, by means of Kutter's formula, with the following results:

Calculated flow of Grand River near Grand Rapids.

Gage height on Grand Rapids gage.	Corresponding gage height at discharge section.	Area of cross section. (A)	Wetted perimeter. (P)	Hydraulic radius—$\frac{A}{P}=R$.	Slope.	Coefficient of roughness.	Mean velocity.	Discharge.
Feet.	*Feet.*	*Square feet.*	*Lineal feet.*		*Feet per foot.*		*Feet per second.*	*Second-feet.*
5.67	2.57	1,205.5	330.0	3.653	0.000035	0.026	0.8142	981.5
7.32	4.24	1,765.4	345.5	5.109	.0000466	.026	1.2187	2,151.0
10.32	7.62	2,961.9	367.5	8.059	.0000559	.026	1.8614	5,514.0
14.32	11.54	4,365.4	392.0	11.136	.000087	.026	2.8363	12,382.0

A nearly continuous record of the stage of Grand River at the Chicago and West Michigan Railroad bridge, 1 mile below the dam in Grand Rapids, has been kept since May 26, 1897. A copy of this record has been furnished by George W. Bunker, United States assistant

[1] Report on Survey of Grand River below Grand Rapids, War Department, 1892.

engineer. The daily gage heights, referred to the Lake Michigan datum, are given in the following tables:

Daily gage height, in feet, of Grand River at Grand Rapids, Michigan, for 1897.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		7.5	6.5		6.2		6.3	6.4
2		6.8	6.5	6.9	6.4	5.9	5.9	6.4
3		7.2	6.5	6.9	6.6	6.0	5.8	6.4
4		7.1		6.7	6.4	6.0	5.9	6.4
5		7.0		6.7		6.0	5.9	
6			6.3	6.6		5.9	6.0	6.8
7		7.0	6.3	6.7	6.1	5.8		6.8
8		6.8	6.3		6.3	5.9	6.1	7.0
9		7.0	5.4	6.8	6.4	5.8		7.0
10		7.0	5.4	6.8	6.4		6.2	7.0
11		6.9		6.7	6.2	5.9	6.3	7.6
12		6.8	6.3			6.0	6.6	
13			6.5	6.6	6.1	6.1	6.7	8.1
14		6.6	6.8	6.4	6.2	6.3		8.2
15		6.6	7.3			6.4	6.6	8.2
16		6.8	7.2	6.4	6.2	6.3	6.8	8.1
17		7.3	7.0	6.4	5.9		7.0	8.0
18		7.0		6.4	6.1	6.1	6.9	7.0
19		6.9	6.7	6.4		6.1	6.6	
20			6.6	6.3	6.2	5.9	6.6	7.2
21		6.9	6.5	6.3	6.2	6.1		7.2
22		6.9	6.5		6.1	6.2	6.6	7.5
23		6.4	6.5	6.2	6.1	6.2	6.6	8.1
24		6.3	6.6	6.2	6.1		6.6	8.4
25		6.3		6.3	6.0	6.0		
26	8.2	6.7	6.5	6.3		6.0	6.7	
27	8.2		6.5	6.3	6.0	5.9	6.7	8.4
28	8.0	6.6	6.5	6.4	6.0	5.7		8.4
29	7.9	6.5	6.9		6.0	5.8	6.7	8.4
30		6.5	7.3	6.6	6.0	6.1	6.5	8.0
31			7.2	6.1		6.1		8.0

Daily gage height, in feet, of Grand River at Grand Rapids, Michigan, for 1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		9.8	12.2	14.1		6.8	6.9	6.4	6.6	6.8	7.4	7.8
2		9.7	11.9	13.9	8.1	6.4	7.0	6.4	6.7		7.4	7.7
3	7.9	9.4	11.4		8.1	6.9		6.4	6.6	6.9	7.3	7.7
4	7.9	9.2	10.6	12.4	8.1	6.1		6.5		6.7	7.1	
5	7.4	9.3	10.2	11.6	8.0		6.6	6.6		6.4	7.2	7.5
6	7.4	9.1		11.2	7.9	6.2	6.6	6.5	6.6	6.3		7.5
7	7.4	9.9	9.4	10.7	7.8	6.4	6.7		6.6	6.3	7.4	7.4
8	7.4	9.4	9.2	10.3		6.5	6.5	6.8	6.6	6.5	6.9	7.2
9		9.1	9.6	10.0	7.6	6.6	6.5	6.8	6.6		7.3	7.4
10	6.8	8.9	11.9		7.6	6.6		6.9	6.5	6.7	7.3	7.4
11	6.9	9.8	13.5	9.5	7.4	6.8	6.4	6.8		6.6	7.4	
12	6.7	11.7	15.7		7.3		6.5	6.7	6.2	6.4	7.5	7.9
13	6.9			9.0	7.2	6.7	6.3	6.8	6.2	5.5		8.3
14	7.4	12.5	18.7	8.8	7.1	7.0	6.4		6.4	6.2	7.7	8.2
15	7.6	12.8	19.5	8.4		6.6	6.3	6.7	6.2	6.4	7.9	8.2
16	8.0	13.0	19.7	8.4	6.9	7.2	6.3	6.8	6.8		8.0	8.1
17	8.0	13.1	19.2		6.9	7.4		7.2	6.8	6.7	8.2	7.8
18	7.8	12.9	18.6	8.2	6.8	7.0	6.4	8.1		6.9	8.2	
19	7.8	12.9	18.1	8.2	7.2		6.4	7.5	6.9	6.9	8.4	
20	7.7			8.4	8.0	6.9	6.5	7.5	6.8	6.8		8.1
21	7.9	12.9	17.0	8.4	7.9	6.9	6.4		6.5	7.3	8.7	7.4
22	8.9		16.7	8.5		6.5	6.4	9.1	6.5	7.6	8.8	7.7
23	8.4	13.1	16.6	8.7		6.4	6.4	7.0	6.8		8.8	8.0
24	9.0	13.1	16.4		7.8	6.8		7.0	7.2	7.6		8.3
25	9.2	13.1	15.8	8.8	7.7	7.0	6.4	6.8		7.3	8.2	
26	10.2	13.1	15.2	8.7	7.5		6.4	6.8	7.6	7.5	8.2	
27	9.4			8.8	7.3	7.4	6.2	6.8	7.6	7.6		9.2
28	9.6	12.4	14.2	8.6	7.3	7.3			7.2	7.6	7.8	9.9
29	9.6		13.9	8.5		7.0	6.2	6.8	6.8	7.7	7.9	9.6
30	9.4		14.0	8.3		7.0	6.2	6.6	6.8		7.9	9.2
31			14.2		7.0			6.6		7.6		10.0

Daily gage height, in feet, of Grand River at Grand Rapids, Michigan, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	9.9	14.1	10.0	9.3	8.6	6.0	6.9	6.4	......	6.6	6.7
2	......	9.8	14.3	......	9.4	8.4	......	6.8	6.4	7.2	7.0	6.7
3	10.0	9.4	14.7	9.9	9.5	8.3	6.2	6.5	......	6.7	7.0	......
4	9.3	9.4	15.3	10.4	9.4	......	......	......	......	6.7	7.0	6.5
5	10.2	......	......	11.4	9.7	7.9	7.0	6.8	6.4	6.7	6.8	......
6	10.3	9.0	14.9	13.1	9.6	7.6	6.7	......	6.5	6.7	7.1	6.3
7	13.0	8.9	14.6	14.0	......	7.6	6.8	6.9	6.6	6.8	7.0	6.3
8	......	......	14.2	14.6	8.7	7.4	......	6.6	6.7	......	6.9	......
9	12.6	......	13.0	......	8.5	......	......	6.6	6.7	6.6	6.8	......
10	12.0	......	11.9	16.0	8.3	......	......	6.5	......	6.4	6.8	......
11	12.8	......	11.4	16.3	8.2	......	......	6.6	6.7	6.7	7.0	6.8
12	11.2	......	......	16.5	8.2	7.4	......	6.4	6.6	6.6	......	7.6
13	11.2	8.1	12.5	16.5	7.6	......	......	......	6.7	6.5	6.9	7.5
14	11.4	8.1	12.8	16.4	......	......	6.6	6.5	6.5	6.6	7.0	7.5
15	......	8.1	13.1	16.2	7.9	7.4	6.9	6.4	6.6	......	7.0	7.6
16	12.3	8.4	13.3	15.7	7.6	......	......	6.5	6.5	6.9	7.2	......
17	12.4	8.4	13.9	14.9	7.7	6.8	6.9	6.5	......	6.8	6.8	......
18	12.4	8.1	13.3	14.2	7.7	......	6.9	6.4	6.7	6.9	7.2	7.4
19	12.3	......	......	13.4	7.7	......	......	6.4	6.9	7.0	......	7.2
20	12.0	9.1	12.2	12.3	7.7	6.5	6.9	......	6.9	6.8	7.0	7.3
21	11.8	9.4	12.3	11.8	......	......	6.6	6.4	6.7	6.8	7.0	7.2
22	......	......	12.3	11.1	7.6	......	6.6	......	6.9	......	6.9	7.0
23	10.6	9.4	12.1	......	7.4	......	......	......	......	6.9	6.6	......
24	10.3	9.4	11.3	10.4	7.2	......	6.8	6.6	......	6.6	6.6	......
25	9.9	9.3	11.0	10.0	7.2	6.1	6.7	6.6	7.4	6.5	6.8	......
26	......	......	......	9.9	7.1	6.2	7.0	6.6	7.6	......	......	7.5
27	10.6	13.7	10.5	9.7	7.0	......	7.1	......	7.3	......	6.6	7.4
28	10.0	14.0	10.8	......	......	......	7.0	6.4	7.3	6.8	......	7.6
29	......	......	10.8	9.4	8.1	6.2	6.9	6.3	7.1	......	6.4	7.6
30	9.8	......	10.2	......	......	......	......	6.3	......	7.2	......	7.6
31	9.9	......	......	......	8.6	......	7.1	6.4	......	7.0	......	......

Daily gage height, in feet, of Grand River at Grand Rapids, Michigan, for 1900

Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr.
1	......	......	8.3	16.8	17	......	12.3	8.9	9.8
2	......	......	8.3	16.7	18	......	11.5	8.7	......
3	......	......	8.1	16.5	19	......	11.0	8.7	......
4	......	......	7.9	16.3	20	......	10.6	8.7	......
5	......	......	7.9	16.1	21	......	10.2	8.7	......
6	......	......	7.9	15.7	22	7.9	......	8.8	......
7	......	......	7.9	15.1	23	7.9	9.7	9.8	......
8	......	11.6	7.9	......	24	7.7	9.3	11.4	......
9	......	14.1	8.1	13.5	25	7.4	9.0	12.2	......
10	......	14.6	8.1	12.7	26	7.0	8.7	12.8	......
11	......	13.9	7.9	11.8	27	6.7	8.5	13.5	......
12	......	13.4	8.0	11.2	28	7.0	8.3	15.4	......
13	......	12.8	8.1	10.6	29	8.7	......	16.7	......
14	......	12.7	8.2	10.3	30	8.7	......	17.0	......
15	......	12.8	8.2	......	31	8.5	......	17.0	......
16	......	12.8	8.2	10.0					

In 1899 the following measurements of the volume of flow of the stream were made under Mr. Bunker's direction. The measurements were made by means of rod floats spaced at intervals of 20 feet across the channel, and timed through a distance of 100 feet.

Discharge measurements of Grand River.

Date.	Location of section.	Elevation of water surface, Lake Michigan datum.	Corresponding stage at Grand Rapids gage.	Mean area of section.	Mean velocity per second.	Discharge.
1899.		*Feet.*	*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-feet.*
Apr. 13	Brick House	14.514	16.49	6,131.6	3.061	18,770
Apr. 23	do	8.968	11.09	3,337.6	2.237	7,465
June 19	do	4.048	*a* 6.39	1,437.6	1.377	1,980
June 29	do	3.480	6.17	1,177.0	1.187	1,397
Aug. 31	do	3.301	6.44	751.2	1.210	909
June 16	Lamont	1.077	*a* 7.09	1,699.1	1.206	2,048
June 29	do	.487	6.17	1,402.2	.957	1,342
Sept. 8	do	----------	6.69	1,214.2	.749	910
Apr. 19	Grand Rapids	13.334	13.39	4,091.4	2.584	10,571
June 28	do	6.142	6.14	784.3	1.903	1,492
June 30	do	6.168	6.17	619.5	1.756	1,098

a Approximate; interpolated.

The relation between the various sections is shown in the following table:

Table showing relation between sections on Grand River where discharge measurements were made.

Location.	Distance below Grand Rapids.	Drainage area.	Proportional drainage area at Grand Rapids.
	Miles.	*Sq. miles.*	*Per cent.*
Brick House	4.0	4,961	98.7
Lamont	16.5	5,179	94.6
C. & W. M. R. R. bridge, Grand Rapids	0.0	4,900	100.0

A gaging was made at Grand Rapids on July 13, 1898, by W. M. Mills, C. E., from which the flow was estimated at 1,000 second-feet. The results of all gagings thus far made are summarized in the following table, the results of measurements made below Grand Rapids having been reduced to equivalent flow at the Chicago and West Michigan Railroad bridge:

Table showing discharge of Grand River at Chicago and West Michigan Railroad bridge at Grand Rapids.

Date.	Hydrographer.	Stage at Grand Rapids gage.	Discharge.
		Feet.	*Sec.-feet.*
September 8, 1899	Geo. W. Bunker	6.69	862
August 31, 1899	do	6.44	897
1891	Fred Morley	5.67	981
July 13, 1898	W. M. Mills	6.29	1,000
June 30, 1899	Geo W. Bunker	6.17	1,098
June 29, 1899	do	6.17	1,270
Do	do	6.17	1,379
June 28, 1899	do	6.19	1,492
June 16, 1899	do	7.09	1,937
June 19, 1899	do	6.39	1,954
1891	Fred Morley	7.32	2,151
1891	do	10.32	5,514
April 22, 1899	Geo. W. Bunker	11.09	7,368
April 19, 1899	do	13.39	10,570
1891	Fred Morley	14.32	12,382
April 13, 1899	do	16.49	18,527

Two gagings of the low-water flow of Thornapple River were made by L. W. Anderson on September 14, 1899, near the mouth of the stream and just above the village of Ada. The velocities were determined by means of both surface and rod floats, which were timed while passing through 100-foot sections. The flow was found to be 155 second-feet, or 0.19 second-foot per square mile from a drainage area of 824 square miles.

Float measurements of Flat River about 7½ miles above its mouth have been made by R. J. M. Danley. Soundings were taken every 10 feet across the channel, and rod floats were put in at the same intervals. The velocity was determined by timing the floats while passing a distance of 200 feet. The drainage area above the point of measurement is 556 square miles, 46 square miles less than at the mouth of the stream.

Discharge measurements of Flat River about 7.5 miles above its mouth.

Date.	Discharge.	
1898.	*Second-feet.*	*Sec.-ft. per sq. mile.*
July 16	215	0.39
July 29	215	0.39
September 5	220	0.40

Mr. Danley states that these measurements represent extreme low water preceded by a period of six weeks with little or no rain.

Arrangements have been made with L. W. Anderson, C. E., for the continuation of gagings of Grand River at Grand Rapids. A gage has been placed at the Fulton street bridge where observations of the stage of the water are taken twice daily. Current-meter measurements of the flow will be made, from which, with the measurements already available, a rating curve for the Grand Rapids cross section can be prepared.

A station has also been established on Grand River at the Schuyler street bridge in North Lansing. The river freezes over through nearly its entire length above Lansing, and in the spring large quantities of ice are brought down. At the point selected for gaging, however, the river does not freeze over, owing to the presence of a dam an eighth of a mile above.

Two miles above the North Lansing gaging station Grand River receives the drainage from Red Cedar River, on which a gaging station was established in January, 1901. The gage is located at the Grand Trunk Railroad bridge on the grounds of the Michigan Agricultural College. The stream is narrow, with gravel bed and without flood plains; the current is moderate.

The station on Red Cedar River, as well as that at North Lansing on Grand River, is under the immediate direction of Prof. H. K. Vedder, of the Michigan Agricultural College.

The drainage areas above the stations are as follows:

Drainage areas above gaging stations.

River.	Location.	Area.
		Sq. miles.
Grand River	Fulton street bridge, Grand Rapids	4,900
Do	North Lansing	1,238
Red Cedar River	Michigan Agricultural College	358

The fall and the power in use at the principal dams on the main river and its branches are given in the following table. There is no storage developed on the stream. The dams are of timber, usually provided with logways, though the logging industry on the river is now practically at an end. During the winter months anchor ice is a frequent source of annoyance to water-power users. The present development involves two power canals which run parallel with the river.

Developed water powers on Grand River and its tributaries.

Stream.	Location.	Number of dam.	Number of mills at dam.	Effective head or fall.			Rated power of water wheels reported.
				Greatest.	Least.	Average.	
				Feet.	*Feet.*	*Feet.*	*Horsepower.*
Grand River	Grand Rapids	1	24	15	6.5	12.5	2,000
Do	Lyons	2	3	9	4.0	7.5	150
Do	Three miles above Lyons.	3	1				
Do	Portland	4	1				241
Do	do	5	2				
Do	Grand Ledge	6	2	9	6.0	7.5	130
Do	do	7	None.				
Do	North Lansing	8	6	9	3.0	7.0	200
Do	Eaton Rapids	9	2	9	5.0	7.5	140
Do	Winfield	10	2				
Do	Jackson	11					
Buck Creek	Grandville	1	1			13.0	400
Rogue River	Childsdale	1	1	18	8.0		418
Do	Rockford	2	1				
Porter Creek	Edgerton	1	1	14	12.0	13.0	52
Thornapple River	Ada	1	2	8	4.0	10.0	32
Do	Alaska	2	2			6.0	90
Do	Labarge	3	1				
Do	Middleville	4	3				
Flat River	Lowell	1	1			8.0	297
Do	Three miles above Lowell.	2	1	12		11.0	466
Do	Alton	3	2				
Do	Belding	4	1				186
Do	Greenville	5	1				
Lookinglass River	Portland	1	2	8	4.0	7.0	203
Red Cedar River	Okemos	1	2				
Do	Williamstown	2	2				

Water power was originally developed at Grand Rapids in 1836 by the construction of a rubble diverting or wing dam on the limestone ledge at the east side of the stream. In 1851–52 a dam was built across the stream and the width of the east side canal was increased to 60 feet, with the intention of providing slack-water navigation past the Long Rapids at this point. In 1866 W. T. Powers purchased the water privilege on the west side of the stream, and joined with the power users on the east side to build the present timber dam, the crest line of which is 678 feet long. The east side canal is 2,560 feet long and the west side canal 3,750 feet long.

Where the space between the canals and river does not permit of the erection of mills or factories, wheel pits are placed at the river's edge and the power is carried to the mills by telodynamic transmission.

Each canal is entitled to half the flow of the stream. Water privileges on the east side were sold by priority, beginning at the lower end of the canal. The flow in the west side canal, constituting half of the power of the stream, was divided into 66 equal parts or "runs." The net power of one run of stone, at the ordinary stage of the stream and under a head of $12\frac{1}{2}$ feet, has been fixed at 15 horsepower. On this basis the ordinary effective power available at Grand Rapids is estimated at 2,000 horsepower. The power is utilized in the manufacture of furniture, in flour mills, machine, iron, and brass works, and for the generation of electricity. In addition power is transmitted electrically to Grand Rapids from the plant of the Peninsular Electric Company on Flat River, above Lowell. The transmission line is 16 miles long, the tension 10,000 volts.

The foregoing list of water powers does not include a number of rural grist and feed mills on the smaller tributaries, some of them very small, only permitting the mills to run intermittently by holding back the flow as pond storage. Abandoned sites where dams have been washed out are not infrequently found. These were used to supply power for sawmills which have long since ceased to be operative through lack of timber supply.

The fall at Grand Rapids aggregates 18 feet, and the available power could be greatly increased by constructing a new dam, increasing the head, and concentrating the entire flow in one wheel pit, for the generation of electricity. It is estimated that an average of 2,200 horsepower net can be obtained 8 months of the year, from May to December, while during the four spring months a minimum of 3,200 horsepower will be available, with the exception of a few days, when the head will be reduced by backwater to 6 feet or less. The plan contemplates the erection of a 12-foot concrete dam, the construction of a power canal along the stream bed, and the excavation of the tailrace channel $2\frac{1}{2}$ feet below the present bed of the river. It would admit of the filling in of the present power canals and the reclamation of valuable land along the river front.[1]

The available power of the main stream is for the most part utilized. It is stated that a site exists between Lyons and Portland where a head of 12 feet could be obtained by the erection of a dam 10 feet

[1] Report on Development of Water Power, Grand Rapids, Michigan. Rae and Monroe, Chicago, 1899.

high. A dam is also contemplated at Delta, 7 miles downstream from Lansing, where a fall of 7 feet is available.

Four miles above Lowell, Flat River forms a bend 5 miles in circumference. The natural difference in elevation of the stream at the two ends of the loop is 11 feet. By building a dam 20 feet high on the upstream side, and carrying the water across the neck of the bow, a head of 30 feet could be obtained, which would yield a minimum of 1,000 horsepower.

On Rogue River, 1 mile below Childsdale, a dam could be erected which would afford a head of 20 feet. Other unimproved privileges are at Fallassburg on Flat River, where a 12-foot head is available at Ada and Cascade on Thornapple River, and at Maple Rapids and other points on Maple River. There are also two abandoned powers on Buck Creek in the vicinity of Grandville, at each of which a head of 12 to 14 feet could be obtained.

Much of the available power on tributaries of Grand River is, however, of little value, owing to irregular flow, limited supply, and remoteness from population centers.

MUSKEGON RIVER, MICHIGAN.

The drainage basin of this stream lies immediately north of that of Grand River. Originally it was covered with pine timber, but now it is almost entirely cleared. Much of the soil is sand and gravel, unfit for profitable cultivation. Large stump-covered areas form a conspicuous feature of the topography. The drainage areas tributary to the stream are given in the following table:

Drainage areas of Muskegon River and tributary.

Stream.	Location.	Area.
		Sq. miles.
Muskegon River	Above Clam River	787
Clam River	Above mouth	307
Muskegon River	Below Clam River	1,094
Do	Above Big Rapids	1,764
Do	Above Newaygo	2,352
Do	Above mouth	2,663

In March, 1901, a station was established at the dam of the Newaygo Portland Cement Company. This dam crosses Muskegon River in a deep valley above the village of Newaygo. It is of timber, having framed cribs filled with stone. Its height is 21 feet; it rests on a hardpan foundation, and is considered to be practically water tight. It is provided with a main spillway, with logways, and with four floodways. The floodways are provided with Taintor segmental flood gates, which are operated by a traveling crab. A record is kept of the time and amount of opening of the flood gates and logways, as well as of the depth of water on the crests of the spillways. Ordinarily the flood gates and logways are closed, and the entire flow passes over the main spillway or through the turbines. Water is carried from the pond to the power house by a short headrace separated from the stream channel by a crib breakwater.

The power house contains two pairs of 35-inch Leffel standard turbines on horizontal shafts. The water wheels are connected to electrical generators by endless rope drives. The power will be used for driving machinery in the adjoining cement mills, and the load and consequent discharge of the turbines will be fairly constant. The record kept for the water wheels includes working head, hours run per day, and average width of gate opening for each pair of wheels, as indicated by the Lombard governors.

A gaging of Muskegon River at Big Rapids was made August 27, 1881, by Frederick P. Stearns, civil engineer, and the discharge was found to be 877 second-feet. This amount is taken as the ordinary flow, and is used in partitioning the water power among the several privileges at Big Rapids.

The Newaygo dam is the first one above the mouth of the stream. An effective head of 14 feet is obtained there. Power is also developed at Big Rapids, where there are two dams. The lower dam is a rough timber structure, built with a view to its use in log driving. One hundred and seventy-two horsepower is now in use for the generation of electricity, the head obtained being 8 feet. At the upper dam in Big Rapids power is distributed through two lateral hydraulic canals. The total flow is estimated as equivalent to the discharge through an orifice of 6,758 square inches area under a head of 8 feet, with a coefficient of contraction of 0.7. Each user is entitled to install wheels having a certain number of square inches vent. The head varies from 6½ to 11 feet, the average or ordinary head being 8 or 9 feet. The rated power of the turbines installed is 668 horsepower. It is stated that but 350 horsepower is actually in use. The power utilized at Newaygo and Big Rapids aggregates 1,000 horsepower. Aside from the foregoing, there is no power developed within the drainage basin, except in a small way on certain tributaries.

From the vicinity of Evart to Newaygo, Muskegon River flows between high banks, and has a rapid fall. Levels, which have been run for this purpose, show that within a distance of 10 miles, 5 miles each way from Big Rapids, there is a total fall of 104 feet. Of this 16 feet is now utilized, leaving an available fall of 88 feet. There are favorable sites for the location of dams, so that practically the entire fall could be economically developed. At Rogers's bridge, 6 miles below Big Rapids, surveys have been made for the erection of a dam to give a head of 35 feet.

In connection with power development, good opportunities exist for the conservation of flow by artificial storage. The water-surface areas of the principal lakes of the watershed and of the tributary drainage which they control is given below.

Drainage and surface areas of lakes in Muskegon River watershed.

Lake.	Drainage area.	Water surface.
	Sq. miles.	*Sq. miles.*
Muskrat Lake and group	57	8.0
Clam Lakes	67	6.7
Higgins Lake	67	15.0
Houghton Lake (not including Higgins Lake)	185	31.0
Higgins and Houghton lakes	252	46.0

In the upper portion of the watershed there is a total lake area of about 110 square miles. Formerly a lumbermen's dam was maintained for the purpose of flooding logs between Houghton and Higgins lakes, but this has been washed out. A properly constructed dam at this site would flow an area of 15 square miles and would yield a storage of 400,000,000 cubic feet per foot of depth. A lumbermen's dam, built of logs and earth, which still remains about a mile below the foot of Houghton Lake, raises the water level in that lake 4 feet, providing a storage of, in round numbers, 3,350,000,000 cubic feet. Thomas H. Coughlin, superintendent of the Muskegon Booming Company, states that a dam could be constructed at this site which would admit of a total storage 8 feet in depth and would greatly increase the flooded area over that of the present lake.

HURON RIVER, MICHIGAN.

This river receives drainage from a broad, flat basin interspersed with lakes, situated in southeastern Michigan. The inland basin is connected with Lake Erie by a long, narrow valley, in which occurs a large portion of the fall and available power of the stream.[1] A gaging station has been established at Ann Arbor, under the immediate charge of Prof. J. B. Davis, of the University of Michigan. Current-meter measurements are made from a temporary bridge or by fording. The stream at this point is winding. It flows in a shallow channel, and ordinarily does not overflow its banks. The bed is generally of gravel. The river usually freezes over during the winter, except immediately below the dams. Natural storage in the numerous lakes and marshes regulates the flow to some extent. The character of the watershed has changed somewhat in recent years. Areas of tamarack swamp lands, the soil of which was formerly a quaking bog, have been cleared and drained and are now under cultivation. The drainage area above the mouth of the river is 1,043 square miles; above Ann Arbor it is 841 square miles. A gaging of the bank-full flow of the stream at the Geddes dam, 3 miles below Ann Arbor, was made by Professor Davis, and the estimated discharge was 1,200 second-feet. The Geddes dam has a flat crest and is practically water tight. The

[1] A report on the water power of Huron River, by James T. Greenleaf, C. E., was published in the Tenth Census of the United States, Vol. XVI, Water Power, Pt. I, pp. 443-495.

length of the crest is 200 feet and the depth of water on the crest at the time the measurement was made was 1.7 feet.

THUNDER BAY RIVER, MICHIGAN.

Thunder Bay River is joined by two large branches 8 and 10 miles above its mouth, respectively. These branches, as well as the main stream, are further subdivided at short distances upstream, so that the river is of relatively small magnitude, except for a few miles near its mouth, where occurs the outcrop of the Traverse shales. It is in passing over this rock ledge that the most rapid fall of the stream occurs. The drainage area was formerly heavily timbered with Michigan pine. Most of the pine has, however, been cut, but a large amount of small conifers, hard woods, white birch, and cedar remains, so that the watershed may be considered as representing a forested rather than a cleared area. A record of precipitation is kept at Alpena, near the mouth of the stream. The outcrop of the Traverse and St. Clair shales crosses the watershed in a northeast-southwest direction, crossing the river channel a few miles west of Alpena. The surface above the line of this outcrop is almost continuous limestone, composed of calcium carbonate of 96 to 98 per cent purity, small areas being covered with sand or with thin drift deposits.

No water powers of importance have been developed on either of the branches. On the main stream there are two power dams. The lower one, which is at Alpena, was constructed in 1862. It is 1 mile from the head of Thunder Bay, an arm of Lake Huron. The river is navigable to the dam, forming a harbor. The dam and privileges of the river are owned jointly by the Alpena Waterworks Company and the Alpena Booming Company. The water wheels installed have a rated capacity of 864 horsepower under a head of 9 feet. The power is used for pumping the municipal water supply and for the generation of electricity. The second dam is at the mill of the Fletcher Paper Company, 4 miles above Alpena, and 2,000 horsepower is developed from a fall of 17 feet. The only dams above the Fletcher mills are those used for floating logs. Spruce dam, at Long Rapids, gives a head of 7 or 8 feet. At Lower Rapids a head of 20 feet could be obtained by the construction of a dam.

The drainage basin of Thunder Bay River contains thirty lakes, with an average area of about 1 square mile. In addition to these is Hubbard Lake, which has a water surface of 13.4 square miles. A timber dam at the foot of the latter lake produces a storage depth of 5 feet, with an aggregate storage capacity of 1,867,500,000 cubic feet, equivalent to a flow of 68 second-feet for thirty days. A similar dam at the foot of Beaver Lake gives a storage depth of 6 feet. The water from Beaver Lake is used chiefly for driving logs.

The limestone area contains numerous sink holes, often deep and precipitous. Surface water entering these pits disappears with greater or less rapidity by finding outlets to a lower level through limestone fissures. Such a pocket, known as Sunken Lake, is located near the north branch of Thunder Bay River, and it absorbed the entire flow of that tributary, involving a considerable loss to power users, until, in 1900, a clay puddle dam was constructed across the channel leading from the stream to the sink hole in such a manner as to turn the water down its original channel. Owing to the pervious nature of the rock strata the effective and apparent boundaries of the watershed may differ materially.

The drainage areas tributary to the stream are as follows:

ainage areas of Thunder Bay River and tributaries.

Stream.	Location.	Area.
		Sq. miles.
South Branch	Above mouth	454
North Branch	do	199
Thunder Bay River	Above mouth of North Branch	580
Do.	Above mouth of South Branch	789
Do.	At Alpena	1,267
Hubbard Lake	(Water surface)	134
Do.	(Drainage area)	148

A gaging station has been established in connection with the dam and mill of the Fletcher Paper Company. The record kept includes the depth flowing over the main dam and logway and the discharge through the turbines. There are four pairs of Trump Model wheels set on horizontal shafts. The water wheels are not run otherwise than at full gate. The dam, which is of timber crib work filled with stone, is on a limestone rock foundation and is 20 feet high and 454 feet long between abutments. A log slide divides the spillway into two sections. The slide has a channel 6 feet in width and is closed by plank flashboards to an elevation of 1 foot above the crest line. The spillway has a vertical face and a crest 4 feet in width, sloping upstream, with a batter of 1 vertical to 5 horizontal. The upstream face of the dam has a batter of about 3 horizontal to 1 vertical. The left section of the spillway is 255¼ feet long. The flat crest is covered with sheet iron, slightly rounded at the lip. The right spillway section is 181.7 feet in length, and the crest is faced with planking.

ST. JOSEPH RIVER, MICHIGAN.

St. Joseph River rises at Bunday Hills, in northern Hillsdale County, Michigan. flows southwesterly into Indiana, turns northward at South Bend, recrosses the State line near Bertrand, and debouches into Lake Michigan at St. Joseph. The total area drained is, approximately, 4,586 square miles, of which 2,916 square miles are in Michigan and 1,670 square miles in Indiana. The drainage basin contains more than 400 small lakes, varying in surface area from an eighth of a square mile to 6 square miles. Of these, approximately 100 are in

Indiana and 300 in Michigan. No storage is developed on the stream. The drainage areas of the river and its more important tributaries are given in the following table:

Drainage areas of St. Joseph River and its tributaries.

Stream.	Location.	Area.
		Sq. miles.
St. Joseph River	Above Three Rivers	863
Prairie River	Above mouth	164
Portage River	do	178
Rack River	do	213
St. Joseph River	Below Three Rivers	1,417
Do	Above Niles	3,616
Dowagiac River	Above mouth	281
St. Joseph River	Below mouth of Dowagiac River	3,898
Do	Above mouth of Pawpaw River	4,157
Pawpaw River	Above mouth	429
St. Joseph River	Below mouth of Pawpaw River	4,586

The drainage basin lies in a completely glaciated region, and is overlain with diversified drift deposits. The current of the river from South Bend to its mouth was formerly reversed, and this valley formed an outlet for the waters of Lake Michigan, which turned to the southwest, through Kankakee River, at South Bend, and thus reached the Mississippi through Illinois River. Leverett states[1] that there is still a well-defined river channel connecting St. Joseph River with the Kankakee, the surface of which, where it leaves the St. Joseph, is but 45 or 50 feet above the present low-water surface of that stream. The watershed of St. Joseph River in Michigan contains relatively little marsh land not artificially drained and relatively little uncleared land. About a third of the lakes are, however, without outlets. The proportion of undrained lakes in Indiana is smaller, and the swamp lands are much more extensive.

Elkhart River, one of the principal Indiana tributaries of the St. Joseph, drains an area of about 500 square miles which contains large lakes and extended swamp areas, with the principal fall occurring in the passage of the stream from marsh to marsh.

St. Joseph River was formerly navigable for boats as far as Elkhart, or perhaps above, and the older dams were provided with locks, long since abandoned and closed. Prof. James Du Shane is of the opinion that at the present time the low-water depth of the river over the rapids is from 1½ to 2 feet. A rise of 5 feet represents ordinary high water, and a rise of 8 feet represents extreme high water. Within the last twenty-two years two freshets have occurred which raised the water in some portions of the river higher than here given. The average width from bank to bank is 400 feet, and the average slope from Elkhart to Berrien Springs is 2.1 feet to the mile.

The first water-power mill in southwestern Michigan was constructed by Eli Ford, in 1827, on Dowagiac Creek, near its confluence with St.

[1] Water resources of Indiana and Ohio, by Frank Leverett: Eighteenth Ann. Rept. U. S. Geol. Survey, Pt. IV, p. 439.

Joseph River, at Niles. This mill, known as the Volante mill, has been in operation since 1828. Power development on St. Joseph River began at a somewhat later date. The dam at Niles was built about 1856. At South Bend the power was developed by the South Bend Manufacturing Company, and was sold in the form of rights to the flow through wheels of a certain number of square inches vent under the available head. The dam is 10 feet high, with lateral power canals on each side. Under an order of the court the water is to be maintained at a stage not lower than 6 inches below the crest of the dam. Nineteen privileges have been granted, calling for a flow of 3,195.5 cubic feet per second under a head of 9.5 feet. Fourteen of these privileges are now in use. The minimum flow of the stream is usually considered to be 1,000 second-feet, but it is stated to have gone considerably lower during the months of July and August, 1895. At Elkhart there is a similar power development, the flow of the stream being divided among eleven mills. The power at Elkhart was originally divided by priority, the amount being specified as so many runs of stone, or "sufficient for the purpose of the mill."

The following table gives the principal facts regarding water power in the St. Joseph River Basin, so far as reported:

Developed water powers in St. Joseph River Basin.

Stream.	Location.	Dam number.	Number of mills at dam.	Effective head or fall.			Rated power of water wheels reported.
				Greatest.	Least.	Average.	
				Feet.	*Feet.*	*Feet.*	*Horse-power.*
St. Joseph River	Buchanan	1	...	...	...	11.0	...
Do	Niles	2	2	...	...	12.0	4,018
Do	South Bend	3	14	12.0	4.0	9.5	2,588
Do	Mishawaka	4	3	11.0	7.0	10.0	1,760
Do	Elkhart	5	3	13.0	6.0	10.0	1,920
Do	Constantine	6	...	...	...	...	...
Do	Three Rivers	7	3	10.0	6.0	8.5	600
Do	Below Mendon	8	...	...	...	...	...
Do	Burlington	9	...	...	...	...	...
Do	Tekonsha	10	1	8.0	6.0	7.0	89
Pawpaw River	Watervliet	1	1	14.0	6.0	10.0	600
Do	Hartford	2	...	...	...	...	...
Do	Lawrence	3	...	...	...	...	...
South Branch of Pawpaw River.	Pawpaw	1	1	14.0	12.5	13.5	132
Do	do	2	1	17.0	...	17.0	108
Spring Brook	Almena	1	...	...	...	...	...
Dowagiac Creek	Niles	1	2	...	...	12.0	356
Do	Above Niles	2	1	...	...	14.5	715
Pokagon Creek	Summerville	1	...	...	...	...	...
South Branch of Dowagiac Creek.	Dowagiac	1	1	10.0	8.0	9.0	95
Do	Lagrange	2	...	...	...	...	...
Christiana Creek	Elkhart	1	...	...	...	...	...
Elkhart River	do	1	...	8.5	4.0	7.0	60
Do	Goshen	2	2	17.0	10.0	14.5	700
Do	Benton	3	...	...	...	...	...
Portage River	Three Rivers	1	1	10.5	8.5	9.5	297
Rocky River	do	1	1	15.0	11.0	14.0	459
Swan Creek	Colon	1	1	10.0	5.0	8.0	107
Coldwater River	Union City	1	1	9.0	...	9.0	52
Do	Above Union City.	2	1	...	...	...	...
Do	Hodunk	3	1	...	...	...	...
Nottawa Creek	Athens	3	1	9.0	6.5	8.0	35

There are a number of undeveloped powers between the present dams, and projects are now formed to utilize them. The power is to be used largely for the generation of electricity for transmission to neighboring towns. A part of it will supplement the power at existing dams. At Berrien Springs, Michigan, a concrete dam 30 feet in height is proposed. This will make available a fall of 20 feet. Eighteen water wheels of a rated capacity of 7,500 horsepower are to be installed. This power is in sec. 18, T. 17 W., R. 6 S., Michigan meridian. At Bertrand, Michigan, a fall of 12 feet could be obtained by the construction of a suitable dam.

Two available sites for dams exist between Mishawaka and Elkhart, Indiana. The former is in sec. 11, T. 38 N., R. 2 E., second principal meridian, where a 12-foot fall is available. The width of the river is about 350 feet. The latter site, called the Twin Branch site, is in sec. 12, T. 37 N., R. 3 E., second principal meridian. A dam 422 feet long is proposed at this point, which would make available a fall of 21 feet.

At Bristol, Indiana, a dam formerly existed, but it was washed out. A site exists in sec. 31, T. 38 N., R. 5 E., second principal meridian, where a fall of 16 feet could be obtained by the construction of a dam 600 feet in length.

At Mottville, Michigan, in sec. 6, T 8 S., R. 5 W., Michigan meridian, a fall of 9½ feet could be obtained by the construction of a dam 540 feet in length.

An undeveloped water power also exists near Three Rivers, Michigan, in sec. 1, T. 6 S., R. 11 W., where about 9 feet fall could be obtained.

The available power of tributaries of St. Joseph River is of little value, as is indicated by the existence of numerous abandoned sites where dams have been carried away by freshets. At Ligonier, Indiana, a dam formerly existed on Elkhart River, but it was washed out. There are three undeveloped powers on Pawpaw River, in Antwerp Township, Van Buren County, Michigan, with falls of 9 feet, 14 feet, and 9 feet, respectively.

Arrangements have been made with the Berrien Springs Power Company for the maintenance of a record of flow of St. Joseph River at their plant when completed. The record will include discharge over the 500-foot concrete dam, and the run of water wheels, which will be 18 in number, arranged in sets of three pairs each. In the meantime a temporary gaging station has been established at the dam of the Berrien Springs Power Company at Buchanan, Michigan, 10 miles above Berrien Springs. The dam is of timber, of the Beardsley gravity type, with a straight crest approximately 400 feet long. It is 9.83 feet high, and is built on an earth foundation.

In January, 1891, the following gaging of St. Joseph River was made by John F. Meighan at Leepers Bridge, 1 mile below the dam at South Bend:

Discharge measurement of St. Joseph River at Leepers Bridge in January, 1891.

Elevation of water surface above city datum	(feet)	7.57
Area of cross section	(square feet)	1,232
Wetted perimeter	(lineal feet)	262.91
Hydraulic mean radius		4.686
Slope	(feet per foot)	0.000378
Coefficient of roughness in Kutter's formula		0.030
Coefficient *c* in Kutter's formula		65
Mean velocity	(feet per second)	2.735
Discharge	(second-feet)	3,369

The stated depth of extreme high water on the crest of the Niles dam is 5 feet, indicating a freshet discharge of about 15,000 second-feet, or 4.5 second-feet per square mile. The extreme high-water flow over the Dowagiac River dam at Niles is stated to be 2 feet depth on the crest of the 120-foot spillway, corresponding to a flow of about 1,200 second-feet, or 4.3 second-feet per square mile, from a drainage area of 281 square miles.

KALAMAZOO RIVER, MICHIGAN.

The details of the hydrography of this stream have been given in an earlier report.[1] The drainage areas of the river and its tributaries are as follows:

Drainage areas of Kalamazoo River and its tributaries.

Stream.	Location.	Area.
		Sq. miles.
North Branch of Kalamazoo River	Albion	138
South Branch of Kalamazoo River	do	136
Kalamazoo River	Below junction of North and South branches	274
Do	Marshall	443
Do	Above Battle Creek	603
Battle Creek	At mouth	244
Kalamazoo River	Below Battle Creek	847
Do	At Plainwell	1,307
Do	At Allegan	1,508
Do	At mouth	2,064

The accompanying table gives a summary of the developed water powers of the drainage basin. Most of the powers on the main stream are utilized. In 1898–99 a dam giving 23 feet head was built between Allegan and Otsego, to develop 2,000 horsepower for electrical transmission. This plant has the merit of being the first large long-distance transmission plant in the State.[2] A portion of the fall between this dam and Allegan is still undeveloped, and it is claimed that a head of 20 feet could be obtained by the construction of a dam 2 miles above that city. Above Otsego, on the main river, there are one or two rapids having falls of several feet which are not yet developed.

[1] Report on the run-off and water power of Kalamazoo River, by Robert E. Horton: Water-Supply and Irrigation Paper U. S. Geol. Survey No. 30, pp. 22-38.

[2] Proc. Mich. Eng. Soc. 1900, pp. 84-91; also Engineering Record, Jan. 13, 1900.

Developed water powers in Kalamazoo River Basin.

Stream.	Location.	Number of dam.	Number of mills at dam.	Effective head or fall. Greatest.	Least.	Average.	Rated power of water wheels reported.
				Feet.	*Feet.*	*Feet.*	*Horse-power.*
Kalamazoo River	Allegan	1	12				1,150
Do	Above Allegan	2	1			23.0	2,000
Do	Otsego	3	5			12.0	1,725
Do	Plainwell	4	5			9.0	786
Do	Battle Creek	5	7	12	10	12.0	469
Do	do	6	1				
Do	Ceresco	7	1			8.0	289
Do	Marshall	8	1			6.0	(*a*)
Do	do	9	1	14	12	13.0	200
Do	Marengo	10	1				118
North Branch	Albion	11	1				
Do	Newburg Mills	12	1				
Do	Bath Mills	13	1				33
Do	Concord	14	1			9.0	118
Do	Horton	15	1			10.0	55
South Branch	Albion	1	2				
Do	North Homer	2	1				69
Do	Homer	3	1				214
Do	Mosherville	4	1				80
Rice Creek	Marshall	1	1			12.0	136
Battle Creek	Battle Creek	1	1			6.0	86
Do	Bellevue	2	1				
Do	Olivet	3	1				
Augusta Creek	Augusta	1	1	18	17	18.0	260
Gull Lake outlet	Galesburg	1	1	13	12	13.0	81
Do	Howlandsburg	2	1	12	10	11.0	70
Do	Yorkville	3	1			20.0	80
Comstock Creek	Comstock	1	1	12		11.5	22
Portage Creek	Kalamazoo						
Wilder Creek	Eckford						
Wabasacon Creek	Bedford						
Comstock Creek	Above Comstock	2	1			23.0	35

a Undershot water wheel.

It is stated that a dam could be built 1 mile above the mouth of Swan Creek, which enters Kalamazoo River 8 miles below Allegan, and a head of 40 feet be obtained.

During a portion of 1900 a daily record of the river stage was kept at Kalamazoo, the results of which are given on the following page. Earlier records will be found in Water-Supply Paper No. 30, page 36. Arrangements have been made for the maintenance of a gaging record at the electric-power dam at Trowbridge, 6 miles above Allegan. The plant includes four pairs of 45-inch Leffel-Sampson turbines on horizontal shafts. The gate opening and discharge of two pairs are controlled by Lombard governors. The excess of flow not taken by the turbines is discharged over a spillway having three Taintor flood gates, each 20 feet long. The spillways have flat crests 20 feet in width, with slopes of 1 to 1 on the upstream and downstream faces. The discharge on the downstream side is received on a floating apron 20 feet in width, which is anchored to the flood-gate cribs by chains.

Daily gage height, in feet, of Kalamazoo River at foot of Sheldon street, Kalamazoo, Michigan, for 1900.

Day.	Sept.	Day.	Sept.	Day.	Sept.	Day.	Sept.	Day.	Sept.
6	68.45	11	68.20	16		21		26	
7	68.32	12	68.15	17		22		27	
8	68.25	13	68.00	18	68.05	23		28	
9		14	67.90	19	67.90	24		29	67.90
10	68.15	15	68.02	20	67.90	25		30	

NOTE.—On August 9 the gage height was 68.50 feet.

Daily gage height, in feet, of Kalamazoo River at Gull street, Kalamazoo, Michigan, for 1901.

Day.	Mar.	Day.	Mar.	Day.	Mar.	Day.	Mar.	Day.	Mar.
16	69.86	20	71.10	23	71.87	26	71.40	29	71.27
17		21	71.72	24	71.66	27		30	
18	70.10	22	{ 72.12 71.97	25	71.52	28	71.48	31	
19	70.75								

NOTE.—Gage height on April 1 was 70.04 feet, and on April 12, 68.02 feet.

Daily gage height, in feet, of Kalamazoo River at extension of Paterson street, Kalamazoo, Michigan, for 1900.

Day.	Sept.	Day.	Sept.	Day.	Sept.	Day.	Sept.	Day.	Sept.
1	68.71	6	68.10	11	67.90	16		21	68.20
2	68.54	7	68.23	12		17		22	67.98
3	68.47	8	68.10	13		18		23	67.94
4	68.41	9	68.10	14		19		24	68.09
5		10	67.99	15		20			

STREAMS OF NORTHERN PENINSULA OF MICHIGAN.

The streams of the northern peninsula of Michigan are contrasted with those of the southern portion of the State by their steep slopes, rocky channels, and occasional waterfalls. They possess numerous water powers, which are almost wholly undeveloped, and many of which are in close proximity to the mining centers of the iron and copper region. Arrangements are being made for the establishment of a gaging station on one of the larger streams.

On Ontonagon River at Glenns Falls a head of 100 feet could be obtained, which would yield an estimated minimum of 4,500 horsepower. This is in sec. 31, T. 50 N., R. 31 W., about three-fourths of a mile south of the Victoria mine. Ontonagon River is the largest Lake Superior tributary in Michigan. It extends entirely across the northern peninsula, and finds its headwaters in a region of numerous small lakes near the Wisconsin-Michigan line. Its fall is mostly concentrated in the short stretch between the summit of the Michigan Range at Rockland and its entrance to Lake Superior at Ontonagon.

Owing to the lack of a map on suitable scale, the drainage area can not at present be estimated.

Dead River, tributary to Lake Superior at Marquette, possesses a fall of 850 feet in a distance of 10 miles.

Much of the southern slope of the upper peninsula drains into Menominee River, a tributary of Green Bay. A report on that river was published in the Tenth Census of the United States.[1] Other streams possessing good falls and opportunities for lake storage in the region of their headwaters are the Escanaba, Manistique, Michigamme, and Tahquemenon rivers.

MISSISSIPPI RIVER AT ST. PAUL, MINNESOTA.

Records of gage heights are maintained by the United States Weather Bureau at St. Paul, and are furnished to the Geological Survey. The station is described in Water-Supply Paper No. 36, page 194.

Daily gage height, in feet, of Mississippi River at St. Paul, Minnesota, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	......	......	......	3.4	3.7	3.2	0.8	1.1	5.4	5.8	4.5	2.0
2	......	......	......	3.0	3.7	3.0	.7	1.2	5.3	5.8	4.5	2.0
3	......	......	......	3.2	3.8	2.9	1.0	1.2	5.0	5.9	4.5	2.0
4	*a*4.4	......	......	3.7	3.8	2.7	2.0	1.2	4.8	5.9	4.5	2.2
5	......	......	......	3.8	3.8	2.6	2.6	1.0	4.7	6.3	4.6	2.3
6	......	*a*6.3	*a*3.2	4.6	3.7	2.5	2.9	1.0	4.5	6.5	4.6	2.3
7	......	......	......	5.6	3.5	2.5	2.9	1.0	4.2	6.6	4.6	2.2
8	......	......	......	5.6	3.4	2.4	3.0	1.1	4.0	6.3	4.5	1.9
9	......	......	......	5.2	3.3	2.4	2.9	1.2	3.9	6.2	4.4	1.9
10	......	......	......	5.0	3.5	2.4	2.9	1.5	4.2	6.0	4.3	1.8
11	......	......	......	4.8	3.2	1.8	2.8	2.2	4.4	5.9	4.2	2.4
12	......	......	......	4.5	3.0	1.8	2.8	2.8	5.3	5.8	4.1	3.6
13	*a*3.9	*a*5.1	......	4.3	2.9	1.9	3.0	2.9	5.8	5.7	4.0	3.5
14	......	......	*a*3.7	4.2	2.8	1.9	3.0	3.5	5.7	5.7	3.8	2.8
15	......	......	......	4.1	2.8	1.5	2.8	3.7	5.5	5.4	3.5	1.8
16	......	......	......	4.0	2.8	1.5	2.8	4.0	5.3	5.3	2.7	2.6
17	......	......	......	4.4	2.8	1.4	2.6	4.2	5.2	5.3	2.1	2.4
18	......	......	......	4.6	2.9	1.3	2.5	4.3	5.1	5.3	2.0	2.7
19	......	......	......	4.8	2.9	1.3	2.3	4.2	5.0	5.2	2.0	3.3
20	......	3.5	......	4.6	2.6	1.2	2.2	4.0	5.2	5.1	2.1	3.0
21	*a*3.8	......	......	4.4	2.5	1.2	2.2	3.8	5.5	5.0	2.1	2.7
22	......	......	*a*3.7	4.2	2.7	1.2	2.2	3.7	5.7	4.8	2.1	2.4
23	......	......	......	4.0	2.8	1.2	2.2	3.7	5.9	4.8	2.0	2.3
24	......	......	......	4.0	2.8	1.2	2.1	3.9	5.9	4.6	1.9	2.2
25	......	......	......	4.0	2.8	1.0	1.8	4.1	6.0	4.5	1.6	(*b*)
26	......	......	......	3.9	2.7	1.0	1.5	4.5	6.0	4.5	1.3	(*b*)
27	......	......	......	3.8	2.8	1.0	1.1	4.7	6.0	4.3	1.8	(*b*)
28	......	*a*3.2	......	3.8	2.8	.9	1.1	5.0	6.0	4.5	2.1	(*b*)
29	......	......	......	3.8	3.2	.9	1.3	5.4	5.9	4.6	2.0	(*b*)
30	*a*3.6	......	......	3.7	3.3	.8	1.0	5.5	5.8	4.5	2.0	(*b*)
31	......	......	*a*3.7	......	3.3	......	1.0	5.4	......	4.3	......	*a*2.1

a Approximate; river frozen. *b* River frozen.

WEST GALLATIN RIVER NEAR SALESVILLE, MONTANA.

This station, which was established in July, 1895, is located at the highway bridge crossing the stream about 5 miles south of Salesville. It is described in Water-Supply Paper No. 36, page 195. Results of measurements for 1899 will be found in the Twenty-first Annual

[1] Vol. XVII, Water Power, Pt. II, pp. 71-81.

Report, Part IV, page 184. During 1900 the following discharge measurements were made under the direction of Samuel Fortier:

Discharge measurements of West Gallatin River near Salesville, Montana.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
May 23	4.86	1,944	July 12	3.61	871
June 7	5.90	3,727	Do	3.60	842
Do	5.90	3,796	August 15	3.10	512
June 18	4.72	2,028	August 25	3.15	526
June 24	4.51	2,039			

Daily gage height, in feet, of West Gallatin River near Salesville, Montana, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.40			3.30	4.00	6.15	4.10	3.20	3.00	3.20	3.10	2.80
2				3.40	4.10	5.80	4.10	3.20	3.00	3.20	3.10	2.80
3				3.40	4.25	6.40	3.90	3.20	3.00	3.10	3.10	2.85
4				3.40	4.50	6.60	3.70	3.23	3.20	3.20	3.10	2.90
5		3.30		3.50	4.70	6.65	3.70	3.23	3.20	3.20	3.10	3.00
6				3.60	5.15	6.90	3.70	3.10	3.20	3.20	3.10	3.00
7			3.10	3.80	4.95	6.55	3.70	3.10	3.20	3.20	3.10	3.00
8	3.30			3.60	5.05	6.25	3.70	3.10	3.15	3.10	3.10	2.90
9				3.50	5.15	6.30	3.70	3.10	3.00	3.10	3.10	2.90
10				3.50	5.55	6.15	3.60	3.10	3.00	3.10	3.10	2.90
11				3.50	6.05	6.45	3.60	3.10	3.00	3.10	3.00	2.90
12		3.00	3.10	3.50	6.05	5.50	3.60	3.10	2.90	3.10	2.90	2.90
13				3.50	5.55	5.55	3.50	3.10	3.00	3.10	3.00	2.90
14				3.50	5.30	5.55	3.50	3.10	3.00	3.10	3.00	2.90
15	3.20			3.50	5.25	5.75	3.50	3.10	3.10	3.10	3.00	2.90
16				3.60	5.15	5.50	3.40	3.10	3.00	3.10	3.00	2.85
17				3.50	5.15	5.30	3.40	3.13	3.00	3.10	3.00	2.80
18				3.60	5.20	5.15	3.40		3.10	3.10	2.90	2.80
19				3.70	5.00	5.20	3.40	3.10	3.10	3.10	2.80	2.80
20			3.10	3.85	5.10	5.25	3.40	3.10	3.10	3.10	2.70	2.80
21		3.20		4.00	5.15	5.30	3.30	3.10	3.10	2.90	2.70	2.80
22	3.20			4.15	5.40	5.20	3.40	3.10	3.00	3.00	2.80	2.80
23				4.35	5.45	5.20	3.30	3.10	3.20	3.10	2.80	2.80
24				4.05	5.65	5.20	3.30	3.13	3.10	3.10	2.80	2.85
25				3.90	5.75	4.70	3.30	3.13	3.10	3.10	2.80	2.85
26				4.00	6.25	4.70	3.30	3.20	3.10	3.10	2.80	2.80
27				4.00	6.75	4.40	3.35	3.15	3.10	3.00	2.80	2.80
28		3.10		4.10	6.90	4.20	3.30	3.15	3.20	2.90	2.80	2.80
29	3.20		3.30	4.10	6.45	4.20	3.20	3.15	3.10	2.90	2.80	2.80
30				4.00	6.45	4.10	3.28	3.10	3.13	3.00	2.80	2.80
31					6.05		3.30	3.00		3.00		2.78

MIDDLE CREEK NEAR BOZEMAN, MONTANA.

This station, which was established August 3, 1895, is located in Middle Creek Canyon, 9 miles from Bozeman. It is described in Water-Supply Paper No. 36, page 196. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 183. During 1900 the following measurements of discharge were made under the direction of Samuel Fortier:

May 22: Gage height, 0.57 foot; discharge, 211 second-feet.
June 5: Gage height, 0.90 foot; discharge, 366 second-feet.
June 18: Gage height, 0.60 foot; discharge, 248 second-feet.
June 24: Gage height, 0.60 foot; discharge, 241 second-feet.
July 7: Gage height, 0.26 foot; discharge, 104 second-feet.
August 15: Gage height, 0.02 foot; discharge, 51 second-feet.

Daily gage height, in feet, of Middle Creek near Bozeman, Montana, for 1900.

Day.	June.	July.	Aug.	Sept.	Oct.	Day.	June.	July.	Aug.	Sept.	Oct.
1	......	0.30	0.10	0.00	0.00	17	......	0.20	0.02	0.00	......
2	......	.30	.10	.00	.00	18	0.60	.20	.02	.00	......
3	......	.20	.10	.00	.00	19	.50	.20	.02	.01	......
4	......	.20	.10	.00	.00	20	.60	.20	.02	.01	......
5	......	.30	.20	.00	.00	21	.80	.10	.02	.01	......
6	......	.20	.10	.00	.00	22	.60	.10	.01	.00	......
7	......	.20	.10	.00	.00	23	.90	.10	.01	.00	......
8	......	.30	.10	.00	.00	24	.60	.10	.01	.00	......
9	......	.30	.10	.00	.00	25	.60	.20	.01	.00	......
10	......	.30	.05	.00	.00	26	.50	.10	.01	.00	......
11	......	.30	.05	.00	.00	27	.50	.10	.01	.00	......
12	......	.20	.04	.00	.00	28	.50	.20	.01	.00	......
13	......	.20	.03	.00	.00	29	.40	.10	.01	.00	......
14	......	.20	.03	.00	......	30	.30	.10	.00	.00	......
15	......	.30	.02	.00	......	31	......	.10	.00	......	......
16	......	.20	.02	.00	......						

NOTE.—This station was discontinued in 1899, but was reopened on June 18, 1900. It was closed for the winter on October 13.

GALLATIN RIVER AT LOGAN, MONTANA.

This station, which was established August 24, 1893, by F. H. Newell, is located on the bridge of the Northern Pacific Railroad crossing the river at Logan. It is described in Water-Supply Paper No. 36, pages 197 and 198, where will also be found the results of measurements for 1899. During 1900 the following measurements of discharge were made under the direction of Samuel Fortier:

Discharge measurements of Gallatin River at Logan, Montana.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-feet.*	1900.	*Feet.*	*Sec.-feet.*
May 29	3.91	4,630	August 13	0.62	349
June 15	2.32	1,966	September 4	.77	445
June 23	1.51	1,066	October 15	1.00	600
June 28	1.22	744	October 16	1.00	596
July 16	.40	239			

Daily gage height, in feet, of Gallatin River at Logan, Montana, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				1.40	2.00	3.50	1.00	0.50	0.70	0.90	1.00	1.10
2				1.40	2.00	3.50	.90	.50	.70	.90	1.00	1.10
3	1.20			1.40	2.05	3.70	.90	.50	.80	.90	1.00	1.10
4				1.40	2.30	3.70	.80	.50	.80	1.00	1.00	1.10
5				1.40	2.30	3.75	.80	.50	.80	1.05	1.00	1.10
6				1.40	2.50	3.90	.80	.50	.80	1.10	1.00	1.10
7		1.50	1.80	1.40	2.80	3.85	.80	.50	.80	1.10	1.00	1.10
8				1.40	2.70	3.60	.80	.60	.80	1.10	1.00	1.10
9				1.40	2.80	3.40	.70	.60	.80	1.00	1.00	1.10
10	1.30			1.40	3.05	3.25	.60	.60	.80	1.00	1.00	1.00
11				1.40	3.35	2.75	.60	.60	.80	1.00	1.00	1.00
12				1.40	3.60	2.50	.50	.60	.80	1.00	1.00	1.00
13				1.40	3.70	2.50	.40	.60	.80	1.00	1.00	1.00
14		(*a*)	1.40	1.40	3.25	2.35	.40	.60	.80	1.00	1.00	1.00
15				1.50	3.15	2.15	.40	.60	.80	1.00	1.00	1.00
16				1.50	3.00	2.00	.40	.60	.80	1.00	1.00	1.00
17	1.30			1.50	3.00	2.00	.40	.60	.80	1.00	1.00	1.00
18				1.60	3.00	1.90	.40	.60	.80	1.00	1.15	1.00
19				1.60	3.00	1.70	.40	.60	.90	1.00	1.35	1.00
20				1.60	3.00	1.70	.40	.60	.90	1.00	1.50	1.00
21		(*a*)	1.50	1.60	3.00	1.55	.40	.60	.90	1.00	1.55	1.00
22				1.60	3.00	1.50	.40	.60	.90	1.00	1.50	1.00
23				1.80	3.00	1.50	.40	.60	.90	1.00	1.40	1.00
24	1.50			1.90	3.05	1.50	.40	.60	.90	1.00	1.30	1.00
25				2.00	3.30	1.40	.40	.60	.90	1.00	1.20	1.10
26				2.05	3.40	1.40	.40	.70	.90	1.00	1.10	1.10
27				2.00	3.75	1.30	.50	.70	.90	1.00	1.10	1.00
28		1.50	1.50	2.00	4.00	1.20	.50	.70	.90	1.00	1.10	1.00
29				2.00	4.00	1.10	.50	.70	.90	1.00	1.10	1.00
30				2.00	3.60	1.00	.50	.70	.90	1.00	1.10	(*a*)
31	1.50				3.70		.50	.70		1.00		(*a*)

a Frozen.

MADISON RIVER NEAR REDBLUFF, MONTANA.

This station, which was established May 2, 1897, is located 4 miles below the Redbluff iron county bridge over the river and 1½ miles below the mouth of Cherry Creek. It is described in Water-Supply Paper No. 37, page 205. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 186. During 1900 the following measurements of discharge were made under the direction of Samuel Fortier. Cherry Creek flows into Madison River between the gage and the point where the river is measured, and its discharge should, therefore, be added to that of the river in order to obtain the total discharge at the gage.

Discharge measurements of Madison River near Redbluff, Montana.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-feet.*	1900.	*Feet.*	*Sec.-feet.*
June 8	2.57	4,412	June 25		*a* 49
Do		*a* 146	June 26	1.79	2,486
June 9	2.53	4,237	July 13	1.40	1,597
June 19	1.92	2,715	Do		*a* 7
Do	1.92	2,848	August 16	1.30	1,434
Do		*a* 66	Do		*a* 9
June 25	1.85	2,610			

a Cherry Creek.

Daily gage height, in feet, of Madison River near Redbluff, Montana, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	------	------	(*a*)	1.00	2.00	2.70	1.60	1.40	1.40	1.50	1.50	1.40
2	------	(*a*)	------	1.00	2.25	2.50	1.60	1.40	1.40	1.50	1.50	1.40
3	------	------	------	1.00	2.40	2.80	1.55	1.40	1.40	1.50	1.50	1.40
4	(*a*)	------	------	1.30	2.40	2.80	1.50	1.40	1.40	1.50	1.40	1.40
5	------	------	------	1.30	2.45	2.88	1.50	1.40	1.40	1.50	1.40	1.40
6	------	------	------	1.30	2.30	2.90	1.50	1.40	1.40	1.50	1.40	1.40
7	------	------	------	1.40	2.35	2.90	1.50	1.40	1.40	1.50	1.40	1.40
8	------	(*a*)	1.00	1.30	2.40	2.80	1.50	1.40	1.40	1.50	1.40	1.40
9	------	------	------	1.30	2.45	2.80	1.50	1.45	1.40	1.50	1.40	1.40
10	------	------	------	1.30	2.50	2.80	1.50	1.50	1.40	1.50	1.40	1.40
11	(*a*)	------	------	1.30	2.62	2.70	1.50	1.50	1.50	1.50	1.40	1.40
12	------	------	------	1.30	2.70	2.65	1.50	1.50	1.50	1.50	1.40	1.40
13	------	------	------	1.30	2.80	2.40	1.50	1.45	1.40	1.50	1.40	1.40
14	------	------	------	1.30	2.70	2.30	1.50	1.40	1.40	1.50	1.40	1.40
15	------	(*a*)	1.00	1.35	2.55	2.20	1.50	1.40	1.40	1.50	1.40	1.40
16	------	------	------	1.40	2.45	2.10	1.50	1.40	1.40	1.50	1.40	1.40
17	------	------	------	1.45	2.30	2.50	1.50	1.40	1.40	1.50	1.40	1.40
18	(*a*)	------	------	1.50	2.25	1.85	1.50	1.40	1.40	1.50	1.40	1.40
19	------	------	------	1.50	2.10	1.80	1.50	1.40	1.40	1.50	1.40	1.40
20	------	------	------	1.50	2.20	1.70	1.50	1.40	1.40	1.50	1.40	1.40
21	------	------	------	1.50	2.23	1.70	1.50	1.40	1.40	1.50	1.40	1.40
22	------	(*a*)	1.00	1.60	2.20	1.70	1.50	1.40	1.40	1.50	1.40	1.40
23	------	------	------	1.70	2.25	1.65	1.50	1.40	1.40	1.50	1.40	1.40
24	------	------	------	1.80	2.37	1.60	1.50	1.40	1.40	1.50	1.40	1.40
25	(*a*)	------	------	1.80	2.45	1.60	1.50	1.40	1.40	1.50	1.40	1.40
26	------	------	------	1.80	2.60	1.60	1.50	1.40	1.50	1.50	1.40	1.40
27	------	------	------	1.80	2.80	1.60	1.50	1.40	1.50	1.50	1.40	1.40
28	------	------	------	1.80	2.90	1.60	1.50	1.40	1.50	1.50	1.40	1.40
29	------	------	1.00	1.80	3.00	1.60	1.50	1.40	1.50	1.50	1.40	1.40
30	------	------	------	1.82	3.00	1.60	1.40	1.40	1.50	1.50	1.40	------
31	------	------	------	------	2.95	------	1.40	1.40	------	1.50	------	------

a Frozen.

JEFFERSON RIVER AT SAPPINGTON, MONTANA.

This station, which was established by Arthur P. Davis in 1894, is located on the bridge of the Northern Pacific Railroad crossing the river at Sappington. It is described in Water-Supply Paper No. 37, pages 206 and 207, where will also be found the results of measurements for 1899. During 1900 the following measurements of discharge were made under the direction of Samuel Fortier:

Discharge measurements of Jefferson River at Sappington, Montana.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
May 31	5.01	5,918	July 16	1.92	844
June 16	3.83	3,593	August 1	1.57	589
June 23	3.46	3,240	October 6	2.45	1,586
June 28	3.00	2,279			

Daily gage height, in feet, of Jefferson River at Sappington, Montana, for 1900.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	(*a*)	2.80	3.90	5.00	2.70	1.60	1.50	2.10	2.50	2.50
2	(*a*)	2.90	3.90	4.90	2.60	1.60	1.50	2.20	2.50	2.50
3	(*a*)	3.15	4.00	4.80	2.50	1.60	1.50	2.25	2.50	2.50
4	(*a*)	3.30	4.05	4.90	2.50	1.50	1.50	2.33	2.50	2.50
5	(*a*)	3.40	4.20	5.00	2.40	1.50	1.60	2.40	2.50	2.60
6	(*a*)	3.50	4.35	4.00	2.40	1.50	1.60	2.43	2.40	2.60
7	(*a*)	3.60	4.55	4.90	2.40	1.50	1.60	2.40	2.40	2.60
8	(*a*)	3.60	4.65	4.90	2.40	1.50	1.60	2.40	2.40	2.60
9	(*a*)	3.60	4.85	4.70	2.30	1.50	1.60	2.40	2.40	2.60
10	3.00	3.45	5.05	4.60	2.30	1.50	1.70	2.40	2.40	2.60
11	2.80	3.30	5.25	4.50	2.20	1.50	1.70	2.40	2.40	2.60
12	2.80	3.20	5.50	4.20	2.20	1.50	1.70	2.40	2.40	2.50
13	2.80	3.20	6.10	4.00	2.20	1.50	1.70	2.30	2.40	2.50
14	2.70	3.20	6.40	4.00	2.10	1.50	1.70	2.30	2.40	2.50
15	2.70	3.20	6.55	3.90	2.00	1.50	1.70	2.30	2.40	2.50
16	2.70	3.30	6.60	3.80	1.90	1.50	1.70	2.30	2.40	2.50
17	2.60	3.30	6.45	3.90	1.80	1.50	1.70	2.30	2.40	2.40
18	2.70	3.30	6.25	4.00	1.80	1.50	1.80	2.30	2.40	2.40
19	2.80	3.30	6.10	4.10	1.70	1.50	1.85	2.20	2.40	2.40
20	2.80	3.40	5.95	4.20	1.70	1.50	1.90	2.20	2.40	2.40
21	2.90	3.40	5.80	3.90	1.70	1.50	1.90	2.20	2.40	2.40
22	2.90	3.50	5.75	3.65	1.70	1.50	1.90	2.20	2.40	2.40
23	3.00	3.60	5.55	3.30	1.70	1.50	1.90	2.30	2.40	2.40
24	3.10	3.65	5.50	3.20	1.70	1.50	1.90	2.30	2.40	2.40
25	3.10	3.75	5.40	3.10	1.70	1.50	1.90	2.30	2.40	2.40
26	3.10	3.80	5.35	3.00	1.60	1.50	2.00	2.40	2.40	2.40
27	3.05	3.90	5.30	2.90	1.60	1.45	2.00	2.40	2.40	2.40
28	2.95	3.90	5.30	2.85	1.60	1.45	2.00	2.40	2.40	2.30
29	2.80	3.90	5.40	2.80	1.60	1.45	2.00	2.40	2.50	2.30
30	2.70	3.90	5.30	2.80	1.60	1.50	2.00	2.40	2.50	2.30
31	2.70		5.15		1.60	1.50		2.50		2.30

a The river was frozen from January 1 to March 9, inclusive.

MISSOURI RIVER AT TOWNSEND, MONTANA.

Observations of gage heights are maintained at this place by the Missouri River Commission, and the results are furnished to the Geological Survey by the Corps of Engineers, United States Army. The heights given are the means of two daily readings expressed in feet above the St. Louis directrix, which is 412.73 feet above the mean Gulf level. The figures 3,300 have been omitted from the record, so that it is necessary to add that amount to the daily observations to obtain the elevation of the water surface above the St. Louis datum. A description of this station will be found in Water-Supply Paper No. 37, page 208. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 187. During 1900 the following discharge measurements were made under the direction of Samuel Fortier:

Discharge measurements of Missouri River at Townsend, Montana.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
May 28	92.10	15,982	July 17	88.53	2,296
June 15	90.65	8,871	August 14	88.30	1,955
June 22	90.16	7,797	October 12	88.92	3,419
June 29	89.50	4,524			

Daily gage height, in feet, of Missouri River at Townsend, Montana, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	90.8	88.8	92.0	89.2	90.4	91.8	89.2	88.2	*a*88.2	88.7	88.9	90.5
2	93.0	88.8	90.0	89.4	90.5	91.7	89.1	88.2	88.3	88.7	88.9	90.5
3	93.0	88.8	90.0	89.6	90.5	91.7	89.0	88.2	88.3	88.8	88.9	90.3
4	92.9	88.8	93.7	89.6	90.6	91.8	88.9	88.2	88.3	88.8	88.9	90.0
5	92.5	88.8	93.7	89.7	90.6	91.8	88.9	88.2	88.3	88.8	88.9	90.7
6	92.5	88.8	93.7	89.8	90.7	91.8	88.8	88.2	88.4	88.9	88.9	90.0
7	91.5	88.8	93.7	89.8	90.9	91.7	88.8	88.2	88.4	88.9	88.9	89.5
8	91.4	88.8	93.4	89.8	91.2	91.7	88.8	88.2	88.4	88.9	88.9	89.2
9	89.5	88.8	90.4	89.8	91.4	91.7	88.8	88.2	88.4	88.9	88.9	89.0
10	89.5	88.8	90.5	89.8	91.6	91.5	88.7	88.3	88.4	88.9	88.9	88.9
11	89.4	88.8	90.7	89.7	91.8	91.2	88.7	88.3	88.4	88.9	88.9	88.8
12	89.3	88.8	90.5	89.2	92.2	90.9	88.6	88.2	88.4	88.9	88.9	88.7
13	89.1	89.0	90.3	89.5	92.3	90.7	88.4	88.2	88.4	88.9	88.9	88.6
14	89.1	92.3	89.9	89.5	92.4	90.6	88.3	88.2	88.4	88.9	88.9	88.6
15	89.1	92.2	89.5	89.6	92.4	90.5	88.3	88.2	88.4	88.9	88.9	88.6
16	89.1	92.1	89.3	89.7	92.2	90.5	88.3	88.2	88.4	88.9	88.9	88.7
17	89.1	92.1	89.3	89.8	92.2	90.5	88.3	88.2	88.4	88.9	89.0	88.7
18	89.1	92.2	89.3	89.8	92.1	90.5	88.3	88.2	88.4	88.8	89.1	88.6
19	89.1	92.2	89.2	89.8	92.1	90.4	88.3	88.2	88.4	88.8	89.1	88.7
20	89.1	92.3	89.2	89.8	91.9	90.3	88.3	88.2	88.4	88.8	89.1	88.8
21	89.1	92.2	89.3	89.8	91.9	90.2	88.3	88.2	88.4	88.8	89.2	88.9
22	89.1	92.1	89.3	89.9	91.8	90.0	88.3	88.2	88.4	88.8	89.3	88.8
23	89.1	92.1	89.4	90.1	91.7	89.9	88.3	88.2	88.4	88.8	89.6	88.7
24	89.1	92.1	89.4	90.2	91.7	89.8	88.3	88.2	88.4	88.8	89.9	88.7
25	89.1	92.1	89.5	90.3	91.7	89.7	88.3	88.2	88.5	88.8	90.1	88.7
26	89.1	92.1	89.5	90.3	91.7	89.6	88.3	*a*88.2	88.5	88.8	90.2	88.6
27	89.1	92.1	89.5	90.3	91.8	89.4	88.3	*a*88.2	88.6	88.8	90.7	88.5
28	89.0	92.1	89.6	90.3	92.1	89.4	88.3	*a*88.2	88.6	88.9	90.7	88.4
29	89.0	......	89.5	90.3	92.3	89.3	88.3	*a*88.2	88.6	88.9	90.7	88.2
30	88.8	......	89.3	90.3	92.2	89.3	88.3	*a*88.2	88.6	88.9	90.5	87.9
31	88.8	......	89.2	......	92.1	......	88.3	*a*88.2	......	88.9	......	87.9

a Approximate; no readings received.

CROW CREEK, MONTANA.

Crow Creek, a tributary of Missouri River, is in Jefferson County, Montana. Its headwaters are at an elevation of between 7,000 and 8,000 feet above sea level. It flows in a southeasterly direction for about 25 miles, and empties into Missouri River 33 miles below Toston, at an elevation of about 4,000 feet.

At the foot of the mountains the valley is approximately 12 miles square. About half of it is owned by the residents, and approximately a third of the land owned is being irrigated, though perhaps scantily at times. This leaves without water about 70,000 acres, the greater part of it the choice land of the valley and, according to the farmers who have made efforts in that direction, well adapted to the raising of hay, grain, and fruit crops. The only apparent source of water supply for this vast tract of uncultivated land is small storage reservoirs on Crow Creek, at points along the canyon where the valley widens sufficiently to permit their construction. From the best information obtainable from those familiar with the canyon, the largest of these valleys is from a fourth to a half mile wide and about 2 miles long. On October 13, 1900, the flow of Crow Creek at the mouth of the canyon, 5 miles above Radersburg, Montana, was, by actual measurement, 16 second-feet. On the same date the discharge at the bridge 1 mile below the canyon was also 16 second-feet. The high-water flow lasts from four to six weeks, with an occasional summer flood, and is confined in a channel having an average width of from 25 to 30 feet, with vertical banks of from 4 to 5 feet on either side, and a fall of 58.7 feet to the mile.

MILK RIVER AT HAVRE, MONTANA.

This station, which was established by C. C. Babb on May 15, 1898, is described in Water-Supply Paper No. 37, page 209. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 189. During 1900 the following measurements of discharge were made by C. W. Ling:

Discharge measurements of Milk River at Havre, Montana.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
April 21	2.90	242	August 4	1.40	12
April 26	3.30	327	August 11	1.40	13
April 27	3.00	302	August 13	2.60	182
Do	3.07	314	August 14	2.40	145
May 3	3.20	390	August 20	1.60	27
May 7	2.70	309	August 31	1.60	27
May 11	2.40	207	September 4	1.50	23
May 15	2.60	260	September 5	1.70	48
May 16	4.00	863	September 8	2.00	80
May 17	5.20	1,651	September 10	2.50	142
May 18	4.50	1,112	September 17	1.90	50
May 24	3.40	444	September 22	2.20	97
May 31	3.00	312	October 2	2.00	84
June 9	2.60	185	October 6	3.10	314
June 12	2.40	142	October 8	2.90	236
June 21	2.20	117	October 12	2.60	157
June 27	2.10	108	October 16	2.90	265
July 3	1.90	76	October 22	2.40	129
July 10	2.00	92	October 27	2.30	114
July 18	1.70	30	November 2	2.30	96
July 25	1.50	14	November 10	2.00	63
August 3	1.40	17			

Daily gage height, in feet, of Milk River at Havre, Montana, for 1900.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.10	3.10	2.00	1.50	1.60	2.00	2.30	(*a*)
2		3.30	3.00	2.00	1.40	1.50	2.00	2.30	(*a*)
3		3.20	2.90	1.90	1.40	1.50	2.10	2.30	(*a*)
4		3.00	2.70	1.90	1.40	1.50	2.20	2.20	(*a*)
5		2.90	2.70	1.90	1.40	1.70	2.40	2.20	(*a*)
6		2.80	2.70	1.90	1.40	1.70	3.10	2.20	(*a*)
7		2.70	2.70	1.80	1.40	1.80	3.10	2.20	(*a*)
8		2.60	2.60	1.80	1.30	2.00	2.90	2.20	(*a*)
9		2.60	2.60	1.90	1.30	2.10	2.80	2.20	(*a*)
10	3.40	2.50	2.40	2.00	1.30	2.50	2.70	2.00	(*a*)
11	3.40	2.40	2.40	2.10	1.40	2.40	2.60	1.90	(*a*)
12	3.70	2.30	2.40	1.80	2.75	2.40	2.60	2.20	(*a*)
13	3.60	2.40	2.30	1.80	2.65	2.40	2.50	2.40	(*a*)
14	3.60	2.40	2.30	1.70	2.40	2.00	2.50	2.20	(*a*)
15	3.40	2.60	2.30	1.70	2.20	2.00	2.80	2.50	(*a*)
16	3.30	4.00	2.30	1.70	2.00	1.90	2.90	(*a*)	(*a*)
17	3.00	5.10	2.30	1.70	1.90	1.90	3.00	(*a*)	1.40
18	3.20	4.60	2.40	1.70	1.70	1.90	2.90	(*a*)	1.40
19	2.90	4.10	2.20	1.60	1.60	1.90	2.80	(*a*)	1.40
20	2.90	3.70	2.20	1.60	1.60	1.90	2.70	(*a*)	1.40
21	2.90	3.60	2.20	1.60	1.50	2.00	2.70	(*a*)	1.40
22	2.90	3.90	2.20	1.60	1.50	2.20	2.40	(*a*)	1.60
23	2.90	3.60	2.20	1.50	1.40	2.20	2.40	(*a*)	(*a*)
24	3.10	3.40	2.10	1.50	1.40	2.10	2.30	(*a*)	(*a*)
25	3.30	3.30	2.10	1.50	1.40	2.00	2.30	(*a*)	(*a*)
26	3.30	3.20	2.20	1.50	1.40	2.00	2.30	(*a*)	(*a*)
27	2.90	3.10	2.10	1.50	1.40	2.00	2.30	(*a*)	(*a*)
28	3.10	2.90	2.10	1.60	1.40	1.90	2.30	(*a*)	(*a*)
29	2.90	3.00	2.10	1.50	1.40	1.90	2.30	(*a*)	(*a*)
30	3.00	2.90	2.00	1.50	1.40	2.00	2.20	(*a*)	(*a*)
31		3.00		1.50	1.60		2.20		(*a*)

a Frozen.

YELLOWSTONE RIVER NEAR LIVINGSTON, MONTANA.

This station, which was established May 2, 1897, is located at the highway bridge over the Yellowstone 5 miles south of Livingston. It is described in Water-Supply Paper No. 37, pages 210 and 211, where will also be found the results of measurements for 1899. During 1900 the following measurements were made under the direction of Samuel Fortier:

Discharge measurements of Yellowstone River near Livingston, Montana.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
May 25	3.08	7,917	July 14	1.76	4,623
Do	3.15	8,482	August 7	.75	3,160
June 14	4.30	13,552	September 29	— .45	1,710
June 21	4.08	11,835	October 17	— .60	1,599
June 27	3.40	9,094			

Daily gage height, in feet, of Yellowstone River near Livingston, Montana, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	------	(*a*)	------	−1.00	0.30	3.80	2.80	0.95	−0.05	−0.45	−0.70	−0.95
2	------	(*a*)	------	− .90	.60	4.00	2.68	.90	− .05	− .43	− .70	− .88
3	------	(*a*)	------	− .80	.75	4.20	2.55	.88	− .10	− .40	− .70	− .90
4	------	(*a*)	------	− .70	1.40	4.30	2.50	.80	− .10	− .43	− .70	− .90
5	------	(*a*)	------	− .70	1.75	4.35	2.40	.75	− .10	− .45	− .70	− .90
6	−0.85	(*a*)	(*a*)	− .70	2.30	4.70	2.30	.75	− .10	− .45	− .70	− .90
7	------	(*a*)	(*a*)	− .50	2.20	4.75	2.23	.70	− .15	− .45	− .73	− .90
8	------	(*a*)	(*a*)	− .20	2.15	4.38	2.13	.70	− .15	− .48	− .75	− .90
9	------	(*a*)	(*a*)	− .30	2.67	4.60	2.10	.65	− .20	− .50	− .75	− .90
10	------	(*a*)	(*a*)	− .60	3.35	3.95	2.03	.60	− .20	− .53	− .80	− .90
11	------	(*a*)	(*a*)	− .60	3.73	3.85	1.95	.55	− .25	− .55	− .88	− .90
12	------	(*a*)	(*a*)	− .60	4.00	3.75	1.88	.50	− .25	− .60	− .90	− .90
13	−0.80	(*a*)	(*a*)	− .60	3.40	3.70	1.80	.50	− .25	− .60	− .83	−1.10
14	------	(*a*)	−0.90	− .55	2.78	4.05	1.73	.45	− .25	− .60	− .80	−1.00
15	------	(*a*)	------	− .55	2.30	4.25	1.70	.45	− .30	− .65	− .85	−1.00
16	------	(*a*)	------	− .60	2.28	4.20	1.63	.40	− .33	− .60	− .75	−1.00
17	------	(*a*)	------	− .60	2.48	4.13	1.55	.35	− .35	− .60	− .83	−1.00
18	------	(*a*)	------	− .60	2.40	3.90	1.53	.30	− .35	− .60	− .95	−1.00
19	------	(*a*)	------	− .50	2.17	3.80	1.50	.30	− .30	− .60	(*a*)	−1.00
20	−0.90	(*a*)	------	− .20	2.25	3.90	1.45	.25	− .30	− .65	(*a*)	−1.00
21	------	−0.90	−1.00	.00	2.38	3.90	1.40	.25	− .35	− .60	(*a*)	−1.00
22	------	------	------	.20	2.55	3.95	1.38	.25	− .35	− .65	(*a*)	−1.00
23	------	------	------	.65	2.73	3.88	1.30	.20	− .40	− .60	(*a*)	------
24	------	------	------	.40	2.90	3.73	1.25	.20	− .40	− .60	−1.10	−1.20
25	------	------	------	.40	3.03	3.68	1.20	.20	− .40	− .65	−1.08	−1.10
26	------	------	------	.30	3.65	3.60	1.20	.20	− .43	− .65	− .90	−1.15
27	------	−0.90	------	.20	4.20	3.43	1.20	.15	− .45	− .65	− .85	−1.15
28	------	------	------	.30	4.65	3.23	1.15	.15	− 45	− .65	− .90	−1.35
29	------	------	------	.40	4.38	3.10	1.10	.10	− .45	− .65	−1.00	−1.35
30	------	------	------	.35	3.98	3.03	1.05	.05	− .45	− .70	−1.00	------
31	------	------	−1.00	------	3.80	------	1.00	.00	------	− .70	------	(*a*)

a Frozen.

MISCELLANEOUS DISCHARGE MEASUREMENTS IN MONTANA.

During the year the following miscellaneous measurements of streams in Montana were made by Messrs. F. E. and G. H. Matthes:

Miscellaneous discharge measurements of streams in Montana.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				*Sec.-ft.*
June 18	St. Mary River	Main	F. E. Matthes.	2,294
August 6	do	do	G. H. Matthes.	750
October 14	do	do	do	552
June 16	do	Outlet of Lower Lake	F. E. Matthes.	750
June 19	North Fork of Milk River.	Bridge at Hall's ranch	do.	12
June 21	Middle Fork of Milk River	Ford of road to Main	do	7
June 14	South Fork of Milk River.	Paul's ranch	do	31
June 8	Cutbank River	Ford of road to St. Mary	do	488
		Lake.		231
June 9	North Fork of Cutbank	Base of mountains	do	
	River.			390
June 7	Two Medicine River	Outlet of Lower Lake	do	
May 23	do	Holy Family Mission	do	1,067
May 29	do	Ford 12 miles below Piegan.	do	1,261
May 28	Badger Creek	Two miles above Piegan	do	562
May 24	do	Ford at Piegan	do	273
May 26	Birch Creek	Four miles above Robare	do	387
Do	do	One-half mile above Robare.	do	392

BIGHORN RIVER NEAR THERMOPOLIS, WYOMING.

This station, which was established by A. J. Parshall on May 28, 1900, is located about a half mile west of Thermopolis, at the ferry crossing the river. The gage, which consists of a horizontal rod extending out over the water, is fastened to a post set firmly in the bank. On the horizontal stick is attached the wire gage by means of which the heights of the river are recorded. The bench mark is the head of a nail in a stick driven in the ground 1 foot south of the post to which the gage rod is fastened and 2.58 feet below the top of the gage frame. The bench mark is 9.08 feet above gage datum. Discharge measurements have been made from a ferryboat, but during the coming season they will be made from the bridge which has recently been erected. • The channel is straight for a distance above and below the station. Both banks are high and not subject to overflow. The bed of the stream is of gravel, and shifts during only extreme high water. Results of measurements for 1899 will be found in Water-Supply Paper No. 37, page 211. During 1900 the following discharge measurements were made by A. J. Parshall:

May 28: Gage height, 4.01 feet; discharge, 8,500 second-feet.
May 29: Gage height, 5.00 feet; discharge, 10,527 second-feet.
May 30: Gage height, 5.40 feet; discharge, 12,187 second-feet.
September 13: Gage height, 0.60 foot; discharge, 945 second-feet.
September 18: Gage height, 0.45 foot; discharge, 674 second-feet.

Daily gage height, in feet, of Bighorn River near Thermopolis, Wyoming, for 1900.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	4.00	3.40	1.55	1.20	12	5.20	2.65	1.50	0.70	23	4.10	1.60	1.40	
2	4.30	3.30	1.50	1.20	13	4.65	2.55	1.50	.60	24	4.45	1.60	1.30	
3	4.45	3.30	1.50	1.10	14	4.30	2.45	1.50	.55	25	4.50	1.60	1.30	
4	5.00	3.20	1.50	1.00	15	4.10	2.25	1.50	.50	26	5.00	1.60	1.30	
5	4.85	3.20	1.80	1.00	16	4.00	2.20	1.50		27	5.25	1.60	1.30	
6	4.80	3.10	1.50	.90	17	3.80	2.20	1.50		28	5.00	1.50	1.30	
7	5.70	3.20	1.50	.90	18	3.60	2.10	1.80		29	4.25	1.50	1.20	
8	6.60	3.15	1.50	.90	19	3.50	2.05	1.40		30	3.50	1.50	1.20	
9	5.90	3.00	1.50	.90	20	3.50	1.95	1.40		31		1.60	1.20	
10	5.85	2.80	1.50	.90	21	3.50	1.70	1.30						
11	5.45	2.80	1.50	.70	22	3.90	1.60	1.30						

CLEAR CREEK NEAR BUFFALO, WYOMING.

This station was established by the State engineer of Wyoming. A measuring flume was erected in order that accurate measurements of discharge might be obtained. Owing to the stability of the station it has not been necessary to make discharge measurements at this place, the computations being made from the rating table established several years ago. The station is described in Water-Supply Paper No. 37, page 212. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 191. Owing to the diversions of water which have taken place within the basin, of late years this station has not been considered as important as formerly, and it was discontinued on March 11, 1900, no measurements of discharge being made during that year.

Daily gage height, in feet, of Clear Creek near Buffalo, Wyoming, for 1900.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.
1	0.40	0.30	0.30	12	0.35	0.30	....	23	0.30	0.30	....
2	.40	.30	.30	13	.35	.30	....	24	.30	.30	....
3	.40	.30	.30	14	.35	.30	....	25	.30	.30	....
4	.37	.30	.30	15	.35	.30	....	26	.30	.30	....
5	.37	.30	....	16	.32	.30	....	27	.30	.30	....
6	.37	.30	....	17	.32	.30	....	28	.30	.30	....
7	.35	.30	.35	18	.32	.30	....	29	.30	....	....
8	.35	.30	....	19	.30	.30	....	30	.30	....	....
9	.35	.30	....	20	.30	.30	....	31	.30	....	....
10	.35	.30	.35	21	.30	.30	....				
11	.35	.30	....	22	.30	.30	....				

BIG SIOUX RIVER NEAR WATERTOWN, SOUTH DAKOTA.

Big Sioux River rises in Grant County, South Dakota, about 30 miles north of Watertown. Its principal headwaters drain lands constituting part of the Sisseton and Wahpeton Indian Reservation. Its general course is southeast, and it empties into Missouri River near Sioux City, Iowa. The river is of interest on account of its water powers, a number of which have been developed, principally at Flandreau, Dell Rapids, and Sioux Falls, South Dakota, and at Akron, Iowa. The gaging station was established by O. V. P. Stout, the gage being put in September 15, 1900, by George W. Carpenter, county surveyor for Codington County. It is located on the farm of L. E. Spicer, about 4 miles above Watertown. The gage consists of an inclined rod securely fastened on the right bank of the stream. The observer is L. E. Spicer. During 1900 the following discharge measurements were made by O. V. P. Stout and G. H. Matthes:

July 17: Discharge, 5 second-feet.
July 18: Discharge, 10 second-feet.
November 12: Gage height, 1.15 feet; discharge, 7 second-feet.

The measurement of July 18 was not made at the gaging station, but in the town.

Lake Poinsett, which lies almost wholly in Hamlin County, South Dakota, has its outlet in Big Sioux River near Dempster, a short distance above Estelline. Immediately below the outlet of the lake a dam has been constructed on the Big Sioux to maintain the level of the lake within certain limits. A measurement of the inlet to the lake was made July 19, 1900, by O. V. P. Stout, and a discharge of 16.5 second-feet was found.

Big Sioux River at the bridge west of Estelline was also measured by Mr. Stout on July 19, 1900, and a discharge of 16.9 second-feet was found.

Daily gage height, in feet, of Big Sioux River near Watertown, South Dakota, for 1900

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1					12		1.25			23	1.30	1.25	1.20	1.20
2		1.30	1.25	1.20	13			1.15		24				
3					14		1.25		1.20	25	1.30		1.20	1.20
4			1.25	1.20	15					26		1.25		
5		1.25			16	1.40	1.25	1.15	1.20	27			1.20	
6			1.20		17					28	1.30	1.25		1.15
7		1.25		1.20	18	1.30		1.20	1.20	29				
8					19		1.25			30	1.30	1.25	1.20	1.15
9		1.25	1.15	1.20	20			1.20		31				
10					21	1.30	1.25		1.20					
11			1.15	1.20	22									

BIG SIOUX RIVER NEAR SIOUX FALLS, SOUTH DAKOTA.

This gaging station, which was established by O. V. P. Stout on July 21, 1900, is 2 miles west of Sioux Falls. The gage consists of an inclined rod securely fastened to bevel blocks supported on well-bedded cross-ties. The observer is George Beggs. During 1900 the following discharge measurement was made by O. V. P. Stout:

July 21: Gage height, 2.02 feet; discharge, 78 second-feet.

Daily gage height, in feet, of Big Sioux River near Sioux Falls, South Dakota, for 1900.

Day.	Aug.	Sept.	Oct.	Nov.	Day.	Aug.	Sept.	Oct.	Nov.	Day.	Aug.	Sept.	Oct.	Nov.
1		1.20	1.60	1.80	12	1.40	1.40	1.70	1.80	22	1.30	1.40	1.20	
2		1.20	1.80	1.80	13	1.50	1.40	1.70	1.80	23	1.30	1.60	1.10	
3		1.20	1.80	1.80	14	1.50	1.30	1.70	1.80	24	1.50	1.60	1.10	
4		1.20	1.80	1.80	15	1.40	1.50	1.70	1.70	25	1.40	1.60	1.10	
5		1.10	1.80	1.80	16	1.40	1.40	1.70	1.70	26	1.40	1.60	1.90	
6		1.30	1.80	1.80	17	1.30	1.40	1.70	1.70	27	1.30	1.50	1.80	
7		1.20	1.70	1.80	18	1.40	1.50	1.70		28	1.30	1.50	1.80	
8		1.20	1.70	1.70	19	1.40	1.50	1.70		29	1.30	1.70	1.80	
9		1.20	1.70	1.70	20	1.30	1.50	1.70		30	1.30	1.60	1.90	
10	1.40	1.30	1.70	1.80	21	1.30	1.40	1.90		31	1.30		1.90	
11	1.40	1.40	1.70	1.80										

MISCELLANEOUS DISCHARGE MEASUREMENTS OF CHEYENNE RIVER AND ITS TRIBUTARIES.

During the year a number of measurements of Cheyenne River and its tributaries were made by J. T. Stewart, as described in the table on the next page.

Miscellaneous discharge measurements of Cheyenne River and its tributaries.

Date.	Stream.	Locality.	Hydrographer.	Discharge.
1900.				Sec.-feet.
May 14	Cheyenne River	Edgemont, S. Dak	John T. Stewart	14.6
May 17	do	do	do	10.3
May 29	do	do	do	.5
May 18	do	Above mouth of Cascade Creek	do	12.2
June 12	do	do	do	.7
May 19	do	Above mouth of Fall River	do	39.2
June 4	do	Mouth of Fall River	do	18.7
May 21	do	Below mouth of Beaver Creek, 7 miles southeast of Buffalo Gap, S. Dak.	do	47.4
June 5	do	Below mouth of Beaver Creek	do	49.0
May 15	Salt Creek	East of Newcastle, Wyo	do	.2
May 31	do	do	do	.2
May 15	Big Oil Creek	B. and M. Railway bridge	do	.2
May 29	do	do	do	.03
May 17	Little Oil Creek	Newcastle, Wyo	do	.05
May 29	do	do	do	.02
May 18	Cascade Creek	At mouth	do	24.6
June 2	do	do	do	19.9
Do	Hat Creek	do	do	.0
May 19	Fall River	Below Hot Springs, S. Dak	do	24.7
June 4	do	Hot Springs, S. Dak	do	28.6
May 19	do	At mouth	do	33.3
June 4	do	do	do	24.8
May 26	Iron Creek	Glendale, S. Dak	do	3.8
June 7	do	do	do	1.6
May 15	Stockade Beaver Creek.	Two miles above L. A. K. ranch, Wyo.	do	11.1
May 31	do	do	do	11.8
May 16	do	At mouth	do	9.4
May 30	do	do	do	3.5
May 15	Beaver Creek	Above mouth of Stockade Beaver Creek.	do	.0
May 30	do	do	do	.0
May 21	do	Three miles northwest of Buffalo Gap, S. Dak.	do	12.2
June 5	do	do	do	14.6
May 21	do	At mouth, 7 miles southeast of Buffalo Gap.	do	1.2
June 5	do	At mouth	do	6.0
May 21	Lame Johnny Creek	Seven miles northeast of Buffalo Gap.	do	.0
Do	do	East of Buffalo Gap	do	.0
May 28	French Creek	Custer, S. Dak	do	.0
May 22	do	Ten miles above Fairburn, S. Dak	do	12.8
June 6	do	Ten miles northeast of Fairburn, S. Dak.	do	4.9
May 22	do	Fairburn, S. Dak	do	3.3
June 7	do	do	do	.2
May 22	Squaw Creek	Otis, S. Dak	do	7.9
June 6	do	do	do	2.8
May 26	Battle Creek	Keystone, S. Dak	do	3.1
June 7	do	do	do	2.3
May 25	do	Hermosa, S. Dak	do	9.1
June 8	do	do	do	2.3
May 24	Spring Creek	North of Rockerville, S. Dak	do	6.5
June 9	do	do	do	.7
May 23	do	F. E. and M. V. Railway bridge, S. Dak.	do	.4
June 9	do	do	do	.1
May 24	Rapid Creek	Five and one-half miles above Rapid City, S. Dak.	do	48.8
June 8	do	do	do	26.3
May 25	do	Rapid City, S. Dak	do	64.2
June 8	do	do	do	29.9

NORTH PLATTE RIVER.

This river has its source in the mountains of North Park, in northern Colorado. Upon entering Wyoming the stream passes through a short, narrow canyon, and then flows northerly through the upper Platte Valley, which extends from the State line down to Fort Steele. On August 27, 1900, A. J. Parshall made measurements of the river at two points in its upper reaches. The first measurement was made a short distance above the mouth of Grand Encampment Creek and immediately above the mouth of Brush Creek, and a discharge of 176 second-feet was found. The second measurement was made near Saratoga, Wyoming, immediately above the mouth of Spring Creek, and a discharge of 211 second-feet was found.

GRAND ENCAMPMENT CREEK AT PERYAM'S RANCH, WYOMING.

This station, which was established by A. J. Parshall May 16, 1900, is located at the bridge over the river at the ranch of the observer, W. T. Peryam. The rod is vertical, and is fastened to the timbers of the bridge. The channel is straight for a distance above and below the station. The right bank is high and is not subject to overflow, but the left bank is low and overflows at high stages. The bed of the stream is rocky. During 1900 the following measurements were made by A. J. Parshall:

May 16: Gage height, 2.00 feet; discharge, 2,050 second-feet.
June 8: Gage height, 2.00 feet; discharge, 2,184 second-feet.
June 21: Gage height, 1.20 feet; discharge, 885 second-feet.
July 5: Gage height, 0.60 foot; discharge, 192 second-feet.
July 18: Gage height, 0.30 foot; discharge, 39 second-feet.

Daily gage height, in feet, of Grand Encampment Creek at Peryam's ranch, Wyoming, for 1900.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1		2.70	0.95	0.50	0.25	17	1.90	1.60	0.40	0.40	0.40
2		2.60	.75	.50	.25	18	2.05	1.50	.40	.40	.30
3		2.40	.75	.45	.20	19	1.90	1.50	.30	.30	.30
4		2.30	.65	.45	.20	20	1.70	1.30	.30	.30	.30
5		2.25	.60	.40	.25	21	1.80	1.20	.30	.30	.30
6		2.30	.60	.40	.25	22	1.90	1.20	.35	.30	.30
7		2.20	.60	.40	.30	23	2.30	1.30	.35	.30	.40
8		2.05	.60	.50	.30	24	2.10	1.20	.40	.30	.40
9		2.20	.60	.50	.30	25	2.40	1.20	.40	.40	.50
10		2.25	.60	.50	.30	26	2.50	1.10	.40	.50	.50
11		2.10	.60	.50	.30	27	2.90	1.00	.40	.50	.60
12		1.90	.60	.45	.30	28	3.00	1.15	.45	.35	.50
13		1.90	.50	.45	.30	29	3.20	1.00	.50	.30	.50
14		1.70	.50	.45	.35	30	3.00	1.00	.50	.30	.50
15		1.60	.45	.40	.40	31	3.00		.50	.27	
16	2.00	1.70	.45	.40	.40						

LARAMIE RIVER AT WOODS, WYOMING.

This station, which was established in December, 1888, by the Territorial engineer of Wyoming, is located 26 miles from Laramie, and is reached by stage. It is described in Water-Supply Paper No. 37, page 214. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 193. The station was discontinued September 30, 1900. During the year one measurement ment of discharge was made by A. J. Parshall, as follows:

May 4: Gage height, 1.60 feet; discharge, 460 second-feet.

Daily gage height, in feet, of Laramie River at Woods, Wyoming, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1				0.70	1.40	4.15	1.40	0.60	0.30
2				.70	1.40	4.05	1.30	.60	.30
3				.70	1.50	3.90	1.30	.60	.30
4				.80	1.55	3.80	1.20	.60	.30
5				.80	1.60	3.70	1.15	.70	.30
6				.65	1.80	3.60	1.10	.70	.30
7	1.10	1.20	1.30	.80	2.00	3.45	1.00	.65	.30
8				.80	2.00	3.45	1.00	.60	.35
9				.70	2.25	3.45	1.00	.60	.50
10				.70	2.55	3.45	1.00	.60	.55
11				.70	2.75	3.40	.95	.50	.45
12				.60	3.00	3.25	.90	.50	.35
13				.60	3.00	2.95	.90	.50	.40
14	1.20	1.20	1.20	.60	2.95	2.75	.80	.50	.40
15				.60	2.65	2.65	.80	.50	.40
16				.50	2.95	2.55	.80	.50	.35
17				.60	3.05	2.45	.80	.40	.30
18				.60	3.15	2.45	.80	.40	.30
19				.75	3.05	2.35	.80	.40	.40
20				.95	3.00	2.25	.80	.40	.40
21	1.20	1.30	1.00	1.30	2.95	2.10	.70	.40	.40
22				1.35	2.85	2.10	.70	.35	.40
23				1.20	3.15	1.95	.70	.30	.45
24				1.10	3.25	1.85	.70	.30	.40
25				1.00	3.45	1.75	.70	.30	.40
26				1.00	3.75	1.65	.60	.30	.40
27				1.15	3.95	1.55	.60	.30	.40
28	1.10	1.20	1.00	1.45	4.05	1.50	.60	.30	.45
29				1.55	4.15	1.40	.60	.30	.50
30				1.45	4.25	1.40	.60	.30	.50
31					4.30		.60	.30	

LARAMIE RIVER NEAR UVA, WYOMING.

This station was established in 1894 by the State engineer of Wyoming. It is described in Water-Supply Paper No. 37, page 216. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 194. The station was discontinued March 31, 1900, and no measurements of discharge were made during the year.

Daily gage height, in feet, of Laramie River near Uva, Wyoming, for 1900.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.
1				12				23			
2			1.6	13	1.4			24		1.5	2.1
3		1.6		14				25			
4				15				26			
5				16				27	1.5		
6	1.6			17		1.6	2.3	28			
7				18				29			
8				19	1.4			30			
9				20				31			1.9
10		1.7	1.8	21							
11				22							

NORTH PLATTE RIVER AT ORIN JUNCTION, WYOMING.

This station was established November 1, 1894, by the State engineer of Wyoming. It is described in Water-Supply Paper No. 37, page 217. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 196. The station was discontinued April 1, 1900, and no measurements of discharge were made during the year.

Daily gage height, in feet, of North Platte River at Orin Junction, Wyoming, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr.
1				2.3	12			1.3		23				
2					13					24		2.2	1.7	
3		1.5	2.2		14					25				
4					15	(*a*)				26				
5					16					27				
6					17		2.2	2.5		28				
7					18					29	(*a*)			
8	(*a*)				19					30				
9					20					31				
10		1.5			21									
11					22	(*a*)								

a Frozen.

NORTH PLATTE RIVER NEAR GUERNSEY, WYOMING.

This station was established June 14, 1900, by A. J. Parshall. It is located at the county bridge about a half mile northwest of Guernsey. The bridge has eight piers, the sides are planked, and there is uniform flow under each span. The location is an excellent one for accurate measurements. The rod consists of a 4-inch by 4-inch by 12-foot scantling firmly attached to one of the piers of the bridge. As the station was to be a temporary one, a metallic tape, divided into feet and tenths, was securely fastened to the rod. The bench mark is a spike driven in a sleeper of the bridge 1 foot from the rod and at an elevation of 10.04 feet above the zero. The channel is straight for a distance above and below the station. Both banks are high and do not overflow at high stages. The bed of the stream is sandy, but probably does not shift much. The station was discontinued September 15, 1900. During 1900 the following measurements were made by A. J. Parshall:

June 14: Gage height, 4.40 feet; discharge, 9,792 second-feet.
June 26: Gage height, 2.40 feet; discharge, 5,018 second-feet.
July 10: Gage height, 0.50 foot; discharge, 1,805 second-feet.
July 13: Gage height, 0.25 foot; discharge, 1,376 second-feet.
August 2: Gage height, —0.20 foot; discharge, 778 second-feet.
August 21: Gage height, —0.70 foot; discharge, 430 second-feet.

Daily gage height, in feet, of North Platte River near Guernsey, Wyoming, for 1900.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1			—0.20	—0.90	17		.40	— .70	
2		1.50	— .20		18	3.40	1.10	— .80	
3		1.30	— .25	— .90	19	3.40	.75		
4		1.20	— .25	— .90	20	3.20	.25	— .90	
5		1.00		— .90	21	3.00	.10	— .80	
6		.90	— .30	— .95	22	2.85		— .70	
7		.80	— .30	— .95	23	2.70	.00	— .70	
8			— .40	— .95	24		.05	— .75	
9		.60	— .40		25	2.50	.10	— .80	
10		.50	— .60	— .95	26	2.40	.00		
11		.40	— .60	— .95	27	2.30	.10	— .80	
12		.30		— .95	28	2.20	.05	— .90	
13		.25	— .70	— .95	29	2.00		— .90	
14	4.40	.20	— .70	— .95	30	1.90	.15	— .90	
15	4.20		— .70	— .95	31		.10	— .90	
16	3.90	.70	— .70						

NORTH PLATTE RIVER AT GERING, NEBRASKA.

This station, which was established May 29, 1897, is located at the highway bridge at Gering. It is described in Water-Supply Paper No. 37, page 218. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 197. During 1900 the following measurements of discharge were made by R. H. Willis:

Discharge measurements of North Platte River at Gering, Nebraska.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
April 18	1.67	5,251	August 1	1.15	1,152
April 27	1.90	7,138	August 10	1.02	848
May 11	2.16	10,980	August 22	.93	529
May 23	2.46	10,909	August 30	.84	395
May 30	2.65	12,371	September 11	.96	385
June 12	2.86	13,706	September 20	.85	356
June 21	2.24	9,231	October 19	.32	486
June 28	1.80	6,321	October 20	.35	399
July 9	1.45	2,874	October 30	.45	522
July 19	1.55	3,947			

Daily gage height, in feet, of North Platte River at Gering, Nebraska, for 1900.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		2.25	2.75	1.70	1.00	0.78	0.48	0.35
2		2.20	2.80	1.70	1.00	.77	.35	.36
3		2.25	2.90	1.71	1.02	.78	.33	.36
4		2.40	2.98	1.70	1.00	.79	.27	.37
5		2.35	2.85	1.60	1.01	.76	.27	.39
6		2.35	2.85	1.53	1.00	.77	.26	.40
7		2.20	2.82	1.53	.97	.73	.27	.41
8		2.15	2.80	1.44	.98	.76	.27	.40
9		2.15	2.78	1.44	.95	.75	.27	.42
10		2.05		1.40	.96	.80	.26	1.05
11		2.15		1.30	.95	.85	.25	1.04
12		2.16	2.71	1.21	.93	.87	.23	1.03
13		2.30	2.71	1.10	.90	.90	.24	1.04
14		2.36	2.86	1.12	.90	.90	.24	*a* 1.05
15		2.53	2.76	1.29	.86	.90	.23	
16		2.62	2.56	1.21	.90	.85	.24	
17		2.65	2.46	1.30	.90	.80	.24	
18	1.67	2.56	2.29	1.30	.90	.80	.23	
19	1.60	2.50	2.23	1.56	.88	.77	.32	
20	1.55	2.45	2.26	1.42	.88	.75	.31	
21	1.55	2.46	2.19	1.25	.88	.75	.31	
22	1.60	2.49	2.01	1.30	.84	.75	.30	
23	1.85	2.40	1.89	1.22	.82	.75	.30	
24	1.90	2.35	1.89	1.30	.80	.75	.31	
25	1.83	2.31	1.91	1.40	.71	.60	.31	
26	1.80	2.29	1.87	1.21	.73	.62	.32	
27	1.90	2.35	1.81	1.21	.76	.60	.33	
28	2.00	2.50	1.80	1.19	.75	.61	.34	
29	2.00	2.53	1.76	1.01	.74	.55	.34	
30	2.40	2.60	1.70	1.05	.75	.53	.36	
31		2.69		1.05	.75		.37	

a Closed for winter November 14.

NORTH PLATTE RIVER AT CAMP CLARKE, NEBRASKA.

This station, which was established June 27, 1896, consists of a timber fastened to cross-ties bedded in the bank of the river. It is described in Water-Supply Paper No. 37, page 219. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 198. During 1900 the following discharge measurements were made by R. H. Willis:

Discharge measurements of North Platte River at Camp Clarke, Nebraska.

Date.	Gage height.	Dis-charge.	Date.	Gage height.	Dis-charge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
April 19	3.28	4,928	July 28	2.61	1,624
April 28	3.71	7,146	August 11	2.20	501
May 14	4.10	11,838	August 24	2.05	421
May 25	2.90	9,131	August 31	1.96	274
May 31	4.08	10,434	September 12	2.08	320
June 13	4.27	11,334	September 21	2.08	246
June 22	3.75	7,695	October 3	2.10	234
June 29	3.35	4,049	October 20	2.18	377
July 11	2.74	2,116	October 31	2.26	610
July 20	3.08	3,654			

Daily gage height, in feet, of North Platte River at Camp Clarke, Nebraska, for 1900.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		4.10	4.29	3.31	2.25	1.98	2.10	2.23
2		3.85	4.31	3.27	2.33	1.92	2.05	2.23
3		3.85	4.45	3.21	2.30	1.95	2.09	2.22
4		4.05	4.49	3.15	2.38	1.96	2.08	2.24
5		4.00	4.52	3.06	2.23	2.02	2.07	2.24
6		3.98	4.52	2.95	2.24	1.97	2.15	2.25
7		3.89	4.48	2.91	2.26	1.98	2.11	2.26
8	2.90	3.92	4.43	2.71	2.20	1.93	2.10	2.28
9	3.03	3.84	4.48	2.70	2.20	2.03	2.10	2.30
10	3.23	3.94	4.42	2.73	2.20	2.08	2.08	*a* 2.31
11	3.20	3.92	4.34	2.71	2.16	2.10	2.09	
12	3.27	3.99	4.38	2.62	2.15	2.09	2.11	
13	3.16	4.02	4.27	2.62	2.15	1.96	2.14	
14	3.28	4.10	4.25	2.62	2.15	1.98	2.16	
15	3.42	4.19	4.28	2.74	2.11	2.05	2.18	
16	3.35	4.27	4.17	2.72	2.11	2.02	2.15	
17	3.20	4.34	4.10	2.62	2.10	2.05	2.15	
18	3.30	4.23	3.90	2.73	2.07	2.07	2.16	
19	3.24	4.12	3.89	2.68	2.05	2.04	2.18	
20	3.22	4.05	3.84	3.05	2.07	2.01	2.19	
21	3.21	4.07	3.81	2.83	2.05	2.03	2.20	
22	3.26	4.09	3.75	2.77	2.03	2.02	2.21	
23	3.57	4.05	3.51	2.78	2.06	2.01	2.20	
24	3.57	3.91	3.52	2.83	2.03	2.15	2.20	
25	3.59	3.90	3.48	2.62	2.01	2.19	2.21	
26	3.48	3.82	3.43	2.70	2.00	2.20	2.21	
27	3.57	3.78	3.39	2.59	1.90	2.15	2.22	
28	3.71	3.91	3.42	2.59	1.90	2.15	2.21	
29	3.89	4.01	3.33	2.50	1.93	2.14	2.23	
30	3.79	4.11	3.31	2.40	1.95	2.10	2.25	
31		4.15		2.32	1.99		2.25	

a Closed for winter.

NORTH PLATTE RIVER AT NORTH PLATTE, NEBRASKA.

This station, which was established in 1894, is 3.5 miles above the junction of South Platte River. It is described in Water-Supply Paper No. 37, page 220. Results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 199. During 1900 one discharge measurement was made by Adna Dobson, as follows:

December 20: Gage height, 2.30 feet; discharge, 1,223 second-feet.

Daily gage height, in feet, of North Platte River at North Platte, Nebraska, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.40	2.00	2.70	2.30	3.20	3.45	2.85	1.85	0.80	1.40	1.80	2.10
2	2.35	2.05	2.85	2.30	3.15	3.50	2.60	1.75	.80	1.40	1.80	2.20
3	2.20	2.20	3.00	2.20	3.35	3.50	2.60	1.60	.80	1.40	1.80	2.20
4	2.35	2.20	3.10	2.25	3.30	3.65	2.60	1.45	.80	1.40	1.80	2.25
5	2.40	2.25	3.10	2.30	3.35	3.80	2.90	1.50	.80	1.30	1.70	2.10
6	2.50	2.35	3.10	2.40	3.50	3.85	2.80	1.80	.80	1.30	1.70	2.30
7	2.60	2.35	2.80	2.50	3.50	3.85	2.80	2.30	.80	1.30	1.75	2.35
8	2.70	2.25	2.80	2.60	3.40	3.90	2.65	1.95	.80	1.30	1.80	2.30
9	2.80	2.20	2.80	2.50	3.25	3.80	2.45	1.95	.80	1.30	1.80	2.30
10	2.80	2.30	2.80	2.50	3.20	3.75	2.20	1.65	.95	1.30	1.70	2.20
11	2.80	2.40	2.75	2.55	3.20	3.70	2.15	1.60	.90	1.30	1.75	2.25
12	2.90	2.40	2.50	2.60	3.20	3.60	2.10	1.60	.90	1.40	1.85	2.30
13	2.90	2.30	2.30	2.65	3.25	3.50	2.20	1.50	.90	1.40	1.80	2.30
14	2.90	2.30	2.15	2,60	3.30	3.50	2.10	1.45	.80	1.40	1.85	2.30
15	2.95	2.60	2.00	2.70	3.30	3.55	2.10	1.30	.80	1.40	1.90	2.20
16	3.00	2.40	2.40	2.90	3.30	3.60	2.15	1.30	.90	1.40	1.85	2.20
17	3.00	2.30	2.80	2.90	3.30	3.60	2.10	1.25	.90	1.50	1.80	2.20
18	3.00	2.35	2.30	2.90	3.45	3.60	2.05	1.15	.95	1.50	1.75	2.20
19	2.85	2.40	2.10	2.80	3.60	3.45	1.90	1.10	.95	1.50	1.60	2.20
20	2.85	2.50	2.00	2.70	3.60	3.30	2.00	.95	.95	1.50	1.70	2.30
21	2.75	2.50	2.40	2.65	3.50	3.30	2.00	1.45	.90	1.50	1.95	2.30
22	2.60	2.65	2.50	2.70	3.50	3.20	2.00	1.50	.90	1.50	1.95	2.40
23	2.65	2.70	2.40	2.80	3.45	3.10	2.10	1.35	.90	1.50	2.00	2.00
24	2.70	2.80	2.50	2.90	3.40	3.10	2.35	1.50	.90	1.60	1.95	2.00
25	2.50	2.80	2.45	3.00	3.40	3.10	2.35	1.45	.90	1.70	2.20	2.40
26	2.55	2.70	2.40	3.10	3.35	3.00	2.50	1.40	.90	1.60	2.25	2.45
27	2.00	2.60	2.40	3.10	3.30	2.90	2.35	1.20	1.00	1.60	2.30	1.85
28	1.70	2.60	2.30	3.05	3.25	2.90	2.00	1.20	1.10	1.60	2.15	1.80
29	1.90	------	2.30	2.90	3.20	2.80	2.00	1.00	1.10	1.65	2.00	1.60
30	2.00	------	2.25	2.95	3.20	2.80	2.00	1.00	1.25	1.70	2.00	------
31	2.00	------	2.30	------	3.40	------	1.90	.90	------	1.75	------	------

SOUTH PLATTE RIVER.

The South Platte rises in the high mountain peaks surrounding the basin known as South Park, near the center of the State of Colorado. These mountains vary in altitude from 14,000 feet, in the Park Range, to 9,000 feet, in South Park. From the point where the stream issues from the mountains at Platte Canyon it flows in a northerly direction through Denver to its junction with the Cache la Poudre near Greeley, thence in a northeasterly direction until it leaves the State a short distance to the northeast of Julesburg, and thence in an easterly direction to its junction with the North Platte near North Platte, Nebraska.

The tributaries may be divided into two classes: (1) Those which, like the headwaters of the South Platte, rise in the mountains, and (2) those which drain the plains east of the mountains. The principal tributaries of the first class, in their order down the river, are Bear Creek, Clear Creek, St. Vrain Creek, Boulder and South Boulder creeks, Big Thompson Creek, and Cache la Poudre River. Among those of the second class there may be named, as especially worthy of consideration, Cherry Creek, Lone Tree Creek, Boxelder Creek, Bijou Creek, Beaver Creek, and Pawnee Creek. There are many others of lesser note. The streams of the first class—those flowing from the mountains—resemble the upper reaches of the South Platte in that they furnish a perennial supply of water, which varies, however, with the season, the discharge being great during the flood stages and low during the latter part of the summer and in the fall and winter. The streams from the plains, on the other hand, are intermittent in their nature, usually furnishing water only during storms or the melting of snows. In general it may be said that the normal perennial discharge of all of the streams of this division is claimed and used for irrigation, but great quantities of water go to waste during the flood stages and in times of storms. As there is a vast amount of land upon the plains adjacent to the South Platte that might be irrigated if there were a sufficient supply of water, the question of storage becomes one of great importance, and the Geological Survey is now studying this problem, examining such reservoir sites as are considered capable of storing considerable quantities of water. It is hoped that reservoirs will be constructed to prevent the loss of this great amount of water, which, if properly stored, would become one of the greatest assets of the arid region.

An interesting feature of the South Platte Basin is the fact that in all of its valleys there is a great return from seepage, which is increasing from year to year, as may be seen in the tables of seepage measurements of this river published by the State engineer of Colorado. The underground water supply of the plains in this basin is also being studied, and the results of the investigations will be of great interest in determining the possibilities of procuring water from artesian sources for stock purposes and possibly for the irrigation of small tracts of land. The surface flow of the intermittent streams of the plains may be made available for irrigation purposes by the construction of suitable reservoirs, a few of which are now being utilized by corporations and private parties. The most notable projects of this character which have been under way in the basin during the year are the Lake Cheesman dam, which is being constructed by the Denver Union Water Company, C. L. Harrison, chief engineer, and the Bijou Irrigation Company's reservoirs in the neighborhood of Orchard. The Lake Cheesman reservoir is especially noteworthy on account of the great height of its dam (215 feet) and the amount of water to be stored. The dam will be of solid masonry. The reservoir sites of the Bijou Irrigation Company are natural basins, along the rims of which embankments will be constructed, thus storing large quantities of water, which will be conducted from the river through canals. Any great extension of the irrigated area of this district must depend upon the construction of additional reservoirs and upon improvements in the use and distribution of water. The present system of distribution throughout this section, as in nearly all of the arid region, is very extravagant, in many cases there being several times the number of ditch lines that the most economical use would demand, while much water goes to waste in marshes and swamps which might be drained, and an increased supply thus be made available.

SOUTH FORK OF SOUTH PLATTE RIVER AT LAKE CHEESMAN, COLORADO.

During the year 1900 the engineers in charge of the construction of the dam at Lake Cheesman kept practically continuous records of the gage heights and discharge of Goose Creek and South Platte River above their junction, and also of the combined discharge below the junction, the latter measurements being made below the dam. The accompanying table of discharge measurements at the latter place was obtained through the courtesy of Mr. C. L. Harrison, at present chief engineer of the Denver Union Water Company. The discharge for February is estimated, but it may be considered approximately correct. Discharges for the other months are from actual measurements, which are usually made three times a day, but sometimes oftener. The results may be considered very nearly correct.

SOUTH PLATTE RIVER NEAR PLATTE CANYON, COLORADO.

This station was located about 2 miles above the Colorado and Southern Railroad station at Platte Canyon. It was maintained by the Denver Union Water Company for some time previous to any cooperation on the part of the Survey, which began April 1, 1899. The gage rod was a 2-inch by 2-inch inclined timber on the right-hand side of the stream, the graduations being marked with brass nails. Measurements of discharge were made from the footbridge constructed by the water company at the rod. Readings were taken until June 2, 1900, inclusive, when extremely high water carried away the gage rod, which has not yet been replaced. Only two measurements were made in 1900. The channel at this point is rocky, but the high water changed it materially, so that it will be best for a new location to be selected. A station at this place is of great importance, and one should be maintained with care. A cable should be stretched across the river, with a traveling car, at such a height as to preclude the danger of its being washed away by floods. The figures given in the table show the actual discharge of the river at Platte Canyon before any water is diverted for irrigation or other purpose, except that taken out by the Denver Union Water Company a short distance above the station, for the supply of the city of Denver.

Readings were taken by James Proctor, of Littleton, Colorado, who is in charge of the pumping station of the Denver Union Water Company at that place. While the station was being maintained gage readings were furnished to the officers of the United States Weather Bureau at Denver, who had them published in the papers.

A description of the station was published in Water-Supply Paper No. 37, page 224. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 201. During 1900 the following measurements were made by A. L. Fellows:

March 5: Gage height, −0.40 foot; discharge, 87 second-feet.
April 18: Gage height, 1.55 feet; discharge, 467 second-feet.

Daily gage height, in feet, of South Platte River near Platte Canyon, Colorado, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	0.3	−0.6	−0.5	0.2	4.7	5.6	17	−0.5	−0.8	0.5	1.4	5.3	......
2	.2	−.6	−.4	.2	4.6	5.6	18	−.5	−.8	.5	1.6	5.4	......
3	.1	−.7	−.3	.2	5.1	(*a*)	19	−.4	−.8	.5	1.9	5.4	......
4	.1	−.7	−.3	.3	(*b*)	......	20	−.4	−.8	.4	2.6	4.5	......
5	.1	−.7	−.3	.4	(*b*)	......	21	−.4	−.7	.3	3.3	4.5	......
6	.1	−.7	−.5	.6	(*b*)	......	22	−.4	−.7	.3	3.7	4.8	......
7	.0	−.7	−.4	.6	(*b*)	......	23	−.3	−.6	.3	3.8	4.8	......
8	.0	−.7	−.2	.8	(*b*)	......	24	−.3	−.7	.4	3.8	4.6	......
9	−.2	−.7	−.1	.8	(*b*)	......	25	−.4	−.7	.4	3.9	4.6	......
10	−.4	−.7	−.2	.9	(*b*)	......	26	−.5	−.7	.4	3.8	4.8	......
11	−.3	−.8	−.1	.7	(*b*)	......	27	−.4	−.7	.4	3.8	4.9	......
12	−.5	−.8	+.2	.8	(*b*)	......	28	−.4	−.7	.3	4.2	5.2	......
13	−.4	−.9	.4	1.0	(*b*)	......	29	−.3	......	.3	5.1	5.3	......
14	−.4	−.9	.6	1.1	(*b*)	......	30	−.4	......	.3	4.8	5.4	......
15	−.4	−.9	.5	1.6	(*b*)	......	31	−.6	......	.2	......	5.5	......
16	−.5	−.9	.6	1.6	5.3	......							

[a] Gage washed away. [b] Gage out.

SOUTH PLATTE RIVER AT DENVER, COLORADO.

This station is located at the Fifteenth street bridge in the city of Denver, a short distance below the mouth of Cherry Creek. It was established July 15, 1895, and has been maintained continuously. For a portion of the last year two rods were in use, one on the left bank and the other on the right bank a short distance below the bridge. Both were inclined rods. The rod on the left bank was washed out by the high water of June, 1900, which also removed the sand bar in front of the rod on the right-hand side, making it available at low-water stages, which it had not been before, and since that time the readings have been taken from the latter rod. The bench mark is a cross on the north corner of the top of the east abutment of the Fifteenth street bridge, and is 15.15 feet above gage datum. The river at this point is confined between slag embankments, but owing to the shifting sandy bottom the channel is very changeable, rendering necessary frequent changes in the rating tables. The observations have been made by the water commissioners of water district No. 2, in which Denver is located, W. J. Southland and his successor, S. M. Matlock. During 1900 eleven gagings were made at this point. The daily gage height, with corresponding discharge, was published in the Denver papers by the United States Weather Bureau. A description of the station was published in Water-Supply Paper No. 37, page 225. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 202. During 1900 the following measurements were made by A. L. Fellows and R. W. Hawley:

Discharge measurements of South Platte River at Denver, Colorado.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1900.	*Feet.*	*Sec.-ft.*	1900.	*Feet.*	*Sec.-ft.*
March 6	5.50	244	July 25	5.45	257
April 12	5.90	377	August 7	5.56	285
April 16	7.24	1,439	August 29	4.90	90
April 20	7.10	1,395	October 20	5.50	226
April 23	8.32	3,516	October 22	5.30	161
June 11	8.50	3,270			

Daily gage height, in feet, of South Platte River at Denver, Colorado, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.30	5.35	5.25	5.05	9.40	8.75	6.65	5.00	4.75	4.90	5.00	5.00
2	5.35	5.45	5.35	5.00	9.40	8.92	6.55	5.10	*a*4.75	4.80	5.10	5.10
3	5.35	5.20	5.25	5.10	9.40	8.90	6.35	5.20	*a*4.75	4.80	5.10	5.20
4	5.30	5.25	5.30	5.05	9.40	9.00	6.35	5.40	4.75	4.90	5.40	5.20
5	5.25	5.25	5.45	5.30	9.35	8.90	6.30	5.45	4.85	4.90	5.30	5.20
6	5.35	5.35	5.45	5.50	9.35	8.80	6.30	5.50	4.70	4.85	5.30	5.30
7	5.35	5.40	5.25	5.60	9.35	8.60	6.30	5.50	4.85	4.70	5.20	5.20
8	5.40	5.30	5.20	5.50	9.40	8.50	6.30	5.55	5.05	4.80	5.30	5.30
9	5.35	5.25	5.20	6.00	9.45	8.50	6.20	5.45	4.90	4.90	5.30	5.30
10	5.45	5.25	5.20	5.95	9.40	8.55	6.20	5.45	4.85	4.90	5.30	5.10
11	5.60	5.20	5.30	6.60	9.50	8.55	6.10	5.50	4.95	4.90	5.30	5.20
12	5.40	5.25	5.20	6.45	9.50	8.50	5.70	5.35	5.60	4.90	5.30	5.20
13	5.30	5.25	5.40	6.20	9.40	8.45	5.55	5.35	5.60	4.90	5.20	5.30
14	5.35	5.30	5.40	6.30	9.00	8.40	5.45	5.10	5.35	4.90	5.20	5.30
15	5.45	5.30	5.40	6.65	8.75	8.15	5.40	5.15	5.00	4.90	5.10	5.30
16	5.40	5.40	5.25	7.35	8.50	8.00	5.40	5.05	5.05	5.20	5.10	5.20
17	5.35	5.35	5.30	7.60	8.40	7.95	5.50	4.90	5.20	5.10	5.10	5.20
18	5.45	5.40	5.35	6.80	8.48	7.70	5.35	4.95	5.15	5.00	5.20	5.20
19	5.35	5.45	5.25	6.75	8.30	7.60	5.10	4.80	5.25	5.00	5.20	5.30
20	5.30	5.50	5.40	7.70	8.40	7.58	5.15	4.95	5.10	5.00	5.20	5.30
21	5.40	5.45	5.30	7.75	8.60	7.35	5.00	4.90	5.10	5.20	5.30	5.40
22	5.30	5.35	5.25	7.95	8.50	7.25	5.00	5.00	5.10	5.20	5.40	5.40
23	5.40	5.25	5.25	8.40	8.50	7.45	5.15	4.95	4.90	5.20	5.40	5.30
24	5.35	5.25	5.20	8.40	8.35	7.55	5.15	5.05	4.85	5.10	5.50	5.30
25	5.45	5.30	5.30	8.40	8.40	7.55	5.85	5.20	5.00	5.00	5.50	5.20
26	5.35	5.35	5.25	8.40	8.30	7.50	5.60	5.10	5.20	5.10	5.50	5.20
27	5.25	5.40	5.35	8.05	8.45	7.45	5.55	5.00	5.20	5.10	5.40	5.30
28	5.35	5.30	5.40	8.10	8.50	7.25	5.60	4.95	5.20	4.90	5.40	5.40
29	5.35	......	5.35	9.75	8.75	7.05	5.50	4.90	5.00	4.90	5.30	5.45
30	5.40	......	5.10	9.50	8.70	6.70	5.30	4.80	4.90	4.90	5.20	5.50
31	5.30	......	5.10	......	8.75	......	5.00	4.70	......	4.90	......	5.40

a Estimated.

SOUTH PLATTE RIVER AT ORCHARD, COLORADO.

This station is on the lower part of the South Platte, below all of the mountain drainage tributary to that stream. The gage rod, which is vertical, is fastened to a pile at a wagon bridge about a quarter of a mile southwest of the Union Pacific Railroad station at Orchard. The station was first established in November, 1895, and has been maintained during the greater part of the time since. During the last year the gage rod had to be moved twice, owing to changes in the channel. The left bank of the river is high, but the right bank is low and is likely to overflow. The bed of the stream is sandy and shifting, but the cross section did not change materially during 1900. The station has been of great value in demonstrating the fact that large quantities of water go to waste during floods and during the winter season, a great portion being seepage or return water. As a result of the investigations at this place, a large irrigation enterprise has been undertaken—namely, that of diverting water from the river near Hardin for the purpose of irrigating lands in the vicinity of Fort Morgan, the water to be stored in large reservoirs, which are referred to elsewhere (page 279, Bijou Irrigation Company's reservoirs). The existence of a large flow having been demonstrated, it is now thought best that the station should be changed to a point farther upstream, probably at Kersey, where another large ditch might possibly be taken out. A description of the station was published in Water-Supply Paper No. 37, page 226. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 203. During

1900 the following measurements were made by A. L. Fellows and R. W. Hawley:

March 7: Gage height, 2.85; discharge, 668 second-feet.
April 21: Gage height, 5 feet; discharge, 4,674 second-feet.
July 23: Gage height, 1.35 feet; discharge, 156 second-feet.
October 27: Gage height, 2.70 feet; discharge, 324 second-feet.

Daily gage height, in feet, of South Platte River at Orchard, Colorado, for 1900.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.00	2.90	3.20	2.70	8.50	6.50	2.70	1.20	1.10	2.40	2.70	2.80
2	4.00	2.90	3.30	2.70	8.50	6.50	2.50	1.20	1.10	2.50	2.70	2.80
3	3.90	2.90	3.30	2.90	8.00	6.50	2.40	1.15	1.10	2.60	2.70	2.80
4	3.90	2.90	3.20	3.00	8.00	6.50	2.30	1.10	1.10	2.60	2.75	2.80
5	3.90	2.90	3.00	3.20	8.00	6.30	2.20	1.10	1.20	2.65	2.75	2.80
6	3.90	2.90	2.85	3.30	8.20	6.00	2.10	1.10	1.30	2.70	2.80	2.80
7	3.90	2.90	2.85	3.40	8.00	5.90	2.00	1.10	1.30	2.70	2.80	2.80
8	3.90	2.90	2.85	3.40	7.80	5.80	2.00	1.10	1.30	2.70	2.80	2.80
9	3.60	2.90	2.85	3.50	7.50	5.70	1.90	1.10	1.30	2.70	2.80	2.80
10	3.60	2.90	2.85	3.60	7.30	5.60	1.80	1.10	1.30	2.70	2.80	2.80
11	3.60	3.00	2.85	3.75	7.50	5.50	1.70	1.10	1.30	2.70	2.85	2.80
12	3.60	3.00	2.80	3.90	8.00	5.40	1.60	1.10	1.30	2.70	2.85	2.80
13	3.60	3.00	2.80	4.00	8.20	5.30	1.50	1.10	1.30	2.70	2.90	2.80
14	3.50	3.30	2.80	4.10	8.00	5.20	1.40	1.10	1.30	2.70	2.90	2.80
15	3.50	3.30	2.80	4.50	7.80	5.10	1.30	1.10	1.30	2.70	2.80	2.80
16	3.40	3.30	2.80	5.00	7.00	4.90	1.35	1.10	1.30	2.70	2.80	2.80
17	3.30	3.30	2.80	6.25	6.80	4.80	1.35	1.10	1.30	2.70	2.80	2.80
18	3.20	3.50	2.80	6.70	6.00	4.75	1.35	1.10	1.30	2.70	2.80	2.80
19	3.00	3.50	2.70	5.50	5.80	4.70	1.35	1.10	1.30	2.70	2.80	2.80
20	2.80	3.50	2.70	5.20	6.00	4.60	1.35	1.10	1.30	2.70	2.80	2.80
21	2.80	3.50	2.70	5.00	7.00	4.50	1.35	1.10	1.30	2.70	2.80	2.80
22	2.90	3.40	2.70	5.30	6.00	4.30	1.35	1.10	1.30	2.70	2.80	2.80
23	2.90	3.40	2.70	6.50	6.00	4.20	1.35	1.10	1.40	2.70	2.80	2.80
24	2.90	3.40	2.70	6.40	6.00	4.00	1.30	1.10	1.50	2.70	2.80	2.80
25	2.90	3.30	2.70	6.30	6.00	3.90	1.30	1.10	1.65	2.70	2.80	2.80
26	2.90	3.20	2.70	6.10	6.00	3.80	1.30	1.10	1.80	2.70	2.80	2.80
27	2.90	3.20	2.70	6.00	6.30	3.70	1.30	1.10	1.95	2.70	2.80	2.80
28	2.90	3.20	2.70	6.00	6.50	3.50	1.30	1.10	2.10	2.70	2.80	2.80
29	2.90	......	2.70	6.30	6.70	3.00	1.35	1.10	2.20	2.70	2.80	2.80
30	2.90	......	2.70	7.30	6.80	2.80	1.40	1.10	2.30	2.70	2.80	2.80
31	2.90	......	2.70	......	6.70	......	1.40	1.10	......	2.70	......	2.80

SOUTH PLATTE RIVER AT JULESBURG, COLORADO.

Although no station has yet been established at this place, one is greatly needed. A rod was attached to the wagon bridge about a mile southeast of the Union Pacific Railroad station at Julesburg, but no one was found who would make the observations, so that no record has been kept. A station here would be of great value, as the bridge referred to is not far from the State line, and a knowledge of the discharge passing from Colorado into Kansas could thus be obtained. The channel is very wide, as it is throughout the lower portion of the river, and on this account the results obtained would necessarily be approximate; but they would nevertheless be valuable. Within the last two years four measurements have been made at this place, as follows:

Discharge measurements of South Platte River at Julesburg, Colorado.

	Sec.-ft.
September 14, 1899	2
November 12, 1899	1,120
March 8, 1900	2,291
November 2, 1900	76

On December 20, 1900, the South Platte was measured at North Platte, Nebraska, by Adna Dobson, and a discharge of 963 second-feet was found.

BEAR CREEK NEAR MORRISON, COLORADO.

Bear Creek is one of the smaller tributaries of the South Platte, heading in the vicinity of Mount Evans, about 30 miles southwest of Denver, and entering the main stream about 8 miles above that city. Although usually of small volume, the stream drains a considerable portion of very mountainous country, which is subject to more or less violent cloudbursts, so that floods sometimes come down this creek, causing great destruction to property and even the loss of life. All of the normal flow of the stream is used for irrigation, and it is only during high-water stages that a large amount of water passes through it. Records of its flow have been kept for a portion of each irrigation season since April, 1888, with the exception of the years 1892, 1893, and 1894. The present station was established April 16, 1899. It is located just above the little town of Morrison. The gage rod, which is a 2-inch by 4-inch timber placed vertically and marked in feet and tenths, is fastened to the upper side of the dam which diverts water into the mains of the Denver Union Water Company. The bench mark is the top of a granite bowlder about 100 feet above the rod on the left-hand side of the stream, and it is 10.33 feet above the gage datum. As in previous years, the station was maintained through cooperation with the Denver Union Water Company. Owing to the formation of a gravel bar in the summer of 1900, the conditions were for some time radically changed from the normal, and during the month of September no gagings were taken. The observer is S. Hebrew, an employee of the Denver Union Water Company. Tables of gage heights and discharge measurements for 1899 will be found in Water-Supply Paper No. 37, pages 227 and 228. Table of the monthly flow for that year will be found in the Twenty-first Annual Report, Part IV, page 204. During 1900 the following measurements were made by A. L. Fellows:

March 9: Gage height, 1.40 feet; discharge, 17 second-feet.
April 14: Gage height, 2.85 feet; discharge, 47 second-feet.
April 25: Gage height, 5.80 feet; discharge, 367 second-feet.
August 7: Gage height, 3.20 feet; discharge, 63 second-feet.
September 6: No gage height taken (conditions abnormal); discharge, 24 second-feet.

Daily gage height, in feet, of Bear Creek near Morrison, Colorado, for 1900.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	--------	6.70	5.95	4.75	3.55	2.00	2.60	1.90	1.35
2	--------	6.25	6.25	4.65	3.45	(*a*)	2.55	1.85	1.35
3	--------	6.30	6.55	4.55	3.30	--------	2.45	1.80	1.45
4	--------	6.20	6.60	4.55	4.00	--------	2.40	1.80	1.55
5	--------	6.20	6.40	4.35	4.00	--------	2.35	1.70	--------
6	--------	6.30	6.10	4.30	3.75	--------	2.30	1.70	--------
7	--------	6.40	6.25	4.35	3.70	--------	2.25	1.70	--------
8	--------	6.50	6.25	4.30	3.60	--------	2.30	1.60	--------
9	--------	6.50	6.15	4.25	3.50	--------	2.20	1.60	--------
10	--------	6.70	6.50	4.20	3.40	--------	2.20	1.60	--------
11	--------	6.90	6.40	4.15	3.30	--------	2.20	1.60	--------
12	--------	6.75	6.10	4.10	3.05	--------	2.10	1.60	--------
13	--------	6.65	5.95	4.10	2.85	--------	2.10	1.50	--------
14	3.00	6.45	5.95	4.05	2.65	--------	2.10	1.50	--------
15	2.90	6.20	5.85	4.00	2.45	--------	2.00	1.50	--------
16	2.95	6.05	5.85	4.20	2.35	--------	2.00	1.40	--------
17	3.65	5.90	5.70	4.10	2.25	--------	2.00	1.40	--------
18	3.65	5.90	5.70	4.05	2.20	--------	2.00	1.30	--------
19	4.50	5.90	5.60	4.00	2.10	--------	2.00	1.30	--------
20	4.80	6.05	5.60	3.90	2.20	--------	1.90	1.20	--------
21	5.30	5.95	5.55	3.80	2.25	--------	1.90	1.20	--------
22	5.80	5.95	5.55	3.75	2.30	--------	1.90	1.20	--------
23	5.85	6.05	5.50	4.00	2.30	--------	1.85	1.10	--------
24	5.80	6.05	5.40	4.35	2.20	--------	1.80	1.10	--------
25	5.90	6.15	5.25	4.40	2.10	--------	1.80	1.20	--------
26	6.15	6.20	5.25	4.25	2.10	--------	1.70	1.35	--------
27	6.25	6.20	5.15	4.15	2.10	--------	1.70	1.40	--------
28	6.30	6.10	5.15	4.05	2.10	--------	1.70	1.50	--------
29	7.00	6.10	5.05	4.00	2.05	--------	1.80	1.45	--------
30	6.90	6.05	4.95	3.85	2.00	2.70	2.00	1.40	--------
31	--------	6.00	--------	3.75	2.00	--------	2.00	--------	--------

a Gage heights not taken from September 2 to 29, inclusive, on account of dam on stream raising the water.

CLEAR CREEK AT FORKSCREEK, COLORADO.

Clear Creek rises on the eastern slope of the Rocky Mountains, in the vicinity of Grays and James peaks, about 40 miles west of Denver, and flows easterly, entering the South Platte 6 miles below the center of that city. Like the other streams of this region, for a long distance it flows through mountainous country, the water being used for power purposes and for placer mining. At Golden the creek enters an open and fertile valley, and so large a proportion of the water is diverted, by means of irrigation canals, for the cultivation of the land lying along the stream, that little of the normal flow passes into the South Platte, except that returned by seepage. During the flood stages, however, considerable water enters the main stream. The gaging station is located at the Forkscreek railroad station on the Colorado and Southern Railway, in Clear Creek Canyon, just below the junction of the North and South forks of Clear Creek. It was established May 29, 1899, and has been continued through the irrigation seasons of 1899 and 1900. The gage consists of a weight fastened to a wire running over a pulley at the edge of the embankment upon which the railway station is located. It is referred to bench marks back of the embankment. The stream flows rapidly through this part of the canyon, the channel being rocky and the fall great. Both banks are high and rocky. There is no suitable means for crossing the river at the gaging station, the railway bridge over the stream being constructed at an acute angle. It is possible, however, to secure fairly good results by means of measurements made at the two bridges above the forks, thus securing data of the flow of each branch as well as the total flow. At low water the stream may be gaged by wading. During the last two years the observer has been C. N. Davis, railway station agent at Forkscreek. He has voluntarily made the readings and sent daily reports to the local forecast official in Denver, who has had them published in the morning papers. A description of the station was published in Water-Supply Paper No. 37, page 228. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 205. During 1900 the following measurements were made by A. L. Fellows:

March 10: Gage height, 1.60 feet; discharge, 55 second-feet.
April 13: Gage height, 1.70 feet; discharge, 73 second-feet.
April 24: Gage height, 2.60 feet; discharge, 290 second-feet.
August 27: Gage height, 1.78 feet; discharge, 130 second-feet.

Daily gage height, in feet, of Clear Creek at Forkscreek, Colorado, for 1900.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.60	2.80	4.40	3.60	2.40	1.70	1.60	1.60	1.55
2		1.60	2.80	4.35	3.50	2.35	1.70	1.60	1.60	1.55
3		1.60	2.80	4.05	3.25	2.25	1.70	1.60	1.60	1.55
4		2.10	2.85	4.20	3.25	2.25	1.70	1.60	1.55	1.55
5		2.10	3.00	4.10	3.20	2.30	1.70	1.60	1.55	
6		2.15	3.25	4.20	3.20	2.25	1.65	1.60	1.55	
7		2.05	3.30	4.35	3.20	2.20	1.60	1.60	1.55	
8		1.85	3.40	4.55	3.10	2.15	1.60	1.60	1.55	
9		1.80	3.55	4.55	3.10	2.10	1.60	1.60	1.55	
10	1.65	1.85	3.90	4.45	3.00	2.10	1.70	1.60	1.55	
11	1.70	1.80	4.30	4.05	3.00	2.10	1.65	1.60	1.55	
12	1.65	1.80	4.55	3.95	2.85	2.10	1.60	1.60	1.55	
13	1.70	1.75	4.20	4.00	2.80	2.00	1.60	1.60	1.55	
14	1.70	1.80	3.75	3.90	2.75	2.00	1.60	1.70	1.55	
15	1.55	1.80	3.15	3.90	2.75	2.00	1.60	1.65	1.55	
16	1.60	1.85	3.45	4.05	2.70	1.90	1.60	1.60	1.55	
17	1.65	1.85	3.80	4.05	2.70	1.90	1.55	1.60	1.55	
18	1.60	1.80	3.70	4.00	2.65	1.90	1.50	1.60	1.55	
19	1.50	2.00	3.70	4.00	2.55	1.90	1.50	1.60	1.55	
20	1.60	2.35	3.75	4.00	2.50	1.90	1.50	1.60	1.55	
21	1.60	2.35	3.75	4.00	2.50	1.90	1.50	1.60	1.55	
22	1.60	2.65	3.60	4.00	2.50	1.90	1.50	1.60	1.55	
23	1.60	2.60	3.75	4.00	2.50	1.90	1.50	1.60	1.55	
24	1.60	2.60	3.65	3.90	2.50	1.85	1.50	1.60	1.55	
25	1.60	2.70	4.05	3.85	2.50	1.80	1.60	1.60	1.55	
26	1.60	2.55	4.05	3.80	2.50	1.80	1.60	1.60	1.55	
27	1.60	2.55	4.10	3.60	2.50	1.80	1.60	1.60	1.55	
28	1.60	2.60	4.35	3.60	2.50	1.80	1.60	1.60	1.55	
29	1.60	2.90	4.40	3.60	2.50	1.80	1.60	1.55	1.55	
30	1.60	2.90	4.45	3.70	2.40	1.80	1.60	1.55	1.55	
31	1.60		4.30		2.40	1.75		1.60		

SOUTH BOULDER CREEK NEAR MARSHALL, COLORADO.

South Boulder Creek, a tributary of Boulder Creek, is the next mountain stream of importance north of Clear Creek. The gaging station, which was established in April, 1888, and has been maintained during a portion of each year since, except during 1893 and 1894, is located at the mouth of the canyon from which the stream issues about 3 miles west of the Colorado and Southern Railway station at Marshall. The rod consists of an inclined timber on the north bank of the stream near the house of C. E. Barber. Above the station two ditches divert water, namely, the South Boulder and Coal Creek ditch and the Community ditch, and their discharges must be added to the discharge at the station, in order to obtain the total run-off of the basin. The channel of the stream, which is rocky and full of bowlders, does not change materially. Gagings are usually made by wading, but at high water they are made from the footbridge just above the rod. The observer during 1900 was Miss Blanche Barber, who lives near by. A description of the station was published in Water-Supply Paper No. 37, page 229. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 206. During 1900 the following measurements were made by A. L. Fellows:

July 28: Gage height, 1.40 feet; discharge, 35 second-feet.
August 28: Gage height, 1.10 feet; discharge, 10 second-feet.

Daily gage height, in feet, of South Boulder Creek near Marshall, Colorado, for 1900.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1		3.45	2.40	1.45	1.00	17		2.55	1.80	1.30	1.05
2		3.45	2.30	1.50	1.05	18		2.65	1.75	1.30	1.10
3		3.45	2.30	1.50	1.00	19		2.70	1.70	1.30	1.05
4		3.40	2.20	1.50	1.05	20		2.65	1.70	1.25	1.00
5		3.20	2.25	1.60	1.05	21		2.85	1.70	1.30	1.05
6	4.00	3.20	2.15	1.50	1.05	22		2.75	1.70	1.25	1.15
7	4.00	3.20	2.15	1.50	1.05	23		2.70	1.70	1.30	1.15
8	4.00	3.20	2.10	1.45	1.05	24		2.65	1.60	1.35	1.10
9	4.00	3.05	2.05	1.40	1.00	25		2.60	1.55	1.35	1.15
10	4.00	3.00	1.80	1.40	1.20	26		2.45	1.55	1.30	1.20
11	4.00	2.95	1.80	1.40	1.10	27		2.50	1.60	1.20	1.10
12	4.00	2.90	1.80	1.30	1.10	28		2.45	1.40	1.20	1.10
13	(*a*)	2.90	1.80	1.40	1.10	29		2.45	1.40	1.10	1.10
14		2.90	1.80	1.35	1.00	30		2.40	1.70	1.10	1.00
15		2.60	1.85	1.35	1.05	31			1.60	1.00	
16		2.70	1.80	1.30	1.00						

a Regular readings did not begin until June 1.

BOULDER CREEK NEAR BOULDER, COLORADO.

The general character of Boulder Creek, one of the tributaries of St. Vrain Creek, is similar to that of the latter stream. The gaging station is located 1½ miles above the town of Boulder, where the stream issues from the mountains. There are two small irrigation ditches above the station, but the amount of water diverted does not exceed 5 or 6 second-feet, and may, therefore, be disregarded. The channel of the stream contains so many large bowlders that accurate measurements are difficult to obtain, either here or at any other point. During high water measurements are made from the bridge, but at low-water stages the stream can be gaged by wading. The entire normal flow is used for irrigation, but large quantities of water go to waste during the flood season. Plans are being considered for the construction of large reservoirs to store the flood waters for the irrigation of lands now arid. The gage rod is an inclined timber spiked to stakes driven into the bank. The bench mark is the top of a large stone 22 feet west of the gage and 5.72 feet above the zero of the rod. Both banks are high and rocky, and are not subject to overflow. The observer for 1900 was Mrs. Carrie Osgood, who lives near by. A description of the station was published in Water-Supply Paper No. 37, page 231. The results of measurements for 1897, 1898, and 1899 will be found in the Twenty-first Annual Report, Part IV, page 207. During 1900 the following measurements were made by A. L. Fellows:

April 28: Gage height, 2.10 feet; discharge, 483 second-feet.
July 27: Gage height, 1.40 feet; discharge, 220 second-feet.
August 28: Gage height, 0.62 foot; discharge, 49 second-feet.

Daily gage height, in feet, of Boulder Creek near Boulder, Colorado, for 1900.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.	Oct.
1	2.35	2.85	2.00	1.22	0.60	0.45	17	2.25	2.42	1.40	0.75	0.55	0.62
2	2.35	2.75	1.95	1.22	.60	.45	18	2.20	2.42	1.40	.78	.55	.60
3	2.30	2.75	1.95	1.22	.62	.42	19	2.15	2.35	1.38	.72	.55	.60
4	2.40	2.65	1.82	1.20	.62	.45	20	2.22	2.40	1.40	.73	.50	.58
5	2.62	2.68	1.70	1.18	.60	.42	21	2.20	2.35	1.32	.70	.50	.55
6	2.52	2.72	1.60	1.18	.60	.48	22	2.22	2.38	1.35	.68	.50	.52
7	2.55	2.68	1.50	1.12	.60	.50	23	2.20	2.40	1.38	.65	.48	.45
8	2.70	2.78	1.45	1.08	.62	.48	24	2.18	2.35	1.35	.75	.45	.43
9	2.68	2.75	1.40	.98	1.17	.50	25	2.18	2.30	1.32	.73	.50	.40
10	2.70	2.78	1.40	.98	.95	.48	26	2.25	2.25	1.38	.72	.65	.37
11	2.65	2.60	1.50	.98	.90	.50	27	2.52	2.22	1.38	.68	.65	.33
12	2.75	2.58	1.62	.92	.88	.67	28	2.70	2.20	1.38	.60	.55	.30
13	2.62	2.45	1.52	.90	.82	.75	29	2.75	2.10	1.25	.60	.52	.32
14	2.48	2.40	1.52	.85	.80	.60	30	2.70	2.08	1.22	.62	.55	.35
15	2.55	2.40	1.60	.80	.65	.55	31	2.78	......	1.22	.60	......	.25
16	2.30	2.42	1.55	.78	.60	.70							

ST. VRAIN CREEK NEAR LYONS, COLORADO.

St. Vrain Creek and its tributaries derive their supply of water from the eastern slope of the Front Range, between Longs Peak and James Peak, which are about 30 miles apart. The general trend of the drainage is northeasterly, the St. Vrain flowing into South Platte River about 6 miles below the town of Platteville. The principal tributaries of the stream are the North and South forks and Boulder Creek. South Boulder Creek is a tributary of the latter stream. In their upper portions these creeks flow through mountainous areas where the water is used only for power purposes and for placer mining, but at the foothills each stream emerges into a broad, approximately level valley, devoted entirely to farming, water being furnished by means of irrigation canals leading from the streams. Three stations are maintained on the main stream and its tributaries, namely, at Lyons, on the St. Vrain, at Boulder, on the Boulder, and at Marshall, on the South Boulder. The station at Lyons is about a half mile southeast of the town, and is below the intersection of the North and South forks.

Records of the flow of the creek at or near Lyons have been kept since April, 1888, except during the years 1893 and 1894, but the station was not put in its present condition until May 5, 1899, since when records have been kept throughout each irrigation season. The rod is an inclined timber on the left bank of the stream, opposite the Tower Hotel, fastened to pieces of timber driven into the slag embankment. The stream has an excellent channel of gravel and bowlders, and is not likely to change. Measurements have usually been made by wading, but at high water they are made from the bridge about a quarter of a mile below the gage rod. The bench mark is a spike 2 feet from the west side of the trunk of a large cottonwood tree 150 feet north of the rod. Supply ditch diverts water above the station, and its discharge should be added to that of the creek in order to obtain the total run-off of the basin. The observer during the year 1900 was L. H. Dickson, commissioner of the St. Vrain water district, who kept up the readings during the irrigation season. Weekly records of the discharge at this point have been furnished to the Longmont papers. During the greater part of the irrigation season the entire discharge of St. Vrain Creek is utilized, but during the flood period considerable water usually goes to waste. Much of the water is, however, stored in reservoirs, and is used to advantage at low stages of the stream. A description of the station was published in Water-Supply Paper No. 37, page 232. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 208. During 1900 the following measurements were made by A. L. Fellows:

March 13: Gage height, 2.06 feet; discharge, 35 second-feet.
April 27: Gage height, 3.68 feet; discharge, 513 second-feet.
July 27: Gage height, 2.70 feet; discharge, 193 second-feet.

Daily gage height, in feet, of St. Vrain Creek near Lyons, Colorado, for 1900.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1			4.10	4.50	3.50	2.55	2.15	2.10	2.05
2			4.00	4.30	3.45	2.55	2.15	2.10	2.05
3			3.90	4.50	3.35	2.50	2.15	2.10	2.05
4			4.00	4.40	3.25	2.50	2.15	2.08	2.05
5			4.15	4.20	3.10	2.50	2.15	2.08	2.05
6			4.10	4.10	3.10	2.55	2.15	2.08	2.05
7			4.15	4.30	3.10	2.50	2.15	2.10	2.05
8		3.20	4.10	4.35	3.10	2.47	2.23	2.10	2.05
9	1.90		4.30	4.40	3.00	2.47	2.23	2.10	2.05
10	1.90		4.15	4.30	2.95	2.45	2.23	2.10	2.05
11			4.15	3.90	3.05	2.45	2.75	2.08	2.00
12			4.10	3.85	3.05	2.40	2.70	2.05	2.00
13	2.06		4.10	3.80	3.05	2.35	2.45	2.05	
14			3.95	3.95	3.05	2.30	2.35	2.05	
15		2.06	3.75	3.80	3.05	2.30	2.25	2.05	
16		1.90	3.65	3.85	3.05	2.30	2.20	2.30	
17	1.85	1.85	3.70	3.85	3.00	2.30	2.15	2.25	
18		1.90	3.70	3.90	2.90	2.25	2.15	2.20	
19		1.85	3.65	3.95	2.90	2.25	2.12	2.20	
20		1.90	3.50	4.00	2.80	2.25	2.12	2.25	
21		1.90	3.60	4.00	2.75	2.25	2.12	2.20	
22	1.90	4.20	3.80	3.95	2.70	2.25	2.10	2.18	
23		3.80	3.70	4.00	2.70	2.25	2.10	2.15	
24		3.90	3.95	3.90	2.80	2.23	2.08	2.15	
25		3.80	3.60	3.80	2.75	2.23	2.10	2.15	
26		3.80	4.00	3.65	2.70	2.20	2.18	2.15	
27		3.70	4.20	3.55	2.70	2.17	2.15	2.15	
28		3.75	4.60	3.55	2.70	2.15	2.18	2.10	
29		4.80	4.60	3.50	2.70	2.15	2.10	2.10	
30	1.95	4.30	4.70	3.45	2.65	2.15	2.10	2.10	
31			4.50		2.65	2.15		2.05	

NOTE.—Regular readings did not begin until April 15.

BIG THOMPSON CREEK NEAR ARKINS, COLORADO.

This stream drains the country immediately north of that drained by the headwaters of St. Vrain Creek, and is one of the largest tributaries of South Platte River, into which it empties about 4 miles above the town of Evans. Little Thompson Creek is an important tributary of Big Thompson Creek, and the country drained by these two streams makes up irrigation district No. 4. The junction of these creeks is near the lower end of the district, a short distance above the point where their combined waters enter the South Platte.

Records of the flow of this stream were begun in April, 1888, and have been maintained for a portion of each year since, with the exception of the years 1893 and 1894. The station was established at its present location on April 1, 1899. The only diversion above the gaging station is Handy ditch, a record of the gage heights of which is kept by the water commissioner of that district, J. M. Wolaver, who has also kept the records of Big Thompson Creek at this point during the year 1900. It is necessary to include the discharge of Handy ditch in order to obtain the total run-off of the basin. The rod is a vertical 2-inch by 4-inch timber fastened to the downstream side of the right-hand end of the wagon bridge on the ranch of John Chasteen. The bench mark is 25 feet south of the gage, and is a nail in the root of a cottonwood stump, the head of the nail being 9.35 feet above the zero of gage. The channel of the stream is lined with bowlders and is very rough, but, not being likely to change, it furnishes a good point for obtaining accurate measurements. A permanent station could be located here to advantage. Like the other tributaries of the South Platte, nearly all of the normal flow of Big Thompson and Little Thompson creeks is used for irrigation, and during the high-water stages the greater part of the volume is diverted into large reservoirs, from which it is used to advantage later in the season. A description of the station was published in Water-Supply Paper No. 37, page 233. The results of measurements for 1899 will be found in the Twenty-first Annual Report, Part IV, page 209. During 1900 the following measurements were made by A. L. Fellows:

April 26: Gage height, 1.91 feet; discharge, 512 second-feet.
July 26: Gage height, 1.35 feet; discharge, 322 second-feet.

Daily gage height, in feet, of Big Thompson Creek near Arkins, Colorado, for 1900.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.20	3.50	3.50	2.00	1.10	0.70	17	1.60	2.70	2.90	1.50	0.80	0.60
2	.20	3.40	3.60	1.80	1.10	.70	18	1.60	2.80	2.80	1.40	.80	.60
3	.30	3.40	3.40	1.80	1.10	.70	19	2.00	2.80	2.80	1.40	.80	.60
4	.50	3.30	3.20	1.70	1.10	.70	20	2.00	2.50	2.80	1.40	.80	.60
5	.60	2.80	2.90	1.70	1.10	.70	21	2.20	2.60	2.80	1.20	.80	.60
6	.60	2.60	3.00	1.70	1.10	.70	22	1.90	2.65	2.80	1.20	.80	.60
7	.70	2.60	3.40	1.70	1.10	.70	23	1.80	2.75	2.90	1.20	.80	.60
8	.90	2.70	3.40	1.80	1.10	.70	24	1.80	2.75	2.80	1.30	.70	.60
9	.90	2.80	3.50	1.80	1.00	.70	25	1.80	2.80	2.80	1.30	.70	.60
10	.90	3.10	3.10	1.70	1.00	.70	26	1.90	3.10	2.70	1.20	.70	.60
11	1.00	3.10	3.00	1.70	.90	.70	27	1.90	3.30	2.60	1.20	.70	.60
12	1.00	3.00	2.90	1.60	.80	.70	28	2.10	3.50	2.50	1.30	.70	.70
13	1.10	2.90	3.00	1.60	.80	.70	29	3.00	3.60	2.40	1.30	.70	.70
14	1.10	2.90	3.00	1.60	.80	.70	30	3.50	3.70	2.30	1.20	.70	.70
15	1.90	2.90	3.00	1.60	.80	.70	31	......	3.50	......	1.10	.70	......
16	1.80	2.70	3.00	1.70	.80	.60							

Daily gage height, in feet, of Handy ditch near Arkins, Colorado, for 1900.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	......	1.20	0.40	0.32	12	......	0.72	0.32	0.30	23	2.20	0.40	0.32	.30
2	......	1.20	.40	.30	13	......	.72	.32	.30	24	2.20	.40	.32	.30
3	......	1.20	.40	.30	14	......	.72	.32	.30	25	2.20	.40	.32	.30
4	......	1.20	.40	.30	15	......	.72	.32	.30	26	2.20	.40	.32	.30
5	......	.80	.40	.30	16	......	.72	.32	.30	27	2.20	.40	.32	.30
6	......	.80	.40	.30	17	2.20	.72	.32	.30	28	1.20	.40	.32	.30
7	......	.80	.40	.30	18	2.20	.72	.32	.30	29	1.20	.40	.32	.30
8	......	.72	.45	.30	19	2.20	.72	.32	.30	30	1.20	.40	.32	......
9	......	.72	.45	.30	20	2.20	.72	.32	.30	31	......	.40	.32	......
10	......	.72	.40	.30	21	2.20	.72	.32	.30					
11	......	.72	.40	.30	22	2.20	.72	.32	.30					

CACHE LA POUDRE RIVER NEAR FORT COLLINS, COLORADO.

This stream is the northernmost of the large tributaries of the South Platte which issue from the east front of the Rocky Mountains. During the irrigating season its discharge is augmented by the supply diverted from the headwaters of Laramie River, which lie immediately to the west of the headwaters of the Cache la Poudre, the diversion being made through Sky Line canal. Measurements of the discharge of the Cache la Poudre Basin, therefore, include some of the Laramie waters. Practically the entire flow of the Cache la Poudre is used for irrigation purposes, even the greater part of the flood waters being stored for use later in the season. It is along the valley of the Cache la Poudre that the earliest and best irrigation of the State has been carried on.

The gaging station, which was established in 1884, is about 15 miles above Fort Collins. Since its establishment it has been maintained under the direction of Prof. L. G. Carpenter, of the Colorado State Agricultural College. The records are from the figures published by Professor Carpenter in the daily papers. The figures of daily discharge for the years 1895 to 1899, inclusive, will be found in Water-Supply Paper No. 37, pages 235 to 237.

Daily discharge, in second-feet, of Cache la Poudre River near Fort Collins, Colorado, for 1900.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	--------	2,551	3,951	1,360	369	204	140
2	--------	2,508	3,938	1,276	355	199	137
3	--------	2,447	4,080	1,176	341	160	122
4	--------	2,251	3,600	1,042	374	143	122
5	--------	2,461	3,104	958	460	133	122
6	--------	2,354	3,602	871	435	126	122
7	--------	2,447	4,376	853	392	124	122
8	--------	2,486	4,227	827	315	137	122
9	--------	2,586	4,193	795	299	183	122
10	--------	2,777	4,180	752	292	260	141
11	--------	3,012	3,224	705	276	255	141
12	--------	2,992	2,978	666	260	151	141
13	--------	2,811	2,813	641	247	157	141
14	--------	2,652	3,001	625	235	156	141
15	--------	2,411	2,797	597	214	144	141
16	--------	2,049	2,968	599	218	138	141
17	--------	2,143	2,923	576	218	133	--------
18	427	2,258	2,622	531	218	126	--------
19	556	2,093	2,789	525	214	118	--------
20	823	2,271	2,567	525	212	113	--------
21	1,168	2,582	2,573	481	210	122	--------
22	1,554	2,525	2,441	460	248	122	--------
23	1,245	2,490	2,460	475	195	121	--------
24	1,263	2,884	2,329	736	200	121	--------
25	1,223	2,939	2,140	767	198	126	--------
26	1,154	3,240	2,036	719	215	141	--------
27	1,204	3,561	1,813	641	212	144	--------
28	1,807	4,071	1,674	592	201	140	--------
29	2,934	4,560	1,540	558	204	140	--------
30	2,530	4,416	1,325	527	199	141	--------
31	--------	4,204	--------	506	204	--------	--------
Mean	1,376	2,808	2,942	721	265	149	132

[Continued in Water-Supply Paper No. 50, where will be found tables of computations of seepage on numerous streams in Colorado.]

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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 Bighorn Range and Bighorn 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, N. Y., 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 "Preliminary report on the geology and water resources of Nebraska west of the one hundred and third meridian," by N. H. Darton.

Part II of the Nineteenth Annual contains a paper on "Principles and conditions of the movements of ground water," by F. H. King, and one on "Theoretical investigation of the motion of ground waters," by C. S. Slichter.

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.

1901.

Twenty-first Annual Report of the United States Geological Survey, 1899–1900, Part IV, Hydrography, 1900; octavo, 768 pp.

Contains a "Report of progress of stream measurements for the calendar year 1899," by F. H. Newell; "Preliminary description of the geology and water resources of the southern half of the Black Hills and adjoining regions in South Dakota and Wyoming," by N. H. Darton; and "The High Plains and their utilization," by W. D. Johnson.

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

The Director, U. S. Geol. 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. Underground waters of southeastern Nebraska, by N. H. Darton, 1898.
13. Irrigation systems in Texas, by W. F. Hutson, 1898.
14. New tests of pumps and water lifts used in irrigation, by O. P. Hood, 1898.

15, 16. Operations at river stations, 1897, Parts I, 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 Bighorn Mountains, by Elwood Mead, 1899.

24, 25. Water resources of the State of New York, Parts I, II, by G. W. Rafter, 1899.

26. Wells of southern Indiana (continuation of No. 21), by Frank Leverett, 1899.

27, 28. Operations at river stations, 1898, Parts I, 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. Geology and water resources of southeastern S. Dak., by J. E. Todd, 1900.

35–39. Operations at river stations, 1899, Parts I–V, 1900.

40. The Austin dam, by Thomas U. Taylor, 1900.

41, 42. The windmill: its efficiency and use, Parts I, II, by E. C. Murphy, 1901.

43. Conveyance of water in irrigation canals, etc., by Samuel Fortier, 1901.
44. Profiles of rivers, by Henry Gannett, 1901.
45. Water storage on Cache Creek, California, by Albert E. Chandler, 1901.
46. Reconn. of Kern and Yuba rivers, Cal., by F. H. Olmsted and M. Manson, 1901.

47–52. Operations at river stations, 1900, Parts I–VI, 1901.

Other papers are in various stages of preparation. 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 made for 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

THE DIRECTOR, UNITED STATES GEOLOGICAL SURVEY, WASHINGTON, D. C.