DEPARTMENT OF THE INTERIOR

WATER-SUPPLY

AND

IRRIGATION PAPERS

OF THE

UNITED STATES GEOLOGICAL SURVEY

No. 39

OPERATIONS AT RIVER STATIONS, 1899.—PART V

WASHINGTON
GOVERNMENT PRINTING OFFICE
1900

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.

(Continued on third page of cover.)

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UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

OPERATIONS AT RIVER STATIONS, 1899

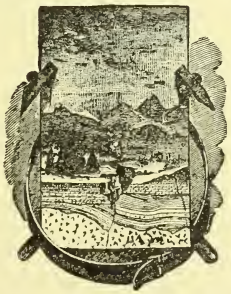
A REPORT OF THE

DIVISION OF HYDROGRAPHY

OF THE

UNITED STATES GEOLOGICAL SURVEY

PART V



WASHINGTON

GOVERNMENT PRINTING OFFICE

1900

CONTENTS.

OPERATIONS AT RIVER STATIONS, 1899.

PART V.

MEASUREMENTS AT RIVER STATIONS.[1]

KINGS RIVER AT RED MOUNTAIN, CALIFORNIA.

This river rises on the western slope of the Sierra Nevada in Fresno County, California. The waters coming from the high catchment basin are probably of greater value for irrigation purposes than those of any other stream in central California, being used exclusively for the raising of grapes and deciduous fruits in the neighborhood of Fresno, Selma, and Hanford. The summer flow of this river is now entirely diverted, and during the dry season of the last few years the scarcity of water has worked many hardships. There is a large surplus of water in this river in the spring of the year, due to the melting of snows, which is now going to waste, and which, if stored in suitable reservoirs, would bring larger areas under cultivation. The mountainous basin of this river has never been systematically explored for reservoir sites. Two gaging stations were formerly maintained on the river; one at Red Mountain and the other at Kingsburg, California. The station at Red Mountain, established September 3, 1895, is located 15 miles east of Sanger, California, and southwest of Red Mountain. The station is on what is called "the lower section of No. 9" of the lumber flume. It is located at the mouth of the canyon, above all diversions. The bed of the stream is of gravel, and few changes have been noticed in the cross section since the establishment of the station. The results of measurements may be found as follows: 1896, Eighteenth Annual Report, Part IV, page 392; 1897, Nineteenth Annual Report, Part IV, page 519; 1898, Twentieth Annual Report, Part IV, page 535. The following discharge measurements were made under the direction of J. B. Lippincott during 1899:

Discharge measurements of Kings River at Red Mountain, California.

1899.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Second-feet.*		*Feet.*	*Second-feet.*
April 19	8.8	5,409	August 2	4.66	608
May 15	8.15	4,422	September 4	3.8	206
June 3	7.85	3,954	December 8	4.36	458
June 26	7.23	3,049	December 21	5.3	*a* 974

a Measured at point 2 miles below gaging station.

[1] Continued from Water-Supply and Irrigation Paper No. 38.

Daily gage height, in feet, of Kings River at Red Mountain, California, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.80	4.60	4.90	6.40	6.90	8.50	7.30	4.70	3.80	3.60	4.20	4.50
2	3.80	4.70	4.90	6.40	6.80	8.40	7.30	4.70	3.80	3.60	4.20	4.40
3	4.00	4.60	4.90	6.50	6.80	8.40	7.30	4.60	3.80	3.60	4.10	4.40
4	4.20	4.40	4.90	6.60	6.80	8.00	7.10	4.50	3.90	3.60	4.20	4.40
5	3.90	4.40	4.90	7.60	6.00	8.70	6.50	4.40	3.90	3.60	4.20	4.50
6	3.90	4.40	5.00	7.80	7.00	10.00	6.80	4.40	3.80	3.60	4.10	4.40
7	4.00	4.30	5.00	8.00	7.10	10.10	6.50	4.50	3.80	3.60	4.10	4.30
8	4.20	4.40	5.10	8.40	7.80	10.00	6.30	4.50	3.70	3.60	4.05	4.30
9	4.10	4.40	5.20	8.60	7.70	10.20	6.20	4.40	3.80	3.60	4.80	4.40
10	4.20	4.50	5.10	8.60	7.80	10.30	6.10	4.40	3.70	3.60	5.50	4.20
11	5.80	4.50	5.10	8.70	7.90	10.40	6.00	4.40	3.70	3.65	4.80	4.30
12	5.00	4.50	4.90	8.70	7.70	10.50	5.90	4.30	3.70	3.70	5.40	4.40
13	4.70	4.50	4.80	8.70	7.80	10.00	5.80	4.30	3.80	3.85	5.10	4.40
14	4.60	4.60	4.80	9.00	7.90	9.40	5.70	4.20	3.70	3.95	4.90	4.60
15	4.50	4.60	4.70	9.30	7.70	9.60	5.60	4.20	3.70	4.00	4.70	5.40
16	4.60	4.60	4.90	9.50	7.80	9.50	5.60	4.20	3.70	4.50	5.70	8.60
17	4.60	4.70	4.90	8.90	7.90	9.50	5.50	4.20	3.70	4.10	5.20	6.40
18	4.60	4.70	5.00	9.10	8.00	9.40	5.40	4.10	3.70	4.20	5.00	5.80
19	4.60	4.80	5.00	8.60	8.20	9.10	5.50	4.20	3.60	4.25	4.80	5.60
20	4.50	5.10	5.40	9.00	7.70	9.00	5.40	4.10	3.70	4.25	4.60	5.40
21	4.50	5.40	5.50	9.20	8.30	8.50	5.30	4.10	3.60	4.30	4.70	5.30
22	4.50	5.40	6.40	9.30	8.20	8.30	5.30	4.00	3.60	5.65	5.00	5.20
23	4.60	5.30	7.80	9.00	8.30	8.10	5.20	4.10	3.60	5.40	4.80	5.20
24	4.50	5.30	9.70	8.30	8.40	8.10	5.10	4.00	3.60	4.70	4.70	5.20
25	4.50	5.30	13.80	8.30	8.00	7.70	5.30	4.00	3.60	4.50	4.70	5.20
26	4.50	5.10	8.20	7.70	7.90	7.50	5.30	3.90	3.60	4.45	4.70	5.20
27	4.50	4.90	7.70	7.50	7.90	7.10	5.20	3.90	3.60	4.45	4.70	5.20
28	4.60	4.90	7.10	7.70	8.40	7.30	5.10	3.90	3.60	4.40	4.60	5.10
29	4.60	.....	7.30	6.60	8.50	7.30	5.00	3.90	3.60	4.40	4.60	5.10
30	4.70	.....	6.80	7.10	8.40	7.30	4.90	3.90	3.60	4.35	4.50	7.10
31	4.60	.....	6.20	.....	7.90	.....	4.80	3.80	.....	4.30	.....	6.40

KINGS RIVER AT KINGSBURG, CALIFORNIA.

The Southern Pacific Railway Company has maintained gage readings at the railroad bridge 1 mile south of Kingsburg since 1879. Attempts have been made in previous years to establish a rating curve for this station, but it has been found impossible to do so on account of the fluctuations of the water surface caused by the manipulation of the head gates of the People's canal, 2 miles below, and also on account of the changes in the sandy bed of the river. The railroad company has maintained daily gage readings as given on the following page. No measurements of discharge were made at this point during 1899.

Daily gage height, in feet, of Kings River at Kingsburg, California, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.92	4.16	3.83	4.08	4.83	6.75	5.67	4.00	3.25	2.83	3.92	5.08
2	3.92	4.08	3.83	4.25	4.58	6.92	5.50	4.00	3.25	2.25	3.83	5.08
3	4.00	4.08	3.92	4.00	4.25	6.67	5.42	4.00	3.25	2.25	3.83	5.08
4	4.00	4.08	3.83	4.17	4.33	6.58	5.00	4.00	3.25	2.25	3.83	5.08
5	3.92	4.16	3.92	4.25	4.42	6.83	4.92	3.92	3.25	2.25	3.75	5.08
6	3.92	4.25	3.92	4.66	4.58	8.00	4.50	3.83	3.25	2.25	3.75	5.08
7	4.00	4.25	3.92	6.33	4.83	8.50	4.33	3.75	3.25	2.25	3.67	5.33
8	4.00	4.33	3.83	6.75	5.25	8.50	4.25	3.83	3.25	2.25	3.67	5.08
9	4.00	4.33	3.83	7.00	5.08	8.58	4.58	3.83	3.25	2.25	3.83	5.08
10	4.00	4.25	3.83	7.08	5.50	8.58	4.25	3.83	3.21	2.25	4.25	5.08
11	5.42	4.25	3.83	7.08	7.00	9.00	4.00	3.75	3.25	2.25	5.25	4.75
12	5.83	4.25	3.83	7.00	8.17	9.00	3.67	3.58	3.25	2.25	4.92	4.83
13	4.33	4.16	3.75	7.00	8.33	8.75	3.75	3.58	3.25	2.25	5.50	4.92
14	3.66	4.16	3.92	7.17	8.08	8.00	4.00	3.54	3.21	2.33	5.25	5.75
15	3.92	4.16	3.83	7.25	7.17	8.00	4.17	3.50	3.25	2.75	5.17	5.25
16	3.92	4.16	3.92	7.75	7.00	7.83	4.00	3.46	3.25	3.08	5.42	8.00
17	3.92	4.16	3.92	7.50	6.50	7.50	4.17	3.60	3.25	3.17	5.83	7.33
18	4.00	4.00	3.92	7.25	6.67	7.50	4.25	3.25	3.25	3.25	5.67	6.83
19	3.92	4.00	3.83	7.08	6.67	7.25	4.33	3.25	3.25	3.50	5.42	6.50
20	4.08	4.25	3.92	7.00	6.58	7.33	4.25	3.25	3.25	3.67	5.25	6.25
21	4.00	4.25	3.92	7.25	6.25	7.00	4.17	3.21	3.25	3.75	5.33	6.00
22	4.00	4.25	3.92	7.17	6.33	6.83	4.17	3.17	3.17	4.17	5.25	6.00
23	4.08	4.16	3.83	7.08	6.75	6.83	4.08	3.17	3.17	5.67	5.42	5.83
24	4.16	4.25	9.33	7.00	7.67	6.50	4.00	3.17	3.17	5.00	5.25	5.75
25	4.00	3.83	11.25	6.25	7.00	6.50	4.00	3.12	3.17	4.58	5.17	5.50
26	4.00	3.83	8.92	5.83	6.58	6.25	4.00	3.08	3.12	4.33	5.08	6.00
27	4.08	4.00	6 75	5.33	6.33	6.25	4.08	3.08	3.08	4.08	5.08	6.00
28	4.08	4.00	5.50	5.17	6.25	5.50	3.92	3.00	3.08	4.00	5.08	5.83
29	4.08	.....	5.33	4.92	6.42	5.58	4.00	3.00	3.08	4.00	5.17	6.00
30	4.16	.....	4.75	4.66	6.75	5.75	4.00	3.00	3.08	3.96	5.17	5.83
31	4.16	.....	4.42	.....	6.50	.....	4.00	3.25	.....	3.92	.....	7.50

KERN RIVER NEAR BAKERSFIELD, CALIFORNIA.

This river issues from the southern extremity of the Sierra Nevada, being formed by the junction of the North Fork and the South Fork a short distance below Kernville. The run-off from this basin is notably less than from the northern tributaries of San Joaquin River, which may be due to the fact that a portion of the basin is located east of the main crest of the mountains and is therefore protected from the water-bearing clouds. Most of the water of Kern River is used for irrigation by the large canals in the southern end of San Joaquin Valley. The winter waters are in part stored in Buena Vista Lake, which was a number of years ago converted into a storage reservoir. The station was established in 1893 by Mr. Walter James, chief engineer of the Kern County Land Company, and is located at what is known as "the first point of measurement," 5 miles above Bakersfield and at the mouth of the canyon of the river. Meter measurements are taken once a week, and an automatic gage records the fluctuations of the river heights. Mr. A. K. Warren, the engineer in charge of this work for the Kern County Land Company, attends to the measurements with much accuracy and precision, and furnishes this office with the final results. The results of measurements may be found as follows: 1896, Eighteenth Annual Report, Part IV, page 297; 1897, Nineteenth Annual Report, Part IV, page 523; 1898, Twentieth Annual Report, Part IV, page 536.

Daily discharge, in second-feet, of Kern River at "first point of measurement," California.

1896.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	379	766	740	1,100	1,009	3,067	1,299	713	384	241	397	320
2	377	732	713	1,044	994	3,200	1,244	671	365	240	384	319
3	382	695	724	1,015	1,011	2,875	1,221	642	339	241	384	335
4	404	660	690	974	1,074	2,628	1,237	607	328	246	364	350
5	393	639	685	942	1,126	2,592	1,434	590	289	247	349	357
6	379	640	707	916	1,205	2,741	1,879	542	279	250	338	365
7	378	624	695	889	1,146	2,854	1,929	514	312	251	333	370
8	394	593	695	861	1,115	3,069	1,698	496	428	236	328	351
9	400	580	705	870	1,086	3,348	1,570	475	454	228	316	325
10	403	591	726	932	1,015	3,379	1,822	451	399	232	321	320
11	397	598	726	925	978	3,118	1,874	450	360	239	347	338
12	390	598	732	911	952	2,939	1,792	442	329	243	406	320
13	385	599	755	970	986	3,028	1,624	440	306	243	385	332
14	387	591	777	1,045	1,082	2,960	1,447	412	294	241	380	387
15	397	590	822	1,151	1,175	2,801	1,272	381	285	238	380	386
16	397	583	827	1,050	1,173	2,715	1,116	366	269	239	365	369
17	469	576	833	933	1,140	2,686	1,056	379	257	238	351	370
18	519	593	864	864	1,175	2,786	1,144	478	244	250	349	342
19	918	590	867	852	1,205	2,553	1,096	588	247	247	341	332
20	915	582	880	850	1,204	2,300	1,027	644	251	254	345	330
21	3,101	577	924	842	1,184	2,138	963	602	268	268	349	342
22	2,327	572	1,068	832	1,229	1,985	986	536	275	262	354	353
23	1,390	577	1,133	861	1,222	1,884	1,219	481	276	258	356	339
24	1,057	571	1,209	864	1,247	1,680	2,004	442	273	265	355	342
25	888	587	1,232	920	1,362	1,553	1,686	425	282	268	374	241
26	844	596	1,375	1,171	1,568	1,442	1,380	412	282	265	387	342
27	844	618	1,782	1,245	1,971	1,333	1,179	401	280	302	351	347
28	1,125	661	1,648	1,201	2,489	1,301	1,029	386	268	364	326	362
29	906	724	1,453	1,088	2,998	1,346	903	378	248	403	299	378
30	867	.....	1,295	1,055	3,283	1,369	830	364	237	376	329	352
31	757	.....	1,211	.....	3,042	.....	765	310	.....	393	.....	355
Mean	747	617	951	972	1,401	2,456	1,346	486	304	267	355	347

1897.

1	386	1,458	777	1,251	4,163	4,045	1,347	631	341	288	391	382
2	355	2,065	846	1,238	4,185	3,638	1,387	606	345	297	377	393
3	319	1,310	787	1,141	4,187	3,428	1,442	606	344	310	357	388
4	314	963	782	1,130	4,536	3,312	1,439	607	347	312	348	342
5	338	822	714	1,274	4,857	3,308	1,311	600	347	303	345	332
6	357	1,292	694	1,516	4,948	3,352	1,260	575	342	290	338	348
7	351	1,169	857	1,816	4,845	3,387	1,175	536	330	293	340	352
8	352	978	849	2,025	4,658	3,260	1,072	507	309	297	346	368
9	361	791	789	2,141	4,504	3,087	1,002	525	297	297	345	733
10	365	660	818	2,354	4,425	3,062	958	511	288	303	322	680
11	367	632	837	2,580	4,505	2,890	957	493	287	309	329	564
12	357	606	827	2,811	4,567	2,600	1,010	457	294	303	339	509
13	360	605	789	3,116	4,577	2,540	1,055	438	295	299	340	474
14	363	562	763	3,376	4,610	2,527	1,142	424	297	315	336	476
15	369	534	756	3,564	4,531	2,413	1,156	412	295	380	330	483
16	370	532	741	3,822	4,482	1,189	1,151	417	290	392	321	446
17	357	544	780	3,953	4,355	1,853	1,108	423	285	377	303	405
18	337	609	780	4,216	4,252	1,617	1,045	448	278	368	302	397
19	327	678	855	4,217	4,338	1,492	988	438	272	360	306	401
20	318	619	936	3,973	4,470	1,423	947	424	268	353	312	406
21	324	635	906	3,681	4,617	1,374	868	440	269	341	317	358
22	336	626	843	3,526	4,815	1,351	868	467	273	334	328	344
23	343	573	831	3,412	5,066	1,393	840	459	280	346	417	358
24	353	573	850	3,212	5,227	1,403	782	423	286	366	415	387
25	363	617	921	3,140	5,083	1,433	740	393	288	394	436	403
26	372	684	1,079	3,368	4,802	1,431	710	386	286	382	441	408
27	369	749	1,256	3,585	4,614	1,386	688	391	279	372	402	399
28	392	771	1,298	3,865	4,548	1,368	679	396	281	387	403	387
29	452	.....	1,891	4,060	4,479	1,356	681	388	271	386	392	386
30	575	.....	1,471	4,056	4,407	1,349	674	368	274	386	383	384
31	667	.....	1,291	.....	4,340	.....	658	350	.....	390	.....	376
Mean	373	809	923	2,914	4,580	2,309	1,006	469	298	340	355	422

Daily discharge, in second-feet, of Kern River at "first point of measurement," California—Continued.

1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	381	332	435	390	877	608	399	132	115	220	136	195
2	379	346	414	385	790	645	365	134	117	203	141	198
3	392	357	430	400	711	662	330	125	111	191	152	195
4	388	356	436	401	678	597	308	127	108	190	158	192
5	384	344	422	381	670	563	303	131	108	181	166	192
6	388	355	402	414	632	597	304	133	107	177	173	191
7	381	639	418	474	580	634	325	136	108	173	181	192
8	381	704	427	465	613	641	341	139	105	165	175	191
9	391	569	434	451	659	635	319	131	102	156	163	184
10	368	483	458	488	712	613	288	125	101	156	161	179
11	354	469	479	552	839	575	284	122	100	157	158	174
12	356	454	448	593	921	543	262	124	97	152	158	160
13	355	433	406	601	904	508	257	120	94	155	158	154
14	379	436	388	632	928	513	252	126	89	156	158	163
15	376	434	373	667	874	554	275	126	85	154	152	176
16	386	426	373	698	889	556	267	128	91	156	149	189
17	373	429	381	718	837	593	248	125	93	157	154	192
18	359	434	374	755	807	621	238	120	95	157	159	189
19	348	430	364	804	781	599	229	117	99	156	167	197
20	356	418	333	879	723	592	205	117	100	152	173	198
21	365	415	335	944	657	554	197	120	98	148	184	209
22	347	407	348	816	611	532	189	117	97	147	182	264
23	340	395	332	777	620	520	188	111	100	147	177	268
24	357	377	323	821	638	519	184	110	99	148	188	230
25	342	392	338	996	635	488	162	107	102	149	186	213
26	347	455	355	1,108	613	411	155	104	116	151	178	214
27	350	428	348	1,233	720	423	157	93	135	151	171	217
28	337	436	341	1,237	818	420	151	97	175	145	167	214
29	342	.....	362	1,227	771	421	136	104	280	140	173	213
30	333	.....	379	995	675	405	131	110	243	133	184	212
31	325	.....	383	.....	612	.....	131	115	.....	132	.....	205
Mean	363	434	388	710	735	551	244	120	116	160	166	199

1899.

1	196	289	303	678	759	929	859	235	100	92	186	220
2	195	300	305	621	712	1,009	856	229	101	93	189	216
3	224	307	314	612	652	944	857	208	101	90	185	209
4	240	288	320	604	633	964	811	207	103	94	185	204
5	214	279	306	624	649	1,007	776	196	105	95	190	211
6	212	275	304	700	659	1,066	763	191	108	95	100	212
7	208	274	309	768	682	1,361	719	196	115	97	196	219
8	213	264	308	855	680	1,560	679	190	115	95	191	216
9	229	264	313	925	623	1,631	622	186	108	109	190	209
10	253	274	311	1,014	588	1,770	563	184	103	111	188	214
11	308	276	299	988	649	1,926	516	173	101	114	204	203
12	346	273	272	926	850	2,072	499	170	98	126	220	195
13	300	277	267	953	1,102	1,994	280	163	105	152	213	218
14	284	281	258	968	1,258	1,756	468	155	110	180	212	220
15	277	293	253	1,010	1,225	1,568	450	150	110	191	330	224
16	281	299	261	1,049	1,051	1,550	439	147	113	194	211	267
17	285	301	262	1,132	959	1,570	446	147	113	189	236	681
18	292	300	268	1,098	913	1,550	389	142	115	193	240	514
19	296	306	264	1,070	890	1,561	360	135	109	209	233	390
20	286	325	283	1,042	852	1,514	363	135	106	219	230	324
21	278	340	319	1,037	809	1,367	349	132	103	220	239	296
22	269	359	323	1,091	794	1,218	338	130	100	222	270	302
23	276	361	323	1,114	806	1,160	312	131	96	223	278	303
24	281	359	398	1,104	907	1,149	295	132	97	226	261	316
25	282	340	2,927	972	970	1,135	289	123	100	212	238	300
26	275	324	3,115	884	923	1,082	292	119	104	198	236	303
27	266	310	1,605	771	863	948	309	114	110	187	228	293
28	269	310	1,105	951	819	848	290	108	109	183	223	280
29	274	.....	877	709	822	846	266	106	98	183	222	289
30	274	.....	797	718	885	863	255	106	93	188	222	284
31	280	.....	722	.....	803	.....	239	102	.....	189	.....	318
Mean	263	302	590	893	835	1,331	489	156	105	160	221	278

MOHAVE RIVER AT VICTOR, CALIFORNIA.

The headwaters of this river have their source on the northern slope of the Sierra Madre and flow northerly, finally disappearing in the sands of the Mohave Desert. At Victor, a station on the Atchison, Topeka and Santa Fe Railroad, the river passes through a narrow gorge, locally known as The Narrows. This place has been under investigation as a possible dam site, and soundings for the depth of bed rock were made by the United States Geological Survey during the season of 1899. The greatest depth of bed rock was found to be 54 feet. The diamond drill showed the rock to be a fine granite. A more detailed account of this exploration will be given in the Twenty-first Annual Report, Part IV. Above The Narrows the valley broadens into a large reservoir site, but as no surveys of it have been made the capacity is unknown. In order to determine the amount of water available for storage for this reservoir, a gaging station was established February 27, 1899. The rod is a 2 by 6 inch timber, bolted to a vertical cliff on right bank of the river, 600 feet upstream from wagon bridge. The bench mark is top of east rail of the Santa Fe track, 75 feet south of center of wagon bridge over track. The zero mark of rod is 12.84 feet below bench mark. The following measurements of discharge were made under the direction of J. B. Lippincott during 1899:

February 27, gage height, 1 foot; discharge, 44 second-feet.
May 5, gage height, 0.90 foot; discharge, 32 second-feet.
June 13, gage height, 0.90 foot; discharge, 25 second-feet.
July 26, gage height, 0.85 foot; discharge, 22 second-feet.

Rating table for Mohave River at Victor, California, 1899.

Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*
0.80	17	1.00	44
0.85	22	1.10	60
0.90	28		

Daily gage height, in feet, of Mohave River at Victor, California, for 1899.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.00	1.10	1.00	1.00	0.90	0.90	0.85	0.85	0.90	0.90
2	.....	1.00	1.10	1.00	.90	.90	.85	.85	.85	.90	.90
3	.....	1.00	1.00	.90	1.00	.90	.85	.85	.85	.90	.90
4	.....	1.00	1.00	.90	.90	.90	.85	.85	.85	.90	.90
5	.....	1.00	1.00	.90	.90	.90	.85	.85	.85	.90	.90
6	.....	1.00	.90	.90	.90	.90	.85	.85	.85	.90	.90
7	.....	.90	1.00	1.00	.90	.90	.85	.85	.85	.85	.90
8	.....	.90	1.00	1.00	.90	.90	.85	.85	.85	.85	.90
9	.....	1.00	.90	1.00	.90	.90	.90	.85	.85	.85	.90
10	.....	1.00	1.00	.90	.90	.90	.90	.85	.85	.85	.90
11	.....	1.00	1.00	.90	.90	.90	.90	.85	.90	.85	.90
12	.....	1.00	1.00	.90	.90	.90	.90	.85	.80	.85	.90
13	.....	.90	.90	1.00	.90	.90	.85	.85	.85	.90	.90
14	.....	.90	1.00	1.00	.90	.90	.85	.85	.85	1.00	.....
15	.....	.90	1.00	1.00	.90	.90	.85	.85	.85	.90	.....
16	.....	1.00	.90	1.00	.90	.90	.85	.85	.85	.90	.....
17	.....	1.00	.90	.90	.90	.90	.90	.85	.85	.90	.....
18	.....	1.10	1.00	1.00	.90	.90	.90	.85	.85	.90	.....
19	.....	.90	1.00	1.00	.90	.90	.80	.85	.85	.90	.....
20	.....	.90	1.00	1.00	.90	.90	.85	.85	.85	.90	.....
21	.....	1.10	1.00	1.00	.90	.90	.85	.85	.85	.90	.....
22	.....	1.00	.90	1.00	.90	.90	.85	.85	.85	.90	.....
23	.....	1.00	1.00	1.00	.90	.90	.85	.85	.85	.90	.....
24	.....	1.00	1.00	1.00	.90	.90	.85	.85	.85	.90	.....
25	.....	1.00	1.00	1.00	.90	.90	.85	.85	.85	.90	.....
26	.....	1.00	1.00	.90	.90	.85	.90	.85	.85	.90	.....
27	1.00	.90	.90	.90	.90	.85	.90	.85	.90	.90	.....
28	1.00	1.00	1.00	.90	.90	.85	.85	.85	.90	.90	.....
29	.....	1.00	1.00	1.00	.90	.85	.85	.85	.90	.90	.....
30	.....	.90	1.00	1.00	.90	.85	.85	.85	.90	.90	.....
31	.....	1.00	.....	1.00	.....	.85	.85	.....	.90	.....	.....

No record December 14 to 31.

LOS ANGELES RIVER AT THE NARROWS, CALIFORNIA.

This river heads immediately south of Santa Clara River, its various tributaries receiving their water supply from the mountains surrounding the San Fernando plains. The river passes out of the lower end of the valley through a short gorge known as The Narrows, at the lower end of which is located the city of Los Angeles. The streams entering San Fernando Valley have in the past brought down immense quantities of sand and gravel from the mountainous area, and have thus formed the San Fernando plains. This coarse deposit acts as a natural reservoir, absorbing the floods, the water gradually appearing lower down. The rainfall of southern California has been deficient for the last few years, but the discharge of Los Angeles River at The Narrows has been exceptionally constant; in 1899 the decrease in discharge being not more than 10 per cent of the average. A study of the river has been made by J. B. Lippincott for the city of Los Angeles. The flow is of marked constancy, and it is believed that the measurements indicate with fair accuracy the discharge for the respective months. As in previous reports, the discharge measurements for 1899 include the flow of the river at bridge No. 2, the main supply ditch at a point opposite, and the Glassell tributary. In addition water is diverted for irrigation purposes from a point known as Formans Lake to the vicinity of Burbank; and also from the development works of the West Los

Angeles Water Company, to the south side of Cahuenga Mountains. Results of measurements for 1896 and to April, 1899, inclusive, may be found in the Twentieth Annual Report, Part IV, page 542. The following measurements of discharge were made by J. B. Lippincott during 1899:

Discharge measurements of Los Angeles River at The Narrows, California.

1899.

Date.	Discharge.	Date.	Discharge.
	Second-feet.		*Second-feet.*
January 5	67	August 25	59
February 14	61	September 20	53
February 25	67	September 27	54
March 11	63	October 25	57
March 25	61	October 31	58
April 29	52	November 17	59
May 18	58	November 28	56
June 7	56	December 13	58
July 18	55	December 26	58
August 19	57		

ARROYO SECO, CALIFORNIA.

This is a small basin draining 21 square miles of the Sierra Madre. The river issues from the mountains on the west side of Pasadena Mesa, passes through an opening in a granite spur known as Devils Gate, and joins Los Angeles River at Los Angeles. Between the point where the water issues from the mountain and Devils Gate lies a broad river bottom 2 miles in length and composed of coarse material. In passing over this the water sinks rapidly, diminishing in volume from the mouth of the canyon to Devils Gate. The following measurements were made at the cable station at the terminal quarries by E. P. Dewey and W. B. Clapp in 1899:

Discharge measurements made on Arroyo Seco, California.

1899.

Date.	Discharge.	Date.	Discharge.
	Second-feet.		*Second-feet.*
January 10	3.02	March 20	2.52
January 11	1.90	March 21	1.90
January 12	2.00	March 22	1.64
January 12	2.06	March 23	1.56
February 1	.24	March 26	2.20
March 17	3.24	March 28	1.22
March 18	1.77	April 2	.28
March 19	.93	April 12	.07

SAN GABRIEL RIVER ABOVE AZUSA, CALIFORNIA.

The drainage basin of this river lies on the southern slope of the Sierra Madre, the watershed being included in Los Angeles County, California. The various tributaries join the river before it enters its lowest canyon, whence it appears finally on the plain in the vicinity of

Azusa. The seepage waters of this valley appear lower down in the river and finally enter the Pacific Ocean not far from the mouth of Los Angeles River. All of the surplus waters of this stream are now used for irrigation purposes. Owing to the numerous diversions, it has been difficult to obtain accurate discharge measurements; but during 1898 the San Gabriel Electric Company completed its system, and measurements are now obtained with greater ease and hence with greater accuracy. The headworks of this company are located about 6 miles above the mouth of the canyon; the water is carried along the left side by a series of tunnels and conduits, and a head of 400 feet is obtained where the electric power is generated. Weirs are placed on the conduit of the electric company, and the water is measured at this point. The capacity of the conduit is 90 second-feet. The season of 1899 was notable in southern California for the deficiency of rainfall, and on six days only was there a surplus of water flowing past the gaging station. The following are the dates, with their respective discharges, on which water passed the gaging station in 1899:

January 11, gage height, 1.18 feet; discharge, 16 second-feet.
January 12, gage height, 1.08 feet; discharge, 12 second-feet.
January 13, gage height, 0.90 foot; discharge, 6 second-feet.
January 14, gage height, 0.78 foot; discharge, 2 second-feet.
January 15, gage height, 0.70 foot; discharge, 1 second-foot.
October 14, gage height, 1.10 feet; discharge, 13 second-feet.

From these measurements the following rating table was constructed:

Rating table for San Gabriel River above Azusa, California, 1899.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
0.40	0.0	1.00	9	1.60	38
0.50	0.2	1.10	13	1.70	45
0.60	0.5	1.20	17	1.80	53
0.70	1.2	1.30	21	1.90	63
0.80	3.0	1.40	26	2.00	80
0.90	6.0	1.50	31	.....	.....

During the rest of the year the entire flow passed through the electric company's canal. The gaging station on the main river is located at the mouth of the canyon. The equipment consists of a rod, cable, car, and tagged wire. Results of measurements may be found as follows: 1896, Eighteenth Annual Report, Part IV, page 405; 1897, Nineteenth Annual Report, Part IV, page 528; 1898, Twentieth Annual Report, Part IV, page 550. The first of the following tables shows the dates in 1898 at which there was water in the main river, together with the amount of discharge. The next table shows the combined discharge for 1898 of the canals diverting water at the mouth of the canyon. A part of this table, from September to December, inclusive, was published in Water-Supply Paper No. 28, page 190; but the data for

the previous portion of the year having now been obtained, the entire table is here given. Dates in 1899 on which there was water passing the gaging station on the main river are given above. Following the table of canal discharges for 1898 is a table showing the daily discharge of San Gabriel canals for 1899. The total flow of the river is obtained by adding the daily discharge for the river to the figures, for the corresponding dates, for the canals.

Daily discharge, in second-feet, of San Gabriel River above Azusa, California, for 1898.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	0.0	8.0	0.0	0.0	0.0	17	19.0	31.0	0.0	0.0	11.0
2	0.0	9.0	0.0	0.0	0.0	18	17.0	11.0	0.0	0.0	9.0
3	0.0	9.0	0.0	0.0	0.0	19	17.0	11.0	0.0	0.0	9.0
4	0.0	9.0	0.0	0.0	0.0	20	17.0	11.0	0.0	0.0	9.0
5	0.0	0.2	0.0	0.0	13.0	21	17.0	11.0	0.0	0.0	0.0
6	0.0	0.2	0.0	0.0	0.0	22	17.0	11.0	0.0	0.0	0.0
7	0.0	0.2	0.0	0.0	0.0	23	15.0	9.0	0.0	0.0	0.0
8	0.0	41.0	0.0	0.0	0.0	24	15.0	0.0	0.0	0.0	0.0
9	26.0	31.0	0.0	0.0	0.0	25	15.0	0.0	0.0	0.0	0.0
10	31.0	26.0	1.0	0.0	0.0	26	15.0	0.0	0.0	0.0	0.0
11	26.0	21.0	0.0	0.0	0.0	27	15.0	0.0	0.0	0.0	0.0
12	24.0	15.0	0.0	0.0	0.0	28	15.0	0.0	0.0	0.0	0.0
13	24.0	13.0	0.0	0.0	0.0	29	15.0	.....	0.0	0.0	0.0
14	24.0	11.0	0.0	0.0	0.0	30	15.0	.....	0.0	0.0	0.0
15	21.0	9.0	0.0	0.0	63.0	31	9.0	.....	0.0	.....	0.0
16	21.0	31.0	0.0	0.0	24.0						

River dry June 1 to December 31.

Daily discharge, in second-feet, of the San Gabriel canals above Azusa, California, for 1898.

[Drainage area, 222 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	28.0	28.0	33.0	36.5	26.0	30.0	14.5	9.5	8.2	9.0	9.0	11.7
2	28.0	28.0	32.0	37.0	39.0	28.0	13.0	9.5	10.0	9.8	8.5	11.8
3	28.0	28.0	31.0	37.0	37.0	25.0	13.5	9.5	8.2	10.0	8.5	11.8
4	28.0	28.0	31.0	37.0	36.0	25.5	13.0	9.0	8.2	10.5	8.0	11.9
5	27.0	32.0	31.0	37.5	34.0	22.8	13.0	9.0	8.2	9.0	8.5	11.9
6	27.0	32.0	31.0	36.5	31.5	21.0	12.0	9.0	8.2	9.0	9.0	11.9
7	27.0	32.0	30.0	36.0	32.0	20.2	14.0	8.5	7.9	8.5	9.0	12.0
8	27.0	29.0	30.0	35.0	31.0	20.0	12.5	8.5	7.9	8.5	9.0	12.0
9	32.0	29.0	28.0	35.0	30.0	20.0	11.5	8.5	8.0	8.5	8.5	12.0
10	32.0	29.0	34.0	35.0	28.0	21.5	11.5	8.4	8.0	9.0	8.7	12.2
11	31.0	29.0	34.0	34.0	25.0	23.5	11.0	8.5	7.5	8.7	9.0	12.5
12	25.0	32.0	32.5	32.5	25.0	22.0	11.0	8.5	7.5	8.0	9.8	12.6
13	25.0	32.0	34.0	32.5	25.0	21.4	10.0	8.4	7.5	8.0	9.8	12.6
14	25.0	32.0	33.5	32.5	25.5	21.0	10.0	6.5	7.5	7.5	9.2	12.6
15	25.0	32.0	33.5	34.0	20.0	20.2	9.7	7.0	7.0	7.5	9.8	18.2
16	25.0	10.0	36.0	34.0	27.5	18.0	10.0	7.0	7.0	7.5	9.8	15.2
17	25.0	10.0	36.0	34.0	45.5	17.5	9.7	7.0	6.7	8.0	9.8	15.0
18	25.0	29.0	37.0	34.0	40.0	16.2	10.0	7.0	6.5	8.0	9.0	15.0
19	25.0	29.0	37.0	33.0	38.5	15.2	10.0	5.0	6.5	8.4	10.1	14.4
20	25.0	29.0	37.0	33.0	33.5	17.0	10.0	5.5	6.1	8.6	10.5	14.5
21	25.0	29.0	37.0	32.0	37.0	16.0	11.5	6.0	7.5	7.9	10.5	14.5
22	24.0	29.0	36.0	30.0	36.0	17.0	11.5	6.0	7.5	8.2	10.5	14.5
23	24.0	29.0	34.0	29.0	35.0	17.3	11.5	6.0	7.5	9.0	11.2	14.5
24	23.0	34.0	34.0	27.0	32.5	17.0	9.5	6.0	7.5	10.0	11.2	14.5
25	23.0	34.0	34.0	26.0	30.5	16.0	9.5	5.5	8.5	9.0	10.5	14.8
26	23.0	34.0	48.0	25.3	30.0	16.0	9.0	5.5	8.5	9.1	10.5	14.0
27	23.0	34.0	41.0	25.3	30.0	16.0	9.0	6.3	7.5	9.1	10.5	14.0
28	23.0	34.0	39.0	27.0	30.5	15.8	9.0	7.5	10.2	8.9	11.0	14.0
29	23.0	.....	36.0	30.0	29.5	15.0	9.5	7.0	8.0	8.9	11.5	14.3
30	23.0	.....	36.0	35.5	30.5	14.5	9.5	7.0	10.2	8.4	11.5	14.0
31	28.0	.....	37.0	.....	30.0	.....	9.5	7.0	.....	8.4	.....	14.5
Mean	25.9	29.1	34.6	32.8	31.7	19.5	10.9	7.4	7.9	8.7	9.8	13.5

Daily discharge, in second-feet, of the San Gabriel canals above Azusa, California, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	14.8	27.2	20.3	28.0	17.5	22.2	4.0	5.0	3.4	3.7	12.0	16.2
2	24.2	28.0	20.3	27.5	17.5	20.0	4.0	5.1	3.0	4.0	11.5	16.0
3	20.3	26.2	21.5	25.2	17.0	17.0	4.0	5.5	4.0	4.0	11.5	16.0
4	19.0	24.2	19.4	24.8	17.0	15.0	4.0	5.5	4.3	4.0	11.7	16.0
5	19.0	23.5	18.7	24.8	15.5	14.8	4.0	6.0	3.7	4.0	10.1	16.3
6	18.0	23.5	18.5	25.0	17.5	13.5	4.2	6.0	4.3	4.0	10.2	16.0
7	18.0	23.5	18.0	24.0	17.5	12.0	4.2	5.0	3.7	4.3	10.2	16.0
8	18.0	23.5	18.5	22.2	16.5	11.0	3.5	4.7	4.5	3.7	10.2	15.7
9	18.0	23.4	18.7	22.0	15.5	9.7	3.4	4.7	5.5	3.7	10.3	15.5
10	22.0	23.4	18.7	23.5	14.0	8.5	3.4	4.5	5.0	4.4	12.0	15.5
11	33.0	23.4	19.0	23.5	13.0	8.8	3.5	4.7	4.0	8.5	12.0	15.5
12	32.0	23.4	19.0	22.2	13.0	9.0	3.4	4.5	4.0	9.0	12.0	15.5
13	22.0	23.0	19.0	21.0	12.5	9.5	3.0	4.5	3.6	22.0	12.0	15.5
14	22.0	21.8	19.0	21.0	12.0	9.2	3.4	4.3	3.8	22.0	14.5	15.5
15	22.0	21.6	19.0	20.5	12.5	8.0	3.5	4.0	4.2	26.0	15.0	16.0
16	22.0	20.3	31.2	20.0	14.1	7.8	3.5	4.0	4.0	19.0	15.0	23.0
17	18.0	20.0	36.4	19.7	13.0	7.5	3.3	4.5	3.7	16.0	15.0	39.0
18	18.0	20.0	35.0	19.5	13.0	7.5	3.0	6.0	3.7	15.0	14.0	30.0
19	19.7	19.7	29.0	19.5	13.5	7.3	3.0	6.0	3.7	13.5	14.0	28.0
20	19.3	19.7	39.5	18.5	11.5	7.0	3.0	6.0	3.7	13.5	14.0	25.0
21	20.4	19.7	37.4	17.0	11.5	7.0	3.0	5.5	3.3	13.0	16.0	23.0
22	21.6	19.7	32.7	16.5	11.5	6.2	3.3	5.5	3.3	13.5	23.5	22.5
23	22.8	20.3	31.7	16.2	11.5	6.2	3.5	5.0	3.3	14.0	20.0	21.5
24	23.6	22.4	32.5	17.5	12.0	6.2	3.5	4.0	3.0	14.0	18.3	20.7
25	24.0	21.8	35.5	19.3	12.0	6.2	3.5	4.0	3.0	12.5	18.0	20.7
26	24.0	21.2	35.4	21.0	12.0	6.2	4.0	4.0	3.0	12.0	17.2	20.7
27	24.1	21.2	32.0	21.3	11.5	6.0	4.0	4.0	3.3	12.0	17.0	20.7
28	23.5	21.0	32.0	20.5	11.5	5.5	4.0	5.5	3.3	12.3	17.0	21.0
29	23.2	.....	31.6	18.0	12.7	5.5	4.0	4.0	3.3	11.5	16.7	23.0
30	24.2	.....	30.0	17.5	12.0	4.9	4.0	4.0	3.7	13.0	16.3	23.0
31	26.2	.....	29.5	.....	13.5	.....	4.0	4.0	.....	12.3	.....	22.0
Mean	21.8	22.4	26.4	21.2	13.7	9.5	3.6	4.8	3.7	11.1	14.2	20.3

LYTLE CREEK AT MOUTH OF CANYON, CALIFORNIA.

This small stream drains the southern slope of the Sierra Madre and discharges its waters onto the plains northwest of San Bernardino. Although it drains a comparatively small area of 54 square miles, at the mouth of the canyon its waters are important for irrigation purposes. Owing to the controversies which have arisen over its diversions, a number of lawsuits for the settlement of the claims have been instituted from time to time. A number of measurements of this stream at the mouth of the canyon from 1892 to 1896, inclusive, are given below. They are copied from court records of proceedings in which the water supply of this creek was involved. These cases were tried in the San Bernardino courts by Judge A. W. McKinley. The measurements were made by A. H. Koebig and G. O. Newman, on weirs, and are believed to be accurate.

Discharge measurements of Lytle Creek at mouth of canyon, California.

Date.	Discharge.	Date.	Discharge.
1892.	*Second-feet.*	1894.	*Second-feet.*
June 3	35.58	August 19	11.44
September 20	18.70	August 25	12.32
September 30	22.04	October 3	16.20
October 28	20.64		
November 21	22.04	1895.	
November 27	20.68	September 2	56.10
		September 30	40.78
1893.			
		1896.	
September 7	49.20		
September 18	49.20	March 3	18.08
September 25	46.34	April 23	19.14
October 4	45.30	April 24	18.60
		April 25	20.52
1894.		May 3	18.52
		May 4	17.26
June 6	17.96	May 10	18.16
June 8	15.50	May 25	15.32
July 10	13.22	May 26	12.84
July 11	13.22		
July 25	13.36		

Beginning in 1894, measurements of Lytle Creek were also made by H. D. Sibley, who was zanjero of the Lytle Creek canals at that time. The measurements were usually made because the discharge of the stream was below normal. In the winter and spring only the amount of water needed for irrigation was turned into the ditches, but later in the summer the entire flow was diverted. These measurements also were made over weirs, and are believed to be fairly accurate. During 1898 trouble was experienced by miners taking the water from the natural channel and turning it into dry channels, sluice boxes, weirs, mill races, etc., thereby causing a loss of from 20 to 25 per cent of the total flow of the creek. Only a portion of these latter diversions were returned to the creek. The measurements of Mr. Sibley would not show the full flow of Lytle Creek at all times, and sometimes show less than the full discharge, for the reasons mentioned above. During 1899 the amount of water which was diverted into the main canal was measured daily by the Anglo-American Canaigre Company, at a weir erected near the head of its cement ditch. The volumes given have been occasionally checked by visiting the canal and making meter measurements. It is believed that during 1899 practically all of the water of the stream was diverted into the canal.

Discharge, in second-feet, of Lytle Creek main canal above Rialto, California.

1894.

[Drainage area, 54 square miles.]

Day.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1			15.5					
2								
3		24.1	17.2		10.9		13.5	
4								
5	16.1			10.8				
6		22.6						
7			14.1				11.4	14.5
8	19.9				10.8	13.0		
9								13.7
10								
11	17.8	18.5	14.3	10.8			13.7	
12								
13	21.8			13.4				
14			14.3			13.2		
15								
16	22.6		14.4					
17		19.1						
18			15.0		13.7	11.5	14.5	
19	22.6			14.1				
20								
21			14.8	12.7				
22	24.9				11.9	12.7		12.9
23			14.6					
24		18.2	14.9					
25	25.4						14.2	
26								
27			15.0					
28		16.6						
29								
30								12.5
31				11.7	13.4			

1895.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			54.4						
2									
3							36.9		
4			68.0			51.4			
5									
6									
7								30.5	
8		33.9					31.5		
9									
10						48.8			
11								24.9	
12						50.8			
13									22.0
14									
15									
16					50.4				
17						44.8			
18	26.4	43.8					41.9		
19									
20									
21		57.5					36.5		
22							34.1	24.0	
23	37.4				52.5				
24						47.1			
25									
26					54.4				
27									
28						36.5	34.5		
29									
30									
31							34.5		

June 5 to August 16 ditch broken, no measurements.

Discharge, in second-feet, of Lytle Creek main canal above Rialto, California—Continued.

1896.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					17.8				13.2			
2				22.2		14.1	11.1					
3												
4												
5	20.0									12.2		
6						11.4			12.2			
7								11.5				
8		19.2					11.1					
9						13.5				11.6		16.0
10						12.5			12.2			
11												
12						11.9		10.5				
13		18.4										
14						12.2	12.2					16.0
15				24.9								
16	21.4				17.1			13.7	10.8			17.0
17			19.8									
18				19.7				11.3				
19									11.8			
20							10.5					
21								12.0				
22												16.0
23								12.5		11.1		
24				22.4				12.5				
25											28.0	
26									11.8	20.0		
27							10.7					
28								13.5				
29		17.5										
30					15.0							24.0
31												

Heavy rains March 1 to 5 and October 26; all water turned out of canal.

1897.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1								
2								
3		60.0						
4					36.0			
5								
6			60.0					
7		24.0						
8								
9				50.0	30.0			
10	16.0							
11								
12								10.6
13								
14			60.0					
15								
16	24.0				34.0			
17								
18		80.0						
19				60.0				
20								
21		50.0						
22								
23								
24				50.0				
25	20.0		60.0					
26								
27								
28		56.0	70.0	40.0				
29	28.0							
30								
31								

Heavy rains February 3 and 18, March 28, September 14. Chicala Water Company took charge of station June 1.

Discharge, in second-feet, of Lytle Creek main canal above Rialto, California—Continued.

1898.

Day.	May.	June.	July.	Day.	May.	June.	July.	Day.	May.	June.	July.
1	.....	.....	10.9	12	.....	.....	.....	22	.....	11.7	.....
2	.....	.....	.....	13	.....	.....	.....	23	.....	.....	.....
3	.....	.....	.....	41	.....	.....	.....	24	.....	.....	.....
4	.....	.....	.....	15	.....	13.9	.....	25	.....	.....	.....
5	.....	.....	.....	16	.....	.....	.....	26	.....	.....	.....
6	.....	.....	.....	17	.....	.....	.....	27	.....	.....	.....
7	.....	.....	.....	18	.....	.....	.....	28	14.6	09.0	.....
8	.....	.....	.....	19	.....	.....	.....	29	.....	.....	.....
9	.....	.....	.....	20	.....	11.5	.....	30	.....	.....	.....
10	.....	.....	.....	21	.....	.....	.....	31	.....	.....	.....
11	.....	.....	.....								

No measurements for January to April, inclusive, and August to December, inclusive.

1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	11.1	11.8	11.2	9.7	11.2	12.2	6.3	9.4	14.5	10.9	10.5	11.1
2	11.1	12.1	11.1	8.9	10.9	10.4	6.8	10.4	15.1	10.8	10.3	11.3
3	12.1	12.1	11.2	8.5	10.9	9.7	6.4	9.6	16.6	10.8	10.3	11.4
4	11.4	12.4	11.1	12.6	10.5	9.5	6.4	10.7	16.7	10.8	10.6	11.1
5	11.7	12.4	10.8	12.5	10.5	9.4	6.4	12.2	16.0	10.7	10.5	11.3
6	11.6	12.5	10.6	12.1	10.5	9.6	6.4	11.0	16.0	10.6	10.6	11.3
7	11.6	12.6	10.4	11.9	10.5	9.2	6.3	10.8	16.0	10.1	10.6	11.3
8	11.6	12.4	10.4	11.8	10.2	9.0	6.2	11.0	15.9	9.9	9.9	11.6
9	11.6	12.1	10.9	11.7	11.8	.....	6.2	11.0	16.5	10.2	9.9	11.4
10	12.0	11.8	10.6	11.9	9.5	7.2	6.0	8.7	16.1	10.8	10.0	11.5
11	16.1	11.8	10.6	11.7	9.5	7.5	5.9	12.0	16.0	11.7	10.2	11.4
12	13.1	11.8	10.6	11.7	9.2	8.2	6.0	12.0	15.8	72.1[a]	10.5	11.3
13	12.2	11.8	10.7	11.0	9.6	8.1	5.9	12.2	15.3	12.4	10.9	11.2
14	12.0	11.6	10.7	10.6	9.5	7.8	5.9	12.1	15.4	13.5	11.0	11.1
15	11.9	11.5	10.7	10.6	9.8	.....	6.0	12.3	16.0	12.7	11.3	11.2
16	12.0	11.5	15.3	10.7	9.4	7.6	6.0	12.3	15.5	13.0	11.7	12.9
17	12.0	11.5	14.7	10.6	9.4	7.8	5.8	12.2	15.3	13.0	11.5	11.8
18	12.0	11.3	13.7	10.7	9.4	7.9	5.4	12.6	14.3	12.3	12.0	11.8
19	11.9	11.4	12.3	10.2	9.7	7.7	5.6	13.0	15.7	12.0	11.9	11.6
20	11.8	11.3	13.7	10.8	9.8	7.3	5.6	13.0	14.9	11.4	11.8	11.6
21	11.7	11.3	13.1	9.9	9.5	7.5	5.8	12.5	15.2	11.2	12.2	11.3
22	11.8	11.3	12.9	9.9	9.4	7.6	7.2	12.4	16.1	11.6	12.7	11.1
23	11.7	11.3	12.8	10.3	9.4	7.4	8.6	12.4	10.8	11.9	12.1	11.1
24	11.6	11.8	13.2	10.6	9.2	7.1	9.3	12.5	10.4	10.3	12.0	11.1
25	11.6	11.4	14.8	10.5	9.2	7.2	8.9	12.4	10.3	10.7	13.8	10.9
26	11.6	11.4	13.5	10.4	9.0	7.4	9.2	12.6	10.3	11.4	11.7	11.2
27	11.6	11.3	13.4	10.4	9.0	7.3	9.4	12.5	10.5	11.3	11.5	11.1
28	11.6	11.3	13.6	10.4	9.0	7.2	9.5	12.2	10.5	11.1	11.5	11.1
29	11.6	.....	13.6	11.0	9.4	6.7	9.7	12.3	10.6	11.0	11.4	11.2
30	11.6	.....	13.5	11.2	9.3	6.4	9.6	12.2	10.6	11.4	11.2	11.1
31	11.7	.....	13.5	.....	.....	.....	10.0	12.1	.....	11.3	.....	11.3
Mean	11.9	11.7	12.2	10.8	9.8	8.1	7.1	11.8	14.3	13.3	11.2	11.3

[a] Rain in mountains.

SANTA ANA RIVER AT WARMSPRINGS, CALIFORNIA.

This river has its source on the southern slope of the San Bernardino Mountains and flows southerly, appearing from its canyon 4 miles north of Redlands. Its waters are completely used in San Bernardino Valley. At the lower part of the valley the water appears again in the vicinity of Rincon, where the river passes through a comparatively narrow gorge, and the general direction of the stream is thence southwesterly, emptying into the Pacific Ocean. The station, established June, 1896, is located 5 miles northeast of Mentone, California, three-fourths of a mile below the headworks of the Santa Ana canal and opposite the warm springs in the canyon. The gage is an inclined timber fastened to a large bowlder and posts set in the bank of the river. On October 16, 1898, owing to some local legal complications, an unusually large volume of water was turned into the Santa Ana canal by the Bear Valley Company. This water was wasted from the canal at a point below the old gage rod, necessitating the establishment of a new gage rod upon this stream at a point below where the waste from the canal was turned into the river. The new gage was put in November 9, 1898, and since that date daily observations have been kept on the lower gage, which is a 2 by 6 inch timber firmly bolted to a granite cliff which forms the left bank of the river, and is situated 800 feet below the mouth of Warmsprings Canyon and 100 feet above a ford on the canyon road. A landslide occurred below the gage rod April 16, 1899, which changed the condition of the rating for the station. Owing to the shifting nature of the stream bed it has not been possible to construct perfectly satisfactory rating curves, but the tables as presented are based on the best information that could be obtained. The record is not considered absolutely correct, but is given as an approximation. This river is one of the most difficult streams in the State of which to obtain an accurate record. The Edison Electric Company diverts the greater portion of the water of Santa Ana River above the gaging station, but also returns all of it above the station; they, however, allow only limited portions of the water to pass out of their conduits during certain hours of the day, holding back the water for the purpose of obtaining additional power when the greatest demand exists. An effort is being made to arrange with this company to obtain a record of the number of gates, the sizes of the openings, and the hours at which the various wheels are run, in order to more accurately determine the volumes of water. The Santa Ana canal, as mentioned above, also diverts water from Santa Ana River above the station, but the greater part of it is returned to the channel of the stream before passing the point of measurement. A portion, as indicated by the measurements below, passes down the canal. Results of measurements may be found as follows: 1896, Eighteenth Annual Report, Part IV, page 411; 1898,

Twentieth Annual Report, Part IV, page 554. A number of measurements of discharge of the canals diverting water from Santa Ana River at the mouth of the canyon were made by S. G. Bennett, and are given below. The following measurements were made at the main station under the direction of J. B. Lippincott in 1899:

Discharge measurements of Santa Ana River at Warmsprings, California.

1899.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Second-feet.*		*Feet.*	*Second-feet.*
January 12	2.34	38.00	May 31	2.27	21.00
February 18	2.16	28.04	June 15	2.21	19.60
March 23	2.30	29.62	July 15	2.30	25.90
May 6	2.45	25.84	August 24	1.85	10.86

Rating table for Santa Ana River at Warmsprings, California, applicable from January 1 to April 15, 1899.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.8	12.5	2.1	21.5	2.3	34.0
1.9	15.0	2.2	26.5	2.4	48.0
2.0	18.0				

Rating table for Santa Ana River at Warmsprings, California, applicable from April 16 to December 31, 1899.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.7	8.0	2.2	19.0	2.7	36.0
1.8	10.0	2.3	22.0	2.8	41.0
1.9	12.0	2.4	25.0	2.9	46.5
2.0	14.0	2.5	28.5	3.0	52.5
2.1	16.5	2.6	32.0		

Discharge measurements of Santa Ana canal, California.

1899.

Date.	Discharge.	Date.	Discharge.
	Second-feet.		*Second-feet.*
January 12	.....	May 31	1.10
February 18	4.00	June 15	.20
March 23	7.60	July 15	.....
May 6	3.40	August 24	.....

Discharge measurements of canals diverting water from Santa Ana River at mouth of canyon, California.

Date.	Canal.	Discharge.
1899.		*Second-feet.*
February 18	North Fork or Highland ditch	8.07
February 18	South Fork or Redlands ditch	15.70
February 18	Green Spot pipe line	.35
March 23	North Fork or Highland ditch	11.78
March 23	South Fork or Redlands ditch	17
March 23	Green Spot pipe line	3.71
May 6	North Fork or Highland ditch	7.70
May 6	South Fork or Redlands ditch	15.50
May 6	Green Spot pipe line	1.43
May 31	North Fork or Highland ditch	6.74
May 31	South Fork or Redlands ditch	14.67
May 31	Green Spot pipe line	.14
June 15	North Fork or Highland ditch	10.30
June 15	Morton Canyon water	.17
June 15	Redlands tunnel water at point where it reaches South Fork ditch.	.67
June 15	South Fork or Redlands ditch at flume above sand box.	7.76
June 15	Head of Green Spot pipe line	.08
July 12	South Fork or Redlands ditch	11.50
July 15	North Fork or Highland ditch	13.14
July 15	Morton Canyon water	.12
July 15	Redlands tunnel	1.03
July 15	South Fork or Redlands ditch	12.70
July 15	Head of Green Spot pipe line.	.59

Daily gage height, in feet, of Santa Ana River at Warmsprings, California, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.10	2.20	2.20	2.30	2.35	2.65	2.30	2.20	1.90	1.90	2.20	2.35
2	2.10	2.25	2.20	2.20	2.30	2.35	2.30	2.20	1.90	1.90	2.20	2.24
3	2.10	2.25	2.20	2.15	2.30	2.40	2.30	2.20	1.90	1.90	2.20	2.24
4	2.10	2.25	2.20	2.20	2.35	2.35	2.30	2.00	1.90	1.90	2.20	2.26
5	2.10	2.20	2.20	2.20	2.40	2.30	2.30	2.00	1.90	1.90	2.11	2.20
6	2.10	2.20	2.20	2.20	2.45	2.30	2.35	2.00	1.90	1.90	2.12	2.17
7	2.10	2.20	2.20	2.20	2.45	2.30	2.35	1.90	1.90	2.00	2,15	2.18
8	2.10	2.20	2.20	2.20	2.35	2.30	2.35	1.90	1.90	1.95	2.16	2.15
9	2.10	2.20	2.20	2.15	2.25	2.30	2.35	1.90	1.90	1.95	2.15	2.22
10	2.10	2.20	2.20	2.15	2.25	2.25	2.37	1.90	1.90	1.90	2.15	2.27
11	2.30	2.20	2.20	2.15	2.30	2.25	2.37	1.90	1.90	1.90	2.15	2.16
12	2.30	2.20	2.20	2.15	2.30	2.25	2.35	1.90	1.90	1.90	2.12	2.25
13	2.30	2.20	2.15	2.15	2.35	2.30	2.35	1.90	1.90	2.20	2.17	2.25
14	2.30	2.20	2.15	2.10	2.35	2.30	2.35	1.90	1.90	2.20	2.15	2.25
15	2.20	2.20	2.15	2.10	2.30	2.30	2.30	1.90	1.90	2.15	2.61	2.25
16	2.20	2.20	2.20	2.40	2.30	2.25	2.30	1.90	1.90	2.15	2.19	2.25
17	2.20	2.20	2.25	2.35	2.30	2.30	2.30	1.90	1.90	2.15	2.30	2.51
18	2.20	2.20	2.35	2.35	2.25	2.30	2.30	1.90	1.80	2.15	2.44	2.47
19	2.20	2.20	2.30	2.35	2.25	2.20	2.30	1.90	1.80	2.17	2.24	2.48
20	2.20	2.20	2.55	2.30	2.25	2.30	2.25	1.87	1.80	2.17	2.29	2.44
21	2.20	2.20	2.55	2.30	2.30	2.30	2.20	1.87	1.80	2.17	2.26	2.37
22	2.20	2.20	2.30	2.30	2.20	2.25	2.25	1.87	1.80	2.17	2.95	2.49
23	2.20	2.20	2.30	2.30	2.25	2.25	2.25	1.87	1.85	2.17	2.51	2.71
24	2.20	2.30	2.35	2.35	2.30	2.25	2.25	1.87	1.85	2.17	2.24	2.64
25	2.20	2.20	2.35	2.40	2.30	2.30	2.50	1.90	1.85	2.20	2.30	2.22
26	2.20	2.25	2.35	2.40	2.30	2.35	2.50	1.90	1.90	2.20	2.26	2.34
27	2.20	2.20	2.40	2.40	2.25	2.30	2.30	1.90	1.90	2.20	2.33	2.36
28	2.20	2.20	2.35	2.40	2.30	2.30	2.27	1.90	1.90	2.20	2.25	2.40
29	2.20	.....	2,35	2.40	2.30	2.28	2.25	1.90	1.90	2.20	2.25	2.39
30	2.20	.....	2.35	2.35	2.30	2.28	2.20	1.90	1.90	2.20	2.25	2.34
31	2.20	.....	2.30	.....	2.30	.....	2.20	1.90	.....	2.20	.....	2.47

MILL CREEK IN CANYON, CALIFORNIA.

This stream is one of the larger tributaries of Santa Ana River, although on account of its importance for irrigation it is generally considered as an independent stream. It rises on the western slope of the San Bernardino Mountains, draining the area immediately south of the headwaters of Santa Ana River. Mill Creek appears from its canyon about 5 miles east of Redlands. The Crafton Water Company diverts all of the water of this creek at the mouth of the canyon, particularly in the summer. The water passes over a weir, and the volume is therefore determined with considerable accuracy. The records have been furnished to this office by Mr. Herbert Garstine, president of the Crafton Water Company. They are particularly accurate for low-water measurements. This stream is described in detail in the Nineteenth Annual Report, Part IV, page 551. The first table gives the measurements made by S. G. Bennett near the head of Crafton zanja in 1899. The second table shows the discharge of Mill Creek, as furnished by the Crafton Water Company, at the head of Crafton zanja during the irrigation seasons of 1897, 1898, and 1899.

Discharge measurements near head of Crafton zanja, California.

1899.

Date.	Discharge.	Date.	Discharge.
	Second-feet.		*Second-feet.*
January 12	10.77	May 31	11.61
February 18	10.53	June 15	6.94
March 23	15.63	July 15	7.40
May 6	14.55	August 24	7.18

Discharge, in second-feet, of Mill Creek at head of Crafton zanja, California.

1897.

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

Discharge, in second-feet, of Mill Creek at head of Crafton zanja, California—Continued.

1898.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	17	26	16	11	8	9	9	10	10
2	.....	17	22	16	10	8	9	9	10	10
3	.....	17	17	16	10	8	7	9	10	10
4	.....	17	17	16	11	8	9	9	10	10
5	.....	17	16	16	11	8	8	9	10	10
6	.....	17	17	14	11	7	9	9	10	10
7	.....	17	17	12	11	7	8	9	10	10
8	.....	17	17	14	10	7	8	9	10	10
9	.....	17	17	14	10	7	8	9	10	10
10	.....	17	15	15	8	*a*10	8	9	10	11
11	.....	16	15	14	8	10	8	9	10	11
12	.....	17	15	14	10	8	7	9	10	11
13	.....	17	15	14	10	8	8	9	10	11
14	.....	18	15	13	10	7	8	9	10	11
15	.....	18	18	13	9	7	8	9	10	12
16	.....	17	18	13	9	7	7	9	10	11
17	.....	17	18	12	9	7	8	9	10	12
18	.....	17	18	15	8	7	8	9	10	11
19	.....	17	20	12	9	7	8	9	10	11
20	.....	17	18	12	9	11	8	9	10	11
21	17	17	17	13	9	25	8	9	10	11
22	.....	17	16	12	9	17	8	9	10	11
23	.....	17	16	13	9	14	8	9	10	10
24	.....	17	18	12	8	10	8	8	10	10
25	18	16	16	12	7	10	9	9	10	11
26	18	16	16	11	9	9	9	8	10	11
27	17	15	18	11	7	9	9	9	10	10
28	17	16	18	11	7	13	9	9	10	11
29	17	19	17	10	7	13	8	9	10	11
30	17	19	16	10	8	11	9	10	10	11
31	17	.....	16	.....	7	11	.....	10	.....	11

a Not entire flow of creek.

1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	11	11	11	13	12	17	5.6	7.1	5.5	4.8	7.2	9.8
2	11	11	11	13	11	13	6.2	6.2	5.6	5.3	7.2	9.5
3	11	11	11	12	11	12	6.2	5.8	5.4	5.3	6.8	9.4
4	11	11	11	12	11	11	6.2	6.7	5.4	4.3	6.8	8.8
5	11	11	11	12	11	10	4.9	7.2	5.5	4.6	7.2	8.0
6	12	11	11	11	11	11	6.7	6.9	5.6	6.3	7.2	7.8
7	11	11	11	12	12	10	6.7	6.7	5.6	5.6	7.2	8.0
8	10	11	11	12	12	10	6.7	6.2	5.3	4.8	7.2	5.3
9	11	12	11	12	12	10	6.7	6.2	5.7	5.6	6.1	9.0
10	.....	12	.....	12	12	8	6.2	6.2	5.3	5.2	6.1	8.8
11	.....	12	10	12	12	8	6.2	6.2	5.3	5.7	6.8	9.0
12	.....	12	10	11	12	8	6.2	6.2	4.9	6.1	6.8	8.2
13	.....	.....	10	11	12	8	4.8	5.6	4.9	6.2	6.4	9.8
14	.....	12	10	11	11	7	4.8	5.3	4.9	8.5	11.2	9.6
15	.....	12	10	11	12	7	5.1	6.2	5.2	7.8	11.2	9.6
16	.....	12	10	12	12	8	7.2	5.6	4.8	7.8	9.8	7.8
17	.....	.....	13	12	12	9	6.3	5.3	3.2	7.8	9.8	14.6
18	.....	12	13	13	11	8	4.9	6.0	3.0	7.2	9.8	13.0
19	.....	12	11	12	11	8	6.2	6.0	3.0	7.8	9.8	12.6
20	.....	12	15	11	11	8	4.9	5.3	2.8	7.2	9.7	9.8
21	.....	.....	14	11	11	8	5.1	5.9	2.8	7.2	9.7	9.4
22	.....	11	12	12	11	8	5.8	5.9	2.8	7.2	9.6	11.0
23	.....	11	12	11	11	7	6.2	5.3	2.8	7.8	9.7	9.6
24	.....	13	16	12	10	7	6.5	5.2	2.8	6.6	9.8	9.8
25	.....	11	16	12	10	7	5.4	5.3	2.8	6.6	10.4	9.8
26	.....	12	16	12	10	8	5.4	5.3	2.8	7.8	10.0	10.0
27	.....	12	12	12	11	8	4.8	5.8	2.9	7.2	9.8	10.0
28	.....	11	12	12	10	7	4.8	4.3	2.0	7.2	9.8	8.5
29	.....	.....	16	12	11	6	5.5	4.3	2.7	7.2	9.8	9.4
30	.....	.....	16	12	11	4	5.5	5.3	2.8	7.2	9.8	9.8
31	.....	.....	14	.....	11	.....	5.5	2.9	.....	7.2	.....	10.0

DEVELOPED WATER OF SAN BERNARDINO VALLEY, CALIFORNIA.

The streams of the eastern end of San Bernardino Valley are discharged from their mountain canyons on a delta-like formation of gravel and sand, into which the water rapidly sinks. Apparently a dike of impervious material extends across this valley in a northwest-southeast direction, passing a short distance east of the town of Colton. Into this body of undergound water numerous development works have been projected, and it is this source of supply which furnishes water for irrigation, particularly in the neighborhood of Riverside. Observations were instituted in 1898 to determine the total output from this underground source, and results may be found in the Twentieth Annual Report, Part IV, pages 557 and 559. Similar observations were made for the Geological Survey by Mr. K. Sanborn, in March, June, and August, 1899, in order to discover whether there is a difference in output at the end of the rainy season as compared with the end of the dry season, and whether the supply is increasing or decreasing. The following table gives the three series of measurements in 1899:

Discharge measurements in San Bernardino Valley, California.

Date.	Stream.	Ditch.	Discharge.
1899.			*Second-feet.*
February 28	Warm Creek	Upper canal, Riverside Water Company, at head gate.	60.53
Do	do	Swamp, at first turnout	.85
Do	Santa Ana River	Mill flume, Riverside Water Company, end of flume.	5.30
March 1	Lytle Creek	Whitings, head	.76
Do	do	McIntyre, head	.82
Do	City Creek	Whitlock, flume at Waterman avenue.	.47
Do	do	Logsdon & Farrell, at head	1.61
Do	do	Daley, at head	.71
Do	Warm Creek	Meeks & Daley, at head gate	17.00
March 2	do	Haws & Talmage, at head gate	.28
Do	do	Beam, flume at head	.72
Do	do	Rabel, at head gate	2.26
Do	do	Shay or Stout dam, at head gate.	2.23
Do	do	McKenzie, 300 feet below head gate.	9.40
March 7	Santa Ana River	Gage canal, head	.72
Do	do	Gage canal, Palm avenue, weir	27.40
Do	do	Timber, at head	.00
Do	Artesian wells	Camp Carlton	2.13
March 10	Santa Ana River	Lower canal, Riverside Water Company, Spanishtown ditch turnout.	16.00
Do	do	Ward & Warren, at head	3.09
Do	Artesian wells	Wells, Riverside Water Company.	16.57
March 13	Lytle Creek	Ranchero, near head	1.64

Discharge measurements in San Bernardino Valley, California—Continued.

Date.	Stream.	Ditch.	Discharge.
1899.			*Second-feet.*
March 13	Pumping plants	East Riverside irrigation district, at reservoir.	4.25
Do	do	Colton Terrace Water Company, head of pipe line.	1.69
Do	do	City of Colton	.00
Do	do	Pomeroy & Marble	.00
Do	do	Johnson & Hubbard	.00
Do	do	Base line and Waterman avenue.	.00
March 25	City Creek	In canyon above all diversions.	8.80
June 16	Warm Creek	Haws & Talmage, 300 feet below head.	.05
Do	do	Rabel, weir at head	1.54
Do	do	Shay or Stout dam, weir at head submerged.	1.13
Do	do	McKenzie, 150 feet below head gate.	3.86
June 20	do	Swamp, weir first turnout	.77
Do	Santa Ana River	Gage canal, weir at head	.24
Do	do	Gage canal, Palm avenue, weir.	25.46
Do	do	Timber, head	.00
Do	do	Ward & Warren, weir at head.	.62
Do	do	Camp Carlton, weir at head	1.62
June 23	Lytle Creek	McIntyre, weir at head	.15
Do	Pumping plants	East Riverside irrigation district, weir to reservoir.	2.08
Do	do	Upper Bloomington, submerged weir near head.	3.34
Do	do	Lower Bloomington, submerged weir flume.	5.93
June 26	Warm Creek	Meeks & Daley, weir at head	15.48
Do	do	Upper canal, Riverside Water Company, weir at head.	53.92
Do	Santa Ana River	Mill flume, Riverside Water Company, flume at mill.	7.29
Do	Pumping plants	Colton Terrace Water Company, head of pipe line.	1.30
Do	do	City of Colton, weir, upper plant.	2.09
Do	do	City of Colton, estimated	2.60
Do	do	Mill pump, Riverside Water Company, weir at mill.	1.77
June 27	Warm Creek	Beam, flume at head	.52
Do	Lytle Creek	Whitings, weir at head	.26
Do	City Creek	Whitlock, flume, Stiles street	.28
Do	do	Logsdon & Farrell, flume at head.	1.15
Do	do	Daley, flume across City Creek.	.51
June 28	Santa Ana River	Lower canal, Riverside Water Company, flume at head.	9.09
August 22	Warm Creek	McKenzie, 200 feet below head gate.	2.00
August 25	do	Haws & Talmage, head gate	.00
Do	do	Rabel, at head gate	.94
Do	do	Shay or Stout dam, weir at head.	.90
Do	do	Meeks & Daley, weir at head	10.45
Do	Santa Ana River	Gage canal, weir at head	.64
Do	do	Gage canal, Palm avenue, weir.	24.11
Do	do	Timber, head	.00

Discharge measurements in San Bernardino Valley, California—Continued.

Date.	Stream.	Ditch.	Discharge.
1899.			*Second-feet.*
August 26	Warm Creek	Beam, flume at head	.40
Do	Lytle Creek	McIntyre, head	.00
Do	do	Whitings, head	.01
Do	do	Ranchero, weir near head	.41
Do	Pumping plants	East Riverside irrigation district, pumps not running.	.00
Do	do	Colton Terrace Water Company	1.30
Do	do	City of Colton, upper pumps	1.52
Do	do	City of Colton, lower pumps	2.37
Do	do	Upper Bloomington, weir at head.	1.18
Do	do	Lower Bloomington, weir at flume.	3.05
Do	do	Pomeroy&Marble, not running.	.00
Do	do	Johnson & Hubbard, not running.	.00
Do	do	Base line and Waterman avenue, estimated by owner.	1.20
August 27	Santa Ana River	Camp Carlton, weir at head	1.02
August 28	City Creek	Whitlock, flume, Stiles street	.09
Do	do	Logsdon & Farrell, flume at head.	.54
Do	do	Daley, flume across City Creek	.51
August 30	Warm Creek	Swamp, weir first turnout	.69
Do	Santa Ana River	Ward & Warren, weir at head	1.56
Do	do	Mill flume, Riverside Water Company, flume at mill.	2.50
August 31	Pumping plants	Mill pump, Riverside Water Company, weir at pump.	1.67
Do	Warm Creek	Upper canal, Riverside Water Company, weir at head.	52.04
September 1	Santa Ana River	Lower canal, Riverside Water Company, flume at head.	7.38

TEMESCAL CREEK NEAR RINCON, CALIFORNIA.

This stream rises in the extreme southwestern corner of Riverside County, California. Its smaller tributaries have their sources on the eastern slope of the Santa Ana Mountains. The river flows in a general northerly direction, entering Santa Ana River 2½ miles above Rincon and just above the lower narrows of the Santa Ana. San Jacinto River discharges into Lake Elsinore. During years of heavy rainfall this lake overflows and the surplus water finds its way into Temescal Creek. During the last few years, however, there has been no such discharge from Lake Elsinore. The water of Temescal Creek and of its tributary, Coldwater Creek, is used for irrigation in the vicinity of Corona. A series of measurements of Temescal and Coldwater creeks have been made by F. Rolfe, and are given below. The first table gives the measurements at the upper pipe line of the Temescal Land and Water Company at the manhole in Rolfe's field; the second table shows the discharge of the lower pipe line at Eddy's blacksmith shop; the third table is the discharge of the same pipe line near

Riley's ranch; the fourth table shows the discharge of Coldwater Creek at its mouth.

During the recent dry years there has been no surface flow of Temescal Creek. The water flowing in the upper pipe line of the Temescal Land and Water Company includes the principal part of the flow of Coldwater Creek and Temescal Hot Springs, augmented by water pumped from wells in Temescal Valley.

Discharge measurements of upper pipe line of Temescal Land and Water Company at manhole in Rolfe's field, California.

1899.

Date.	Discharge.	Date.	Discharge.
	Second-feet.		*Second-feet.*
January 27	0.74	April 22	3.71
February 4	1.62	April 29	3.25
February 11	.87	May 6	2.80
February 18	3.67	May 13	4.02
February 24	3.37	May 18	4.21
March 3	3.87	May 30	4.01
March 12	5.10	June 9	3.36
March 16	3.56	June 16	3.53
March 25	3.74	July 10	3.21
March 31	4.16	July 19	3.20
April 14	2.93	July 25	3.67

Discharge measurements of lower pipe line of Temescal Land and Water Company, California.

1899.

Date.	Discharge.	Date.	Discharge.
	Second-feet.		*Second-feet.*
January 28	0.66 *a*	April 22	2.28 *a*
February 1	.00 *a*	April 29	2.28 *a*
February 11	.34 *a*	May 6	4.46 *a*
February 15	1.39 *a*	May 13	2.55 *a*
February 20	1.56 *a*	May 30	3.08 *b*
March 4	4.22 *a*	June 9	3.10 *b*
March 12	3.51 *a*	June 15	2.36 *b*
March 18	2.69 *a*	July 4	2.87 *b*
March 25	2.91 *a*	July 19	2.03 *b*
March 31	3.42 *a*	July 28	2.49 *b*
April 14	.89 *a*		

a Measurements at Eddy's blacksmith shop. *b* Measurements near Riley's ranch.

Discharge measurements of Coldwater Creek at mouth, California.

1899.

Date.	Discharge.	Date.	Discharge.
	Second-feet.		*Second-feet.*
January 18	1.43	April 15	0.62
January 27	.84	April 21	.26
February 3	.99	April 26	.38
February 11	.97	May 5	.37
February 18	.78	May 13	.21
February 24	.94	May 17	.21
March 1	.92	May 29	.27
March 12	.71	May 31	.38
March 17	1.60	May 31	.30
March 25	1.18	June 5	.30
March 31	.84	June 7	.22
April 14	.68		

CHINO CREEK AT RINCON, CALIFORNIA.

San Antonio Creek discharges from the southern slope of the Sierra Madre onto a large bed of sand and gravel. The underground waters percolate slowly to the south, and begin to appear again in the channel of what is known as Chino Creek. This creek enters Santa Ana River just before the latter stream passes through its lower canyon in the Coast Range. The discharge of Chino Creek is very constant, owing to the nature of its supply, and hence water rights along its course are valuable on account of their permanency. A series of measurements of the supply of this creek were made during 1899 under the direction of J. B. Lippincott. There is no gage rod, owing to the shifting nature of the stream bed.

Discharge measurements of Chino Creek at Rincon, California.

1899.

Date.	Discharge.	Date.	Discharge.
	Second-feet.		*Second-feet.*
May 2	12.79	August 15	2.14
May 15	8.64	August 31	3.19
June 3	17.02	September 29	3 88
June 15	5.63	October 25	14.52
July 4	3.02	October 26	14.52
July 17	4.68	November 18	20.06
August 1	7.49		

SANTA ANA RIVER AT RINCON, CALIFORNIA.

This river and its tributaries derive their water supply from the southern and western slopes of the San Bernardino Mountains. On their appearance from their canyons the water is shortly diverted for irrigation purposes. After passing through San Bernardino Valley water begins to appear on the lower courses of Santa Ana River, and at the point where it passes through the Coast Range a remarkably constant stream is found. The bed rock, although not visible in the channel of the river, must be near the surface, judging by the appearance of the water in the bed. Springs of large volume occur on the southern side of the river near Rincon, and the flat lands immediately above there are heavily saturated with the rising water. Artesian water also is found in considerable quantities from Rincon to Pomona, in the valley of Chino Creek. Twelve miles above Rincon Santa Ana River passes through what is known as Riverside Narrows, and here also the water appears at the surface. Approximately 80 second-feet are used in this locality for irrigation purposes. Two measurements were made at Riverside Narrows in 1899, the first, on July 17, showing a discharge of 31.70 second-feet, and the second, on September 12, showing a dis-

charge of 39.69 second-feet. Measurements were also made during 1899 of Santa Ana River at the Rincon Narrows. The first were made 1 mile below the town of Rincon, and included the water of Chino Creek. After September 29 measurements were made at the bridges in the town of Rincon and above the mouth of Chino Creek. It was found that at this latter point from 2 to 3 second-feet more water was flowing than at the locality 1 mile below, where the earlier measurements were made.

Discharge measurements of Santa Ana River near Rincon, below mouth of Chino Creek, California.

Date.	Discharge in second-feet.		
	River.	Canal.	Total.
1898.			
June 21	79.81	3.18	82.99
August 28	62.67	4.15	66.82
1899.			
January 3	209.40	2.30	211.70
January 16	231.90	.....	231.90
January 28	216.00	6.50	222.50
February 15	181.00	1.75	182.75
March 4	108.60	0.00	108.60
March 18	199.89	0.00	199.89
April 6	172.23	0.00	172.23
April 18	101.10	2.75	103.85
May 2	100.34	2.45	102.79
May 15	100.36	3.95	104.31
June 3	110.27	3.18	113.45
June 16	87.89	1.65	89.54
July 4	68.89	2.42	71.31
July 18	64.13	1.54	65.67
August 1	57.82	3.44	61.26
August 15	64.71	3.16	67.87
August 30	65.90	2.00	67.90
September 13	72.73	1.65	74.38
September 29	83.82	.....	83.82

Discharge measurements of Santa Ana River at Rincon, above mouth of Chino Creek, California.

1899.

Date.	Discharge in second-feet.			
	River.	Chino Creek.	Springs.	Total.
October 25	131.32	14.52	0.50	146.34
October 26	146.53	14.52	.50	161.55
November 18	151.16	20.06	.50	171.72

SAN LUIS REY RIVER, CALIFORNIA.

This river rises on the western slope of the Coast Range, in the northern part of San Diego County, California. It flows westerly, with rapid fall, and after passing through a narrow gap in the mountains finally enters the Pacific about 35 miles north of San Diego. The water of this river is diverted upon its appearance from the canyon by the flume of the Escondido irrigation district, and is conducted to a reservoir, whence its waters are used for irrigation purposes. In

addition to this diversion, 2 second-feet, approximately, are permitted to remain in the river for the use of the Indians near Pauma, who are prior appropriators. The following results are furnished by the Escondido irrigation district. The measurements are made over a weir at the headworks of their canal. The following table shows the entire flow of the river, with the exception of the 2 second-feet noted above. The drainage area at the point of diversion is 229 square miles.

Discharge, in second-feet, of San Luis Rey River in canyon, California, for 1899.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.0	3.0	5.6	10.9	*a*	10.0	*a*	*a*	*a*	*a*	0.0	0.0
2	0.0	20.0	5.3	9.3	.....	10.0	.....	.....	.....	.....	0.0	0.0
3	0.0	33.0	5.0	9.0	.....	0.0	.....	.....	.....	.....	0.0	0.0
4	0.0	13.3	4.7	8.6	.....	0.0	.....	.....	.....	.....	0.0	0.0
5	0.0	14.9	4.1	8.1	.....	0.0	.....	.....	.....	.....	0.0	0.0
6	0.0	10.1	3.6	7.8	.....	0.0	.....	.....	.....	.....	0.0	0.0
7	0.0	10.2	3.6	7.3	.....	0.0	.....	.....	.....	.....	0.0	0.0
8	0.0	10.2	3.6	6.5	.....	0.0	.....	.....	.....	.....	0.0	0.0
9	0.0	9.3	3.6	6.2	.....	0.0	.....	.....	.....	.....	0.0	0.0
10	0.0	9.0	3.6	5.9	.....	0.0	.....	.....	.....	.....	0.0	0.0
11	24.0	8.6	3.6	5.3	.....	0.0	.....	.....	.....	.....	0.0	0.0
12	0.0	7.8	3.6	4.9	.....	0.0	.....	.....	.....	.....	0.0	0.0
13	0.0	7.8	3.6	4.6	.....	0.0	.....	.....	.....	.....	0.0	0.0
14	10.0	7.8	3.6	4.4	.....	0.0	.....	.....	.....	.....	0.0	0.0
15	0.0	7.8	3.6	4.1	.....	0.0	.....	.....	.....	.....	0.0	0.0
16	6.0	7.3	3.6	3.9	.....	0.0	.....	.....	.....	.....	0.0	2.0
17	6.0	6.9	24.4	3.6	.....	0.0	.....	.....	.....	.....	0.0	0.0
18	6.0	5.9	24.4	0.0	.....	0.0	.....	.....	.....	.....	0.0	4.8
19	5.6	5.6	11.7	0.0	.....	0.0	.....	.....	.....	.....	0.0	3.6
20	5.3	5.3	11.7	0.0	.....	0.0	.....	.....	.....	.....	0.0	0.0
21	4.9	4.9	25.0	0.0	.....	0.0	.....	.....	.....	.....	0.0	0.0
22	4.7	4.7	18.5	0.0	.....	0.0	.....	.....	.....	.....	0.0	0.0
23	3.0	4.7	13.3	0.0	.....	0.0	.....	.....	.....	.....	3.0	0.0
24	3.6	16.8	11.7	0.0	.....	0.0	.....	.....	.....	.....	0.0	0.0
25	3.6	10.1	10.9	0.0	.....	0.0	.....	.....	.....	.....	0.0	2.6
26	3.6	7.5	19.5	4.7	.....	0.0	.....	.....	.....	.....	0.0	0.0
27	3.4	6.6	11.7	4.1	.....	0.0	.....	.....	.....	.....	0.0	0.0
28	3.0	5.9	10.9	0.0	.....	0.0	.....	.....	.....	.....	0.0	0.0
29	3.0	.....	17.8	0.0	.....	0.0	.....	.....	.....	.....	0.0	0.0
30	3.0	.....	15.1	0.0	.....	0.0	.....	.....	.....	.....	0.0	7.2
31	3.0	.....	11.7	.....	.....	.....	.....	.....	.....	.....	.....	5.4

a River dry for month.

SWEETWATER RIVER AT SWEETWATER DAM, CALIFORNIA.

This river has its source on the western slope of the Cuyamaca Mountains, in the extreme southern part of San Diego County, California, adjoining Mexico. During the last three seasons observations of the discharge of this river into the Sweetwater reservoir have been made by N. H. Savage, who is the chief engineer of the Sweetwater irrigation system. The measurements are of particular accuracy, because the capacity of the reservoir is definitely known, and the readings of the gage rod in the reservoir indicate volumes discharged. Mr. Savage furnishes these records voluntarily, and they are of special interest, not only because of the great value of water in this portion of San Diego County, but also because this basin is located in the extreme southwestern corner of the United States. The effects of the severe drought of the last few years in southern California are brought out

very plainly by a study of the discharge table which is given below. The drainage area above the reservoir is 186 square miles. The second table shows the amount of evaporation, by weeks, from the water surface of the Sweetwater reservoir, from January 1, 1897, to April 30, 1899. The third table shows the rainfall for 1898.

Estimated discharge of Sweetwater River at Sweetwater dam, California.

[Drainage area, 186 square miles.]

Year.	Discharge.	Total for year.	Run-off.		Rain.
	Sec. feet.	*Acre-feet.*	*Inches.*	*Sec. feet.*	
1896–97	9.35	6,777	0.665	0.050	10.97
1897–98	.006	4.3	.0005	.000032	7.05
1898–99	.339	245.5	.025	.0018	5.05

Evaporation at Sweetwater dam, California.

1897.

Date.	Weekly.	Monthly.	Date.	Weekly.	Monthly.
	Inches.	*Inches.*		*Inches.*	*Inches.*
January 1 to June 30		25.177	October 10	1.312	
July 4	.773		October 17	1.066	
	1.031		October 24	.984	
July 11	1.722		October 31	1.312	
July 18	1.724		November 7	.902	5.272
July 25	1.968		November 14	1.025	
August 1	1.617	8.062	November 21	1.148	
	.269		November 28	.920	
August 8	1.886		December 5	.234	4.229
August 15	1.845			.586	
August 22	1.783		December 12	.574	
August 29	1.722		December 19	.492	
September 5	.492	7.997	December 26	.492	
	1.230		December 31	.631	2.775
September 12	1.640				
September 19	1.476		Total for 1897		60.048
September 26	1.394				
October 3	.796	6.536			
	.598				

Records for three days in August were assumed; high winds filled pan.

Evaporation at Sweetwater dam, California—Continued.

1898.

Date.	Weekly.	Monthly.	Date.	Weekly.	Monthly.
	Inches.	*Inches.*		*Inches.*	*Inches.*
January 2	a 0.631		July 10	1.722	
	.107		July 17	1.968	
January 9	.328		July 24	1.804	
January 16	.246		July 31	1.886	
January 23	.492		August 7	1.804	8.153
January 30	.574		August 14	1.804	
February 7	.41	1.747	August 21	1.886	
February 13	.574		August 28	1.804	
February 20	.82		September 4	.843	8.141
February 27	.730			1.125	
March 6	.129	2.671	September 11	1.722	
	.773		September 18	1.804	
March 13	.738		September 25	1.599	
March 20	.82		October 2	.989	7.239
March 27	1.248			.395	
April 3	.670	4.249	October 9	1.230	
	.519		October 16	1.189	
April 10	1.066		October 23	1.025	
April 17	1.148		October 30	.984	
April 24	1.353		November 6	.176	4.999
May 1	1.265	5.351		1.054	
	.211		November 13	1.066	
May 8	1.230		November 20	.820	
May 15	1.23		November 27	.738	
May 22	1.066		December 4	.334	4.012
May 29	1.394			.445	
June 5	.480	5.611	December 11	No record.	
	1.201		December 18	No record.	
June 12	1.640		December 25	No record.	
June 19	1.517		December 31	.422	.867
June 26	1.804				
July 3	1.031	7.193	Total for 1898		60.233
	.773				

a Evaporation during last five days in 1897. Record missing for three weeks in December.

1899.

January 1	a 0.422		March 12	1.23	
	.070		March 19	.902	
January 8	.328		March 26	.656	
January 15	.246		April 2	.878	4.366
January 22	.533			.352	
January 29	.820		April 9	1.148	
February 5	.165	2.162	April 16	1.230	
	.411		April 23	1.886	
February 12	.656		April 30	1.312	5.928
February 19	.802				
February 26	.820		Total for 1899, to April 30		15.426
March 5	.281	2.970			
	.703				

a Evaporation during last six days in 1898.

Rainfall at Sweetwater dam, California.

Month.	1898.	1899.	Month.	1898.	1899.
	Inches.	*Inches.*		*Inches.*	*Inches.*
January	2.33	2.40	August	0.00	.00
February	.13	.70	September	0.00	.00
March	1.50	.89	October	0.00	.41
April	.33	.23	November	0.07	1.66
May	.85	.11	December	0.76	.77
June	0.00	.58			
July	0.00	.00	Total	5.97	7.77

MISCELLANEOUS DISCHARGE MEASUREMENTS IN CALIFORNIA.

During the severe drought of 1898 measurements on the important irrigation streams of California during their low stages were instituted, and the results were shown in Water-Supply Paper No. 28, page 193. The rainfall for 1899 was also deficient throughout California, and up to the present time the water shortage has been extreme. As a continuation of the low-water measurements of the previous years the series given below were made during 1899:

Miscellaneous discharge measurements in California in 1899.

Date.	Stream.	Locality.	Discharge.
			Second-feet.
January 11	Eaton Canyon Creek	At falls	0.50
March 14	Piru Creek	Narrows, 8½ miles above Piru.	3.52
March 15	Sespe Creek	Headworks of Sespe Land and Water Company's canal.	8.25
Do	Lower Cienega ditch	In Santa Clara Valley, 1 mile east of Fillmore.	2.43
March 16	Piru Creek	Just above wagon-road crossing, 200 feet below Southern Pacific Railroad bridge.	60.60
March 17	do	do	151.50
March 24	East Twin Creek	15 feet above headworks of Del Rosa canal.	3.88
Do	West Twin Creek	At point above headworks of canal.	3.00
March 25	Plunge Creek	At point below intake in walled canal.	10.85
September 13	Sacramento River	Jellys Ferry	4,087.00
September 16	American River	1 mile above mouth of South Fork.	86.10
Do	do	North Fork ditch, at road crossing 2½ miles above Folsom.	19.64
Do	do	Natoma ditch, South Fork, at Placerville road crossing.	20.00
Do	do	South Fork, estimated by Mr. Knight, superintendent Folsom Electric Power Company.	20.00
September 15	Sutter Creek	At town of Suttercreek, estimated.	1.00
Do	Cosumne River	At bridge, Jackson and Latrobe road crossing.	2.00
Do	do	Ditch, south side, at bridge, Jackson and Latrobe road crossing.	2.00
September 14	Mokelumne River	100 feet below bridge, Mock Hill, Jackson road.	33.10
Do	Calaveras River	Bridge, San Andres and Jackson road.	0.00
September 9	Stanislaus River	Oakdale	88.40
September 11	Tuolumne River	1,000 feet below gaging station, at bridge, Lagrange.	12.10
Do	do	Turlock canal, flume No. 3	28.90
Do	do	Mining ditch	24.00
		Total	65.00

Miscellaneous discharge measurements in California in 1899—Continued.

Date.	Stream.	Locality.	Discharge.
			Second-feet.
September 11	Merced River	Hoffman canal, 300 feet below head gate.	16.50
Do	do	1 mile above head gate, Hoffman canal.	35.50
Do	do	Valley Mills ditch	4.95
		Total	56.95
Do	do	Snellings ditch, estimated	0.50
September 8	San Joaquin River	Pollasky, 500 feet above bridge	269.30
Do	do	Herndon	195.60
September 4	Kings River	Red Mountain	206.00
Do	do	Church ditch, at check weir just below Trimmer Springs road crossing.	151.10
Do	do	Fowler Switch canal, near mouth of canyon.	0.00
Do	do	Kingsburg canal, near mouth of canyon, estimated.	0.25
Do	do	Enterprise canal, near mouth of canyon, estimated.	2.00
Do	do	'76 canal, near mouth of canyon.	0.00
September 6	Kaweah River	Kaweah Irrigation and Power Company canal. This water is being pumped from wells.	1.49
Do	do	Pogues ditch	4.87
Do	do	One-half mile above headworks of Kaweah Irrigation and Power Company canal.	40.92
Do	do	North Fork	1.12
Do	do	South Fork, Britton ditch	0.41
Do	do	South Fork, estimated, Buttmann & Hitchcock ditch.	0.20
Do	do	South Fork, Carter's lower ditch.	0.32
Do	do	South Fork, estimated, Carter's upper ditch.	0.25
Do	do	At iron bridge	33.30
September 5	Tule River	Pioneer canal, just below headworks.	13.12
Do	do	Pioneer canal at road crossing, 1 mile below head gate.	8.43
Do	do	Pioneer canal at bridge road crossing, 2 miles below head gate.	7.06
September 2	Poso Creek		0.00
Do	Kern River	First point of measurement	99.22
September 5	Deer Creek		0.00
September 19	Santa Clara River	East channel, point where road crosses below San Francisquito Creek.	3.38
Do	do	West channel, below San Francisquito Creek.	1.65
Do	do	Newhall ditch	3.37
		Total	8.40

Miscellaneous discharge measurements in California in 1899—Continued.

Date.	Stream.	Locality.	Discharge.
			Second-feet.
August 19	Santa Clara River	Cumulos ranch ditch, 2 miles east of Cumulos ranch.	17.63
Do	do	2 miles east of Cumulos ranch house.	1.24
		Total	18.87
August 18	do	Farmers ditch	16.00
Do	do	Grease ditch	8.61
Do	do	East Side ditch	5.80
Do	do	Near Santa Paula	10.34
		Total	40.75
August 19	Piru Creek	Head of ditch of Piru Fruit Company.	1.33
August 18	Sespe Creek	In walled canal, Sespe Land and Water Company ditch.	1.93
Do	Santa Paula River	In flume 300 feet west of Nupu schoolhouse, 3 miles above Santa Paula.	0.85
August 21	Pacoima wash	Dry at mouth of canyon. Small spring from south side of mountain above wash, flowing 0.01, estimated.	0.00
Do	Pacoima submerged dam.	Pumping water which had accumulated during night. Man in charge of pump says they pump from 5 to 8 miners' inches per day.	0.24
Do	Little Tujunga River.		0.00
Do	Tujunga River	At weir headworks of Monte Vista ditch.	0.20
Do	do	Same place, statement of ditch tender.	0.44
August 28	San Gabriel River	Canals, statement H. F. Parkinson.	5.50
August 29	San Antonio Creek	Division weir, one-half to Pomona, one-half to Ontario.	4.06
Do	do	To Ontario	0.42
		Total	4.48
Do	Cucamonga Creek	Red Hill development, water goes to Ontario.	2.48
Do	Lytle Creek	Weir, head of Rialto canal	10.62
Do	do	Weir, head of Grapeland canal.	1.91
		Total	12.53
August 26	do	McIntyre ditch, at head	0.00
Do	do	Whitings ditch	0.01
Do	do	Ranchero ditch, weir near head.	0.41
August 25	Warm Creek	Haws & Talmage ditch, head gate.	0.00

Miscellaneous discharge measurements in California in 1899—Continued.

Date.	Stream.	Locality.	Discharge.
			Second-feet.
August 25	Warm Creek	Rabel ditch, head gate	0.94
Do	do	Shay or Stout ditch, weir at head.	0.90
August 22	do	McKenzie, 200 feet below head gate.	2.00
August 25	do	Meeks & Daley ditch, weir at head.	10.45
August 31	do	Upper canal, Riverside Water Company, weir at head.	52.04
August 26	do	Beam ditch, flume at head	0.40
August 30	do	Swamp ditch, weir, first turnout.	0.69
		Total of Warm Creek	67.42
August 28	City Creek	Whitlow ditch, flume, Stiles street,	0.09
Do	do	Logsdon & Farrell ditch, flume at head.	0.54
Do	do	Daley ditch, flume across City Creek.	0.51
August 25	Santa Ana River	Gage canal, weir, Santa Ana River.	0.64
Do	do	Gage canal, weir, Palm avenue.	24.11
Do	do	Timber ditch, at head	0.00
August 30	do	Ward & Warren ditch, weir at head.	1.56
Do	do	Mill flume, Riverside Water Company, flume at mill.	2.50
September 1	do	Lower canal, Riverside Water Company, flume at head.	7.38
August 27	do	Camp Carlton ditch, weir at head.	1.02
		Total	36.57
August 26	Pumping plants	East Riverside irrigation district, pumps not running.	0.00
Do	do	Colton Terrace Water Company.	1.30
Do	do	City of Colton ditch, upper pumps.	1.52
Do	do	City of Colton ditch, lower pumps.	2.37
Do	do	Upper Bloomington, weir at head.	1.18
Do	do	Lower Bloomington, weir at flume.	3.05
August 31	do	Mill pump, Riverside Water Company, weir at pump.	1.67
August 26	do	Pomeroy & Marble, not running.	0.00
Do	do	Johnson & Hubbard, not running.	0.00
Do	do	Base line and Waterman avenue, estimated by owner.	1.20
August 25	Santa Ana River	Developed and return water above Colton.	117.83
Do	Plunge Creek	In cement ditch below headworks in canyon.	0.48

Miscellaneous discharge measurements in California in 1899—Continued.

Date.	Stream.	Locality.	Discharge.
			Second-feet.
August 25	City Creek	In cement ditch near headworks in canyon.	0.17
Do	East Twin Creek	K. C. Investment Co., developed.	0.16
Do	do	Canal	0.58
Do	West Twin Creek	In V flume, at intake	0.20
August 24	Mill Creek	Old zanja	5.73
Do	do	Crafton headworks. This water is pumped from wells in bed of creek above Electric Co. power house.	1.45
		Total	7.18
Do	Santa Ana River	End of Green Spot pipe line	0.28
Do	do	South Fork ditch, Redlands canal, less amount from tunnel and Morton Canyon, 4.50 second-feet.	5.71
Do	do	Morton Canyon	0.11
Do	do	Redlands tunnel water	1.10
Do	do	Head of Green Spot pipe line	0.00
Do	do	North Fork ditch, Highlands canal, Cippoletti weir.	4.28
Do	do	Santa Ana canal	0.00
Do	do	Below overflow from Santa Ana canal.	10.86
August 30	do	Near Colton	0.00
Do	do	Submerged overflow, near Colton.	4.88
Do	do	West Riverside ditch	4.80
Do	do	Riverside Water Co., flume near Riverside Mesa tunnel.	57.39
Do	do	At Gallager Ford, just below Rubidoux Mountain.	5.63
Do	do	Chinese ditch	4.48
Do	do	At point 300 feet above Auburndale bridge, 3 miles north of Corona.	50.30
Do	do	South Side ditch	2.25
Do	do	North Side ditch	0.59
		Total at Auburndale	53.14
Do	do	1 mile below Rincon	65.90
Do	do	Scully ditch, or Bodieres, estimated.	2.00
		Total at gaging station	67.90
August 31	Chino Creek	Measured by F. Rolfe	3.19
Do	Santa Ana River	Santa Ana and Anaheim division box.	60.60
August 20	Water Canyon	Banning Colony, statement of C. D. Hamilton.	3.60
August 26	Cabazon ditch	At main road crossing	0.55
Do	Whitewater River	Two Cippoletti weirs at Bear Valley Irrigation Co. headworks.	6.34

PRECIPITATION ON MOUNTAINS IN SOUTHERN CALIFORNIA.

In order to obtain precipitation data bearing upon river discharge, a number of rain gages have been placed by Mr. J. B. Lippincott at various important points. The results obtained at these localities during 1899, together with a few figures from other sources, are shown in the following tables. The first gives the location of the rainfall station and the name of the observer, and the second the depth of rainfall, in inches, for each month of the year. Similar figures for 1896 are given on page 418 of the Eighteenth Annual Report, Part IV, for 1897 on page 539 of the Nineteenth Annual Report, Part IV, and for 1898 on page 560 of the Twentieth Annual Report, Part IV.

Location of rainfall stations in southern California.

Station.	Observer.	County.	Post-office.	Latitude.	Longitude.	Elevation.
				° ′	° ′	*Feet.*
Sisson	Southern Pacific R. R.	Siskiyou	Sisson	41 27	122 25	3,555
Redbluff	United States Weather Bureau.	Tehama	Redbluff	40 12	122 20	324
Sonora	Dr. John Shaw	Tuolumne	Sonora	38 00	120 16	1,824
Second Garrotte	J. P. Chamberlain	do	Groveland	37 49	120 12	2,900
Crockers	H. R. Crocker	do	Sequoia	37 48	119 53	4,453
Yosemite		Mariposa	Yosemite	37 45	119 35	4,063
Milo	R. T. Bailey	Tulare	Milo	36 15	118 50	3,200
Taylor's ranch	Geo. E. Carlton	Kern	Weldon	36 20	118 17	2,640
Kernville	Steven Barton	do	Isabella	35 45	118 25	2,600
Mount Breckenridge.	George Owens	do	Bakersfield	35 25	118 35	6,750
Tejon ranch	R. M. Pogsen	do	do	35 00	118 45	1,450
Fort Tejon	J. G. Stitt	do	Lebec	34 53	118 53	3,245
Bear Valley	Philip Tickert	do	Tehachapi			4,000
Glenn ranch	Jas. M. Applewhite	San Bernardino	Cajon	34 50	117 30	3,112
Frazier mine	N. Bennett	Ventura	Neenach	34 49	118 58	3,000
La Liebre	J. W. Forbes	Los Angeles	Neenach	34 46	118 40	3,170
Smith's ranch	William Smith	Ventura	Gorman	34 44	118 47	
Sneddens	Burt Snedden	do	Griffin	34 41	119 03	4,900
Mutah Flat	do	do	do	34 38	119 03	4,850
Palmdale headworks.	Burt Cole	Los Angeles	Palmdale	34 25	118 03	3,299
Magic Hill	B. L. Hutchings	do	Burbank	34 23	118 22	2,820
Holcomb Creek	Arrowhead Reservoir Co.	San Bernardino	San Bernardino	34 18	116 58	5,220
Upper Holcomb	do	do	do	34 18	116 50	7,200
Mount Sister Elsie	L. T. Rowley	Los Angeles	Monte Vista	34 17	118 14	5,021
Deep Creek	Arrowhead Reservoir Co.	San Bernardino	San Bernardino	34 17	117 05	5,200
Mount Lowe	Prof. Lewis Swift	Los Angeles	Echo Mountain.	34 15	118 07	3,200
Little Bear Valley	Arrowhead Reservoir Co.	San Bernardino	San Bernardino	34 15	117 10	5,150
Follows's camp	B. W. Follows	Los Angeles	Azusa	34 14	117 49	1,800
Colby's camp	D. W. Colby	do	Pasadena			3,875
Morse's house	Arrowhead Reservoir Co.	San Bernardino	San Bernardino	34 12	117 12	5,350
Squirrel Inn	do	do	do	34 12	117 12	5,300
Mill Creek	Redlands E. L. and P. Co.	do	Redlands			5,000
Do	do	do	do			2,915
Cuyamaca	San Diego Flume Co.	San Diego	San Diego	32 58	115 35	4,800
Descanso	E. W. Hubbard	do	Descanso	32 50	116 40	3,500
Sweetwater dam	G. N. Savage	do	National City	32 43	117 00	250
Millwood	Sanger Lumber Co.	Fresno	Sanger			

Precipitation at rainfall stations in southern California, 1899.

Station.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Sisson	5.55	1.03	2.98	0.23	1.32	0.89	0.00	.....	0.00	4.01	10.83	5.67	32.51
Redbluff	9.29	0.01	6.22	0.72	.....	0.94	0.00	0.02	0.00	3.02	4.08	3.80	28.10
Sonora	6.99	0.42	14.03	1.08	2.18	2.17	0.00	0.08	0.00	6.90	7.02	5.38	46.25
SecondGarrotte	6.75	1.00	14.00	0.50	1.00	0.00	0.00	0.00	0.00	6.75	6.75	6.00	43.75
Crockers	8.32	1.00	15.89	1.50	0.15	1.65	0.00	0.00	0.00	8.10	7.45	11.38	55.54
Yosemite[a]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Milo	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Taylor's ranch	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.78	0.66	.....
Kernville	1.95	0.19	1.89	0.28	0.25	0.45	0.00	0.00	0.00	0.78	0.85	0.73	7.37
Mount Breckenridge	1.67	0.94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tejon ranch	1.30	2.10	4.03	0.82	0.00	0.00	0.00	0.00	0.00	1.31	1.82	1.67	13.05
Fort Tejon	2.57	0.50	2.99	0.55	0.25	0.78	0.00	0.00	0.05	1.10	1.71	1.40	11.90
Bear Valley	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.21	1.94	.....
Frazier mine	.....	.....	.....	.....	.....	0.60	0.00	.....	.....	.....	.....	.....	.....
La Liebre	1.79	0.04	2.26	0.09	0.04	0.27	0.00	0.00	0.05	1.47	0.90	0.46	7.37
Smith's ranch	8.2	0.00	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.65	0.35	4.22
Sneddens	2.65	0.00	1.50	0.50	0.00	0.00	0.00	0.00	0.00	1.50	0.47	0.27	6.89
Mutah flat	2.25	0.00	2.50	0.50	0.00	0.00	0.00	0.00	0.00	2.00	1.30	2.25	10.80
Palmdale headworks	1.00	0.31	0.97	0.00	0.00	0.00	0.00	0.00	0.00	1.28	0.27	0.32	4.15
Magic Hill	1.60	0.15	2.07	0.14	1.55	0.05	0.00	0.00	0.07	2.25	1.07	1.20	10.15
Holcomb Creek	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Upper Holcomb	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mount Sister Elsie	2.95	0.12	3.37	0.58	0.08	0.78	0.00	0.00	0.35	2.10	1.34	0.41	12.08
Deep Creek	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mount Lowe	3.29	0.00	3.40	0.20	1.90	0.40	0.00	0.00	0.00	3.00	2.85	.....	15.04
Glenn ranch	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.96	1.00	.....
Little Bear Valley	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Follows's camp	3.59	0.84	2.49	0.12	0.00	0.91	0.00	0.00	0.12	3.03	1.64	0.44	13.18
Colby's camp	2.90	0.25	2.73	0.17	0.60	0.79	0.00	0.00	0.00	3.66	1.25	1.26	13.61
Morse's house	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Squirrel Inn	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mill Creek	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mill Creek	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cuyamaca	7.02	1.53	7.23	0.98	.....	2.96	0.04	T.	0.00	4.51	3.45	2.49	30.21
Descanso	3.49	1.69	2.73	0.25	1.45	.....	0.15	0.38	.....	.....	0.25	1.06	11.45
Sweetwater dam	2.40	0.70	0.89	0.23	0.11	0.58	0.00	0.00	0.00	0.41	1.66	0.77	7.75
Millwood	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

[a] No record.

MISCELLANEOUS DISCHARGE MEASUREMENTS IN NEBRASKA.

The following miscellaneous measurements of discharge were made in Nebraska during the year 1899:

Miscellaneous measurements of discharge in Nebraska in 1899.

Stream.	Where measured.	Date.	Discharge.	Hydrographer.
			Sec.-feet.	
Ash Creek	At mouth	May 15	0.76	C. B. Channel.
Baker Creek	North line sec. 19, T. 31 N., R. 13 W.	June 19	.35	Do.
Beaver Creek	At Hyer's, sec. 20, T. 34 N., R. 46 W.	May 22	8.97	Do.
Birdwood Creek	1 mile above mouth	May 25	183.47	H. H. Pickens.
Blue Creek	South line sec. 18, T. 17 N., R. 42 W.	May 22	90.12	Do.
Boardman Creek	At Buckley's, sec. 13, T. 30 N., R. 31 W.	June 3	16.4	C. B. Channel.
Boggy Creek	West line sec. 31, T. 33 N., R. 54 W.	May 24	.05	A. B. McCoskey.
Bone Creek	At Stringer's, sec. 16, T. 31 N., R. 21 W.	June 17	12.46	C. B. Channel.
Calamus River	Burwell	May 17	372.	Glenn E. Smith.
Do	Sec. 8, T. 24 N., R. 19 W	Sept. 20	152.5	C. B. Channel.
Cedar Creek	Above Bruce's mill, sec. 33, T. 24 N., R. 25 W.	July 9	7.41	Do.

Miscellaneous measurements of discharge in Nebraska in 1899—Continued.

Stream.	Where measured.	Date.	Discharge.	Hydrographer.
			Sec.-feet.	
Cedar irrigation ditch.	Ericson	May 17	19.6	Glenn E. Smith.
Cedar River	Ericson, above dam	....do	107.4	Do.
Do	Ericson, below dam	....do	113.	Do.
Chadron Creek	North line sec. 36, T. 33 N., R. 49 W.	....do	8.71	C. B. Channel.
Do	Above waterworks dam, sec. 18, T. 32 N., R. 48 W.	....do	2.24	Do.
Do	Below waterworks dam	....do	2.15	Do.
Clear Creek	700 yards below Barber & Marsh head gate, sec. 32, T. 16 N., R. 41 W.	May 19	7.84	H. H. Pickens.
Do	At Schlademan's, sec. 5, T. 14 N., R. 34 W.	Dec. 16	3.4	C. B. Channel.
Cottonwood Creek.	Sec. 21, T. 35 N., R. 22 W	June 12	1.2	H. H. Pickens.
Crooked Creek	At Mutz, sec. 19, T. 34 N., R. 19 W.	June 13	1.23	C. B. Channel.
Culbertson canal	Below head gate	May 29	43.94	H. H. Pickens.
Dead Horse Creek	North line sec. 31, T. 33 N., R. 49 W.	May 17	3.46	C. B. Channel.
Do	At Slattery's ditch, sec. 32, T. 33 N., R. 49 W.	....do	3.98	Do.
Dismal River	Dunning	Apr. 21	334.48	Do.
Dry Cedar Creek.	At mouth, near Ericson	May 17	5.	Glenn E. Smith.
East Ash Creek	Head of Tomlin's ditch, sec. 30, T. 32 N., R. 50 W.	May 15	3.35	C. B. Channel.
Do	Head of Shelton ditch, sec. 33, T. 32 N., R. 50 W.	Aug. 18	.33	A. B. McCoskey.
East Middle Creek.	Sec. 32, T. 33 N., R. 23 W	June 10	.27	C. B. Channel.
Elkhorn River	O'Neill	July 8	145.77	Do.
Frenchman River.	At Palisade, below canal	May 29	53.39	H. H. Pickens.
Do	West line sec. 5, T. 5 N., R. 38 W.	June 3	29.54	Do.
Do	Maranville's, sec. 12, T. 6 N., R. 41 W.	July 8	19.33	E. D. Johnson.
Do	Below head gate of Inman's ditch	July 9	16.62	Do.
Do	At head gate of Wirsig ditch, sec. 24, T. 6 N., R. 40 W.	July 10	20.98	Do.
Do	At Palisade	Sept. 16	50.61	A. B. McCoskey.
Do	At Culbertson	....do	29.92	Do.
Do	At Wauneta	Sept. 19	62.91	Do.
Goose Creek	Sec. 10, T. 22 N., R. 27 W	Apr. 27	30.27	C. B. Channel.
Holt Creek	Head of Webster & Carnahan ditch, sec. 19, T. 35 N., R. 20 W.	June 12	3.58	Do.
Horse Creek	Nebraska-Wyoming line	June 16	11.1	A. B. McCoskey.
Horsehead Creek	Sec. 16, T. 33 N., R. 24 W	June 9	1.15	C. B. Channel.
Indiana Creek	North line sec. 33, T. 32 N., R. 50 W.	Aug. 18	.5	A. B. McCoskey.
Keya Paha River	Sec. 24, T. 35 N., R. 20 W	June 13	38.99	C. B. Channel.
Little Cottonwood Creek.	West line T. 31 N., R. 51 W	May 15	.29	Do.
Do	Below mouth of Spring Creek	May 16	.35	Do.
Lodgepole Creek.	3 miles east of Sidney	May 15	10.95	H. H. Pickens.
Do	4 miles west of Kimball	Aug. 9	7.43	E. D. Johnson.
Do	1 mile west of Kimball	....do	2.41	Do.
Do	¾ mile east of Kimball	Aug. 11	2.04	Do.
Do	½ mile above head G. Kinney ditch. sec. 33, T. 15 N., R. 56 W.	Aug. 10	6.52	Do.
Do	Above Young's head gate	....do	15.57	Do.
Long Pine Creek.	Below Miller's mills, sec. 5, T. 31 N., R. 20 W.	June 15	90.67	C. B. Channel.
Middle Loup River.	Arcadia	Apr. 18	809.66	A. B. McCoskey.
Do	Dunning	Apr. 21	408.23	Do.
Do	Seneca	May 2	225.34	C. B. Channel.
Mill race	At Ericson	May 17	6.5	Glenn E. Smith.
Minichaduza River.	Valentine	Jan. 27	26.2	Do.
Do	....do	Feb. 21	45.	Do.
Do	....do	Mar. 15	25.7	Do.
Do	....do	Apr. 26	32.6	Do.
Do	....do	May 11	35.	Do.
Do	....do	May 26	64.7	Do.
Do	....do	June 26	23.	Do.
Do	....do	Aug. 13	19.	Do.
Do	....do	Sept. 13	23.5	Do.
Do	....do	Sept. 26	26.5	Do.
Hat Creek	Above Coffee's ditch, sec. 26, T. 33 N., R. 55 W.	May 24	3.6	A. B. McCoskey.
Newman Creek	Head Newman ditch, sec. 17, T. 33 N., R. 24 W.	June 9	.73	C. B. Channel.
Niobrara River	Bourette, sec. 32, T. 30 N., R. 56 W.	May 27	13.65	Do.
Do	Mouth of Whistle Creek	May 28	33.04	Do.

Miscellaneous measurements of discharge in Nebraska in 1899—Continued.

Stream.	Where measured.	Date.	Discharge.	Hydrographer.
			Sec.-feet.	
Niobrara River	Marsland	May 29	36.16	C. B. Channel.
Do	Head Hatch & Cross ditch, sec. 25, T. 29 N., R. 50 W.	....do	47.94	Do.
Do	Cook ranch, sec. 6, T. 28 N., R. 55 W.	Aug. 3	13.87	A. B. McCoskey.
Do	Curtis ranch, sec. 1, T. 28 N., R. 55 W.	Aug. 16	10.15	Do.
Do	5 miles south of Valentine	Mar. 15	650.	Glenn E. Smith.
North Fork Elkhorn River.	Norfolk	Feb. 20	119.	Do.
Do	....do	Apr. 27	122.	Do.
Do	....do	May 25	414.	Do.
Do	....do	Aug. 17	81.3	Do.
Do	....do	Sept. 25	85.2	Do.
North Loup River	Brownlee	May 1	359.79	C. B. Channel.
Do	Burwell	May 16	984.	Glenn E. Smith.
Do	Brewster	Sept. 21	361.92	C. B. Channel.
Do	Brownlee	Sept. 23	195.84	Do.
North Platte River.	Llewellen bridge	May 22	15,901.88	H. H. Pickens.
Do	Gering	June 14	16,104.8	A. B. McCoskey.
Oak Creek	3 miles northwest of Lincoln	May 10	27.46	Do.
Do	Below Eiche's, 3 miles northwest of Lincoln, after heavy rains.	July 3	703.25	Do.
Do	Dannebrog	May 19	5.	Glenn E. Smith.
Platte River	Central City (estimated)	Sept. 8	20.	Do.
Plum Creek	Sec. 35, T. 33 N., R. 23 W.	June 10	81.07	C. B. Channel.
Republican River.	Above mouth of Frenchman River.	May 29	Dry.	H. H. Pickens.
Do	Orleans, below mouth of Sappa Creek.	Sept. 6	.25	Glenn E. Smith.
Do	Oxford	....do	Dry.	Do.
Do	Above Frenchman River	Sept. 19	Dry.	A. B. McCoskey.
Do	McCook	....do	12.27	Do.
Do	Head of irrigation and water-power canal, sec. 15, T. 3 N., R. 31 W.	....do	17.5	E. D. Johnson.
Sandy Creek	Sec. 3, T. 31 N., R. 15 W	June 17	8.28	C. B. Channel.
Shobe Branch	Lambs, sec. 32, T. 33 N., R. 11 W.	June 20	1.66	Do.
South Platte River.	North Platte	Apr. 19	883.	Glenn E. Smith.
Do	....do	May 6	866.	Do.
Do	....do	May 22	88.	Do.
Do	....do	June 6	Dry.	Do.
Do	....do	June 19	Dry.	Do.
Do	Sutherland	May 23	50.	H. H. Pickens.
Sowbelly Creek	North line sec. 19, T. 32 N., R. 55 W.	Aug. 1	1.37	A. B. McCoskey.
Spring Creek	Head Townsend ditch, sec. 35, T. 34 N., R. 19 W.	May 16	5.18	C. B. Channel.
Do	Head Opperman's ditch, sec. 5, T. 31 N., R. 20 W.	June 15	.31	Do.
Squaw Creek	Duncan, sec. 28, T. 31 N., R. 51 W.	May 11	1.21	Do.
Do	Stetsons, sec. 18, T. 31 N., R. 51 W	....do	.33	Do.
Do	Head proposed Daniel & Stetson ditch.	....do	.79	Do.
Do	Head Cooper ditch, sec. 36, T. 32 N., R. 52 W.	May 12	.72	Do.
Stinkingwater River.	Above Palisade	May 29	21.60	H. H. Pickens.
Thompson Creek	Sec. 4, T. 2 N., R. 13 W	Sept. 8	3.45	E. D. Johnson.
Trunk Butte Creek.	North line sec. 36, T. 33 N., R. 50 W.	May 17	1.45	C. B. Channel.
Do	Sec. 3, T. 52 N., R. 50 W.	Aug. 18	.34	A. B. McCoskey.
Turkey Creek	Sec. 30, T. 4 N., R. 21 W	Sept. 6	2.26	E. D. Johnson.
Warbonnet Creek	Brewster's ranch, sec. 21, T. 33 N., R. 56 W.	May 25	2.50	A. B. McCoskey.
West Ash Creek	At Woodwards, sec. 25, T. 32 N., R. 51 W.	May 15	.19	C. B. Channel.
West Middle Creek.	Sec. 32, T. 33 N., R. 23 W.	June 2	1.48	Do.
White River	Whitney	May 15	10.37	E. D. Johnson.
Do	Below Crawford	May 17	18.68	A. B. McCoskey.
Do	Force's ranch	May 19	4.41	Do.
Do	Head Crawford ditch	...do	16.70	Do.
Do	Below Crawford	...do	18.05	Do.
Do	....do	May 22	45.89	Do.
Do	Andrews siding	May 26	4.93	C. B. Channel.
Do	Below Crawford	Aug. 19	16.20	A. B. McCoskey.
White Clay Creek	Sec. 13, T. 32 N., R. 51 W	May 11	.72	C. B. Channel.
Do	Brooks, sec. 2, T. 33 N., R. 45 W	May 20	5.27	Do.
Wooden Spring Branch.	Sec. 25, T. 35 N., R. 29 W.	June 13	2.14	Do.

RATING TABLES.

The following pages contain the rating tables prepared for various river stations described in Papers Nos. 35 to 39, inclusive. These show the relation which has been found to exist during the year 1899 between the height of water on the gage at each locality and the discharge in cubic feet per second. These tables have been prepared from the measurements made during 1899 or previous years, and are used in computing the daily flow, the results of which are to be given in the Twenty-first Annual Report, Part IV. Taking, for example, the first table, No. 62, Delaware River at Lambertville, New Jersey, the number 62 refers to the page upon which the river station is described. At the end of the description are given the results of discharge measurements made during 1899. From these and earlier data the relation of gage height to discharge has been deduced and is given in the following tables. On page 63 is given the daily height in feet. On March 1 this was 6.80. In the following table the flow equivalent to this height is shown to be 33,710 second-feet. In the same manner the flow corresponding to each gage height in the table has been obtained and the averages computed, for use, as above noted, in the annual report relating to the year 1899.

Rating tables for stations in New Jersey, Pennsylvania, Maryland, and West Virginia.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 35.]

Gage height in feet.	Discharge in second-feet.											
	62. Delaware River at Lambertville, New Jersey.	75. North Branch of Susquehanna River at Wilkesbarre, Pennsylvania.	77. North Branch of Susquehanna River at Danville, Pennsylvania.	78. West Branch of Susquehanna River at Allenwood, Pennsylvania.	79. Juniata River at Newport, Pennsylvania.	80. Susquehanna River at Harrisburg, Pennsylvania.	81. Octoraro Creek at Rowlandsville, Maryland.	83. Patapsco River at Woodstock, Maryland.	86. Antietam Creek at Sharpsburg, Maryland.	90. Shenandoah River at Millville, West Virginia.	91. Potomac River at Point of Rocks, Maryland.	93. Monocacy River at Frederick, Maryland.
0.0	.....	.....	.....	.....	.....	3,000	.....	.....	.....	.....	750	.....
0.2	.....	.....	.....	.....	.....	3,650	.....	.....	.....	.....	1,000	.....
0.4	.....	.....	.....	.....	.....	4,350	.....	.....	.....	.....	1,400	.....
0.6	.....	.....	.....	.....	.....	5,050	.....	.....	.....	740	1,800	.....
0.8	.....	.....	.....	.....	.....	5,900	.....	.....	.....	940	2,400	.....
1.0	.....	.....	.....	.....	.....	7,000	.....	.....	.....	1,140	3,100	.....
1.2	.....	.....	.....	.....	.....	8,200	.....	.....	38	1,370	3,900	.....
1.4	.....	.....	.....	.....	.....	9,450	.....	.....	60	1,650	4,700	.....
1.6	.....	.....	.....	750	.....	10,750	.....	.....	105	1,950	5,500	.....
1.8	.....	.....	970	1,050	.....	12,300	.....	.....	171	2,260	6,400	.....
2.0	.....	.....	1,350	1,350	.....	13,900	.....	.....	233	2,600	7,300	.....
2.2	.....	1,000	1,750	1,700	.....	15,500	.....	.....	294	2,960	8,300	.....
2.4	1,750	1,200	2,250	2,150	.....	17,300	.....	.....	356	3,340	9,300	.....
2.6	2,100	1,400	2,750	2,650	.....	19,300	.....	.....	417	3,740	10,300	.....
2.8	2,600	1,600	3,300	3,250	600	21,300	.....	.....	479	4,160	11,300	.....
3.0	3,300	1,860	3,900	4,000	1,000	23,400	.....	50	544	4,600	12,350	.....
3.2	4,100	2,120	4,550	5,200	1,400	25,625	110	83	644	5,060	13,450	.....
3.4	5,050	2,400	5,250	7,500	1,820	27,925	155	122	766	5,540	14,550	.....
3.6	6,100	2,700	6,000	10,750	2,270	30,300	225	173	887	6,050	15,650	45
3.8	7,250	3,000	6,800	14,000	2,750	32,800	305	235	1,000	6,600	16,800	90
4.0	8,550	3,300	7,600	17,250	3,250	35,400	385	310	1,114	7,190	18,000	150
4.2	10,000	3,600	8,500	20,500	3,750	38,100	465	400	1,227	7,790	19,200	210
4.4	11,650	3,940	9,400	23,750	4,300	41,100	545	520	1,340	8,410	20,400	270
4.6	13,350	4,340	10,400	27,000	4,900	44,590	635	670	1,454	9,040	21,600	340
4.8	15,050	4,760	11,400	30,250	5,500	48,170	725	835	1,567	9,680	22,800	420
5.0	16,750	5,200	12,500	33,500	6,200	51,750	815	1,000	1,680	10,320	24,000	500
5.2	18,500	5,700	13,700	36,750	6,900	55,330	910	1,200	1,794	10,960	25,200	600
5.4	20,300	6,250	14,900	40,000	7,700	58,910	1,010	1,400	1,908	11,600	26,400	700
5.6	22,150	6,850	16,100	43,250	8,500	62,490	1,110	1,600	2,022	12,240	27,600	800
5.8	24,050	7,560	17,390	46,500	9,350	66,070	1,210	1,800	2,136	12,880	28,800	900
6.0	25,950	8,340	18,800	49,750	10,250	69,650	1,314	2,000	2,250	13,520	30,100	1,020
6.2	27,850	9,240	20,240	53,000	11,150	73,230	1,418	2,205	2,364	14,160	31,400	1,192
6.4	29,750	10,260	21,680	56,250	12,060	76,810	1,522	2,410	2,478	14,800	32,700	1,364
6.6	31,700	11,360	23,120	59,500	13,000	80,390	1,628	2,615	2,592	15,440	34,100	1,536
6.8	33,710	12,480	24,560	62,750	14,000	83,970	1,736	2,820	2,706	16,080	35,500	1,708
7.0	35,750	13,600	26,000	66,000	15,000	87,550	1,844	3,025	2,820	16,720	36,950	1,880
7.5	40,900	16,400	29,600	74,125	17,500	96,500	2,114	3,538	3,105	.....	40,800	2,310
8.0	46,050	19,200	33,200	82,250	20,000	105,450	.....	4,050	3,390	.....	44,900	2,740
8.5	51,200	22,000	36,800	.....	22,500	114,400	.....	4,562	.....	.....	49,300	3,170
9.0	56,350	24,800	40,400	.....	25,000	123,350	.....	.....	.....	.....	53,850	3,600
9.5	61,500	27,600	44,000	.....	27,500	132,300	.....	.....	.....	.....	58,400	4,030
10.0	.....	30,400	47,600	.....	30,000	141,250	.....	.....	.....	.....	62,950	4,460
10.5	.....	33,200	51,200	.....	32,500	150,200	.....	.....	.....	.....	67,500	4,890
11.0	.....	36,000	54,800	.....	35,000	159,150	.....	.....	.....	.....	72,050	5,320
11.5	.....	38,800	58,400	.....	.....	168,100	.....	.....	.....	.....	76,600	5,750
12.0	.....	41,600	62,000	.....	.....	177,050	.....	.....	.....	.....	81,150	6,180
12.5	.....	44,400	.....	.....	.....	186,000	.....	.....	.....	.....	85,700	6,610
13.0	.....	47,200	.....	.....	.....	194,950	.....	.....	.....	.....	90,250	7,040
13.5	.....	50,000	.....	.....	.....	203,900	.....	.....	.....	.....	94,800	7,470
14.0	.....	52,800	.....	.....	.....	212,850	.....	.....	.....	.....	99,350	7,900
14.5	.....	.....	.....	.....	.....	221,800	.....	.....	.....	.....	103,900	8,330
15.0	.....	.....	.....	.....	.....	230,750	.....	.....	.....	.....	108,450	8,760
15.5	.....	.....	.....	.....	.....	239,700	.....	.....	.....	.....	113,000	9,190
16.0	.....	.....	.....	.....	.....	248,650	.....	.....	.....	.....	117,550	9,620
16.5	.....	.....	.....	.....	.....	257,600	.....	.....	.....	.....	122,100	10,050
17.0	.....	.....	.....	.....	.....	266,550	.....	.....	.....	.....	126,650	10,480

Rating tables for stations in Virginia and North Carolina.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 35 or No. 36.]

Gage height in feet.	Discharge in second-feet.											
	95. North (of James) River at Glasgow, Virginia.	97. James River at Buchanan, Virginia.	107. Roanoke River at Roanoke, Virginia.	109. Roanoke River at Neal, North Carolina.	110. Tar River at Tarboro, North Carolina.	111. Neuse River at Selma, North Carolina.	112. Haw River at Moncure, North Carolina.	113. Deep River at Moncure, North Carolina.	115. Cape Fear River at Fayetteville, North Carolina.	116. Yadkin River at Salisbury, North Carolina.	118. Yadkin River at Norwood, North Carolina.	120. Catawba River at Catawba, North Carolina.
0.2	.....	.....	.....	.....	.....	145	.....	.....	.....	.....	.....	.....
0.4	.....	.....	.....	.....	370	175	.....	.....	.....	.....	.....	.....
0.6	155	.....	70	.....	410	215	.....	210	.....	.....	.....	.....
0.8	180	.....	110	.....	453	255	.....	230	.....	.....	.....	.....
1.0	200	.....	170	2,270	500	295	290	250	489	.....	1,500	.....
1.2	220	.....	240	2,410	555	335	350	290	550	.....	2,080	.....
1.4	290	.....	325	2,550	615	377	415	330	612	.....	2,670	.....
1.6	410	.....	420	2,690	675	419	500	380	678	1,600	3,270	850
1.8	560	370	540	2,830	735	462	600	440	744	2,000	3,900	1,050
2.0	730	530	670	2,970	800	506	700	500	810	2,500	4,600	1,270
2.2	920	690	820	3,110	875	551	820	560	876	3,100	5,400	1,540
2.4	1,120	850	1,010	3,250	953	600	950	630	946	3,700	6,240	1,840
2.6	1,340	1,010	1,240	3,390	1,031	650	1,090	715	1,022	4,300	7,080	2,200
2.8	1,570	1,180	1,540	3,530	1,110	700	1,230	805	1,103	5,000	7,920	2,600
3.0	1,810	1,380	1,920	3,670	1,200	750	1,370	900	1,187	5,700	8,760	3,000
3.2	2,070	1,590	2,325	3,810	1,300	800	1,530	1,070	1,273	6,500	9,630	3,450
3.4	2,330	1,810	2,735	3,950	1,400	860	1,690	1,240	1,367	7,300	10,600	3,900
3.6	2,610	2,070	3,145	4,090	1,500	920	1,850	1,410	1,467	8,100	11,780	4,375
3.8	2,890	2,340	3,555	4,230	1,600	980	2,010	1,580	1,567	8,900	12,980	4,875
4.0	3,190	2,620	3,965	4,370	1,700	1,040	2,170	1,750	1,674	9,700	14,180	5,400
4.2	3,490	2,920	4,375	4,510	1,810	1,100	2,340	1,940	1,782	10,500	15,380	5,940
4.4	3,790	3,220	4,785	4,650	1,920	1,168	2,510	2,130	1,890	11,300	16,580	6,495
4.6	4,090	3,520	5,195	4,790	2,030	1,236	2,680	2,320	1,994	12,100	17,820	7,065
4.8	4,390	3,830	5,605	4,930	2,140	1,305	2,850	2,510	2,102	12,900	19,060	7,640
5.0	4,690	4,150	6,015	5,070	2,250	1,385	3,020	2,700	2,210	13,700	20,300	8,225
5.5	5,490	5,050	7,040	5,420	2,550	1,585	3,445	3,175	2,470	15,700	23,510	9,700
6.0	6,400	6,030	8,065	5,770	2,865	1,805	3,870	3,650	2,740	17,900	26,800	11,175
6.5	7,420	7,080	9,090	6,120	3,200	2,030	4,310	4,125	3,010	20,200	30,300	12,650
7.0	8,540	8,130	10,115	6,525	3,550	2,255	4,760	4,600	3,280	22,700	33,800	14,125
7.5	9,910	9,300	11,140	6,970	3,910	2,500	5,210	5,100	3,550	25,650	37,800	15,600
8.0	11,400	10,600	12,165	7,420	4,285	2,750	5,660	5,600	3,822	29,100	41,800	17,075
8.5	12,900	11,930	.....	7,870	4,685	3,000	6,110	6,100	4,102	33,000	46,300	18,550
9.0	14,430	13,310	.....	8,345	5,085	3,250	6,600	6,600	4,382	37,000	51,000	20,025
9.5	15,930	14,740	.....	8,840	5,500	3,500	7,100	7,100	4,672	41,000	56,250	21,500
10.0	17,430	16,240	.....	9,340	5,915	3,750	7,600	7,600	4,955	45,000	61,500	22,975
10.5	18,930	17,820	.....	9,840	6,330	4,000	8,100	8,100	5,245	49,000	66,750	24,450
11.0	20,430	19,430	.....	10,340	6,750	4,280	8,600	8,600	5,535	53,000	72,000	25,925
11.5	21,930	21,170	.....	10,840	7,175	4,610	9,100	9,100	5,833	57,000	.....	27,400
12.0	23,430	22,920	.....	11,340	7,600	4,960	9,600	9,600	6,133	61,000	.....	28,875
12.5	24,930	24,680	.....	11,840	8,025	5,320	10,100	10,100	6,443	65,000	.....	30,350
13.0	26,430	26,630	.....	12,340	8,470	5,695	10,600	10,600	6,733	69,000	.....	31,825
13.5	.....	28,700	.....	12,890	8,920	6,070	11,100	11,100	7,033	73,000	.....	33,300
14.0	.....	30,850	.....	13,440	9,370	6,450	11,600	11,600	7,333	77,000	.....	34,775
14.5	.....	33,000	.....	14,040	9,820	6,850	12,100	12,100	7,633	81,000	.....	36,250
15.0	.....	35,150	.....	14,640	10,270	7,250	12,600	12,600	7,933	85,000	.....	37,725
16.0	.....	39,450	.....	15,940	11,170	8,050	13,600	13,680	8,541	93,000	.....	40,675
17.0	.....	43,750	.....	17,240	12,070	8,850	14,600	14,780	9,161	101,000	.....	43,650
18.0	.....	48,050	.....	18,600	12,970	9,650	15,600	15,880	9,781	109,000	.....	46,650
19.0	.....	52,350	.....	20,400	13,870	10,450	16,600	16,980	10,401	117,000	.....	49,650
20.0	.....	.....	.....	22,400	14,850	11,250	17,600	18,080	11,569	.....	.....	52,650
25.0	.....	.....	.....	39,700	19,850	.....	22,600	23,580	18,364	.....	.....	.....
30.0	.....	.....	.....	.....	.....	.....	.....	.....	25,159	.....	.....	.....
35.0	.....	.....	.....	.....	.....	.....	.....	.....	33,600	.....	.....	.....
40.0	.....	.....	.....	.....	.....	.....	.....	.....	44,000	.....	.....	.....
45.0	.....	.....	.....	.....	.....	.....	.....	.....	54,500	.....	.....	.....
50.0	.....	.....	.....	.....	.....	.....	.....	.....	65,000	.....	.....	.....

Rating tables for stations in South Carolina and Georgia.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 36.]

Gage height in feet.	Discharge in second-feet.											
	121. Catawba River at Rockhill, South Carolina.	123. Broad River at Gaffney, South Carolina.	125. Broad River at Alston, South Carolina.	126. Saluda River at Waterloo, South Carolina.	127. Tugaloo River at Madison, South Carolina.	129. Savannah River at Calhoun Falls, South Carolina.	130. Savannah River at Augusta, Georgia.	131. Broad River at Carlton, Georgia.	133. Oconee River at Dublin, Georgia.	134. Yellow River at Almon, Georgia.	136. Ocmulgee River at Macon, Georgia.	139. Chattahoochee River at Oakdale, Georgia, lower gage.
—0.2	.....	.....	.....	.....	.....	.....	.....	.....	*a* 1,300	.....	.....	.....
0.0	.....	.....	.....	.....	.....	.....	.....	.....	1,425	.....	.....	400
0.2	.....	.....	.....	.....	.....	.....	.....	.....	1,552	.....	580	480
0.4	.....	.....	.....	.....	.....	.....	.....	.....	1,681	.....	620	580
0.6	.....	.....	.....	.....	.....	.....	.....	.....	1,812	.....	690	680
0.8	.....	.....	.....	.....	563	.....	.....	.....	1,945	.....	770	780
1.0	.....	.....	.....	.....	665	.....	.....	.....	2,080	120	850	900
1.2	.....	600	.....	.....	767	.....	.....	.....	2,218	147	940	1,020
1.4	1,550	780	.....	.....	869	.....	.....	.....	2,358	175	1,040	1,150
1.6	1,750	1,050	.....	.....	971	.....	.....	380	2,500	212	1,140	1,280
1.8	2,030	1,350	.....	.....	1,073	.....	.....	450	2,644	255	1,250	1,420
2.0	2,390	1,650	1,520	300	1,175	.....	.....	540	2,790	300	1,360	1,560
2.2	2,830	1,960	1,800	320	1,277	1,990	.....	660	2,938	345	1,480	1,700
2.4	3,380	2,300	2,160	350	1,379	2,190	.....	800	3,089	390	1,600	1,850
2.6	4,060	2,660	2,520	400	1,481	2,490	.....	940	3,243	435	1,720	2,000
2.8	4,880	3,020	2,900	465	1,583	2,870	.....	1,080	3,400	480	1,840	2,150
3.0	5,750	3,400	3,300	550	1,685	3,420	.....	1,220	3,560	525	1,960	2,300
3.2	6,632	3,820	3,700	650	1,787	4,160	.....	1,370	3,720	570	2,080	2,470
3.4	7,516	4,260	4,100	750	1,889	5,036	.....	1,520	3,890	615	2,200	2,650
3.6	8,400	4,720	4,500	850	1,991	5,924	.....	1,680	4,070	660	2,320	2,850
3.8	9,284	5,200	4,900	950	2,093	6,812	.....	1,840	4,260	705	2,440	3,050
4.0	10,168	5,680	5,300	1,050	2,195	7,700	2,350	2,000	4,460	750	2,560	3,250
4.2	11,052	6,160	5,800	1,156	2,310	8,588	2,470	2,180	4,672	795	2,680	3,450
4.4	11,936	6,640	6,300	1,262	2,435	9,476	2,695	2,360	4,888	840	2,800	3,650
4.6	12,820	7,120	6,800	1,368	2,570	10,364	2,725	2,550	5,108	885	2,920	3,900
4.8	13,704	7,600	7,360	1,474	2,710	11,252	2,860	2,750	5,332	930	3,040	4,150
5.0	14,588	8,080	7,920	1,580	2,860	12,140	3,000	2,950	5,560	975	3,160	4,400
5.2	15,472	8,560	8,500	1,686	3,020	13,028	3,160	3,160	5,788	1,020	3,280	4,660
5.4	16,356	9,040	9,100	1,805	3,180	13,916	3,340	3,390	6,016	1,065	3,400	4,920
5.6	17,240	9,520	9,700	1,935	3,340	14,804	3,540	3,640	6,244	1,110	3,520	5,180
5.8	18,124	10,000	10,300	2,065	3,500	15,692	3,760	3,900	6,472	1,155	3,640	5,440
6.0	19,008	10,480	11,000	2,200	3,660	16,580	4,000	4,160	6,700	.....	3,760	5,700
6.5	21,218	11,680	12,750	2,550	4,060	18,800	4,620	4,825	7,270	.....	4,060	6,370
7.0	23,428	12,880	14,700	2,900	4,460	21,020	5,300	5,500	7,840	.....	4,360	7,000
7.5	25,638	14,080	16,950	3,275	4,860	23,240	6,050	6,175	8,410	.....	4,660	7,650
8.0	27,848	15,280	19,200	3,670	5,260	25,460	6,800	6,850	8,980	.....	5,010	8,300
8.5	30,058	16,480	21,450	4,075	5,660	27,680	7,600	7,525	9,550	.....	5,410	8,950
9.0	32,268	17,680	23,700	4,500	6,060	29,900	8,400	8,200	10,120	.....	5,810	9,600
9.5	34,478	18,880	25,950	4,950	6,460	32,120	9,250	8,875	10,690	.....	6,250	10,250
10.0	36,688	20,080	28,200	5,400	6,860	34,340	10,100	9,550	11,260	.....	6,820	10,900
11.0	40,108	22,480	32,700	6,350	7,660	38,780	11,900	10,900	12,400	.....	8,120	12,200
12.0	45,528	24,880	37,200	7,350	8,460	43,220	13,800	12,250	13,540	.....	10,010	13,500
13.0	49,948	.....	41,700	8,400	9,260	47,660	15,800	13,600	14,680	.....	12,900	14,800
14.0	54,368	.....	46,200	9,500	10,060	52,100	17,900	14,950	15,820	.....	16,000	16,100
15.0	58,788	.....	50,700	10,650	10,860	.....	20,100	16,300	16,960	.....	19,200	17,400
16.0	62,208	.....	55,200	11,850	11,660	.....	22,400	17,650	18,100	.....	22,400	18,700
18.0	72,048	.....	64,200	14,350	.....	.....	27,300	.....	20,380	.....	.....	21,300
20.0	.....	.....	.....	.....	.....	.....	33,300	.....	22,660	.....	.....	23,900
22.0	.....	.....	.....	.....	.....	.....	41,000	.....	24,940	.....	.....	26,500
24.0	.....	.....	.....	.....	.....	.....	52,000	.....	27,220	.....	.....	29,100
26.0	.....	.....	.....	.....	.....	.....	68,800	.....	.....	.....	.....	31,700

a Continued: Gage height —1.20, discharge 890; gage height —1.00, discharge 950; gage height —0.8, discharge 1,015; gage height —0.6, discharge 1,095; gage height —0.4, discharge 1,185.

Rating tables for stations in Georgia, Alabama, Maryland, and West Virginia.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 36.]

Gage height in feet.	Discharge in second-feet.												
	139. Chattahoochee River at Oakdale, Georgia, upper gage.	142. Chattahoochee River at West Point, Georgia.	143. Etowah River at Canton, Georgia.	144. Coosawattee River at Carters, Georgia.	146. Oostanaula River at Resaca, Georgia.	148. Coosa River at Rome, Georgia.	149. Coosa River at Riversside, Alabama.	152. Tallapoosa River at Milstead, Alabama.	156. Black Warrior River at Tuscaloosa, Alabama.	159. Youghiogheny River at Friendsville, Maryland.	163. Greenbrier River at Alderson, West Virginia.	164. New River at Fayette, West Virginia.
—0.4	.....	.....	275	.....	.....	.....	.....	.....	205	.....	.....	.....
—0.2	.....	.....	385	.....	.....	.....	.....	.....	240	.....	.....	.....
0.0	.....	.....	515	.....	.....	.....	.....	.....	280	.....	.....	1,400
0.2	910	.....	665	.....	.....	.....	.....	.....	340	.....	.....	1,550
0.4	1,000	.....	820	.....	.....	1,550	.....	.....	400	.....	.....	1,700
0.6	1,100	.....	988	230	.....	1,710	.....	.....	460	.....	.....	1,850
0.8	1,220	.....	1,154	280	.....	1,870	.....	430	530	.....	.....	2,000
1.0	1,350	935	1,320	345	460	2,030	2,460	672	600	.....	.....	2,150
1.2	1,490	1,000	1,486	420	500	2,218	2,760	918	670	.....	60	2,310
1.4	1,630	1,180	1,652	495	550	2,406	3,100	1,164	750	.....	120	2,480
1.6	1,780	1,380	1,818	580	600	2,620	3,500	1,410	830	.....	220	2,660
1.8	1,940	1,600	1,984	675	650	2,860	3,940	1,656	910	.....	350	2,850
2.0	2,100	1,840	2,150	770	705	3,100	4,400	1,902	1,000	.....	505	3,050
2.2	2,270	2,100	2,316	872	770	3,420	4,900	2,148	1,090	.....	685	3,270
2.4	2,450	2,380	2,482	977	840	3,740	5,430	2,394	1,180	.....	920	3,490
2.6	2,630	2,680	2,648	1,086	920	4,060	5,970	2,630	1,270	.....	1,205	3,720
2.8	2,810	3,000	2,814	1,200	1,000	4,380	6,530	2,876	1,370	.....	1,535	3,960
3.0	3,000	3,340	2,980	1,318	1,080	4,700	7,100	3,132	1,470	.....	1,900	4,200
3.2	3,200	3,700	3,146	1,440	1,175	5,100	7,700	3,378	1,570	.....	2,330	4,480
3.4	3,405	4,080	3,312	1,566	1,275	5,500	8,330	3,624	1,670	.....	2,770	4,760
3.6	3,615	4,480	3,478	1,698	1,380	5,900	8,970	3,870	1,780	.....	3,240	5,060
3.8	3,825	4,920	3,644	1,834	1,490	6,300	9,620	4,116	1,890	.....	3,720	5,380
4.0	4,035	5,370	3,810	1,970	1,610	6,700	10,300	4,362	2,000	260	4,200	5,700
4.2	4,250	5,880	3,976	2,106	1,730	7,102	11,040	4,608	2,111	295	4,680	6,060
4.4	4,470	6,400	4,142	2,242	1,860	7,504	11,780	4,854	2,222	350	5,160	6,442
4.6	4,700	6,940	4,308	2,378	2,005	7,906	12,520	5,100	2,333	425	5,660	6,890
4.8	4,930	7,490	4,474	2,514	2,160	8,308	13,260	5,346	2,444	520	6,180	7,338
5.0	5,160	8,040	4,640	2,650	2,330	8,710	14,000	5,592	2,555	640	6,700	7,786
5.5	5,850	9,420	5,055	2,990	2,780	9,715	15,850	6,207	2,832	1,050	8,000	8,906
6.0	6,600	10,800	5,470	3,330	3,230	10,720	17,700	6,822	3,110	1,600	9,500	10,026
6.5	7,350	12,180	5,885	3,670	3,690	11,725	19,550	7,437	3,370	2,170	11,000	11,146
7.0	8,100	13,560	6,300	4,010	4,150	12,730	21,400	8,052	3,665	2,740	12,500	12,290
7.5	8,850	14,950	6,715	4,350	4,610	13,735	23,250	8,667	3,925	3,310	14,000	13,490
8.0	9,600	16,400	7,130	4,690	5,070	14,740	25,100	9,282	4,220	3,880	15,600	14,820
8.5	10,350	17,850	7,545	5,030	5,530	15,745	26,950	9,897	4,480	4,450	17,300	16,170
9.0	11,100	19,300	7,960	5,370	5,990	16,750	28,800	10,512	4,775	5,020	19,000	17,600
9.5	11,850	20,750	8,375	5,710	6,450	17,755	30,650	11,127	5,035	5,590	20,700	19,190
10.0	12,600	22,200	8,790	6,050	6,910	18,760	32,500	11,742	5,330	.....	22,500	20,920
11.0	14,100	25,100	9,620	6,730	7,830	20,770	36,200	12,972	5,885	.....	26,500	24,480
12.0	.....	28,800	10,450	7,410	8,750	22,780	39,900	14,202	6,440	.....	31,200	28,050
13.0	.....	33,410	11,280	8,090	9,670	24,790	43,600	15,432	6,995	.....	36,200	31,620
14.0	.....	38,030	12,110	8,770	10,590	26,800	47,300	16,662	7,550	.....	41,200	35,200
15.0	.....	42,630	12,940	9,450	11,510	28,810	51,000	17,892	8,105	.....	46,200	38,770
16.0	.....	.....	13,770	10,130	12,430	30,820	54,700	19,122	8,660	.....	.....	42,340
17.0	.....	.....	14,600	10,810	13,350	32,830	58,400	20,352	9,215	.....	.....	45,910
18.0	.....	.....	15,430	11,490	14,270	34,840	62,100	21,582	9,770	.....	.....	49,480
19.0	.....	.....	.....	12,170	15,190	36,850	.....	22,812	10,325	.....	.....	53,050
20.0	.....	.....	.....	.....	16,110	38,860	.....	24,042	10,880	.....	.....	56,620
25.0	.....	.....	.....	.....	20,710	48,910	.....	30,192	16,000	.....	.....	74,470
30.0	.....	.....	.....	.....	.....	58,960	.....	36,342	24,600	.....	.....	92,320
35.0	.....	.....	.....	.....	.....	.....	.....	42,492	35,000	.....	.....	110,170
40.0	.....	.....	.....	.....	.....	.....	.....	.....	49,000	.....	.....	.....
45.0	.....	.....	.....	.....	.....	.....	.....	.....	65,250	.....	.....	.....
50.0	.....	.....	.....	.....	.....	.....	.....	.....	84,000	.....	.....	.....
55.0	.....	.....	.....	.....	.....	.....	.....	.....	102,750	.....	.....	.....
60.0	.....	.....	.....	.....	.....	.....	.....	.....	121,500	.....	.....	.....

Rating tables for stations in North Carolina, Georgia, Tennessee, Ohio, and Montana.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 36 or No. 37].

Gage height in feet.	Discharge in second-feet.											
	165. French Broad River at Asheville, North Carolina.	167. Tuckasegee River at Bryson, North Carolina.	168. Little Tennessee River at Judson, North Carolina.	169. Hiwassee River at Murphy, North Carolina.	171. Toccoa River at Blueridge, Georgia.	174. Tennessee River at Chattanooga, Tennessee.	175. Olentangy River at Columbus, Ohio.	176. Scioto River at Columbus, Ohio.	195. West Gallatin River at Salesville, Montana.	196. Middle Creek at Bozeman, Montana.	205. Madison River at Redbluff, Montana.	208. Missouri River at Townsend, Montana.
								a				*b*
−0.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	380	.....	.....
0.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	410	.....	.....
0.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	440	.....	.....
0.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	470	.....	2,000
0.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	500	.....	2,400
0.8	.....	.....	.....	.....	.....	6,600	.....	.....	.....	530	.....	2,800
1.0	.....	300	.....	.....	.....	7,300	30	15	.....	560	850	3,250
1.2	.....	460	.....	.....	.....	8,040	90	50	.....	590	1,500	3,750
1.4	.....	620	.....	.....	.....	8,820	160	100	.....	620	2,150	4,250
1.6	.....	824	.....	.....	.....	9,620	250	150	.....	650	2,800	4,800
1.8	.....	1,072	.....	.....	.....	10,430	360	200	.....	680	3,450	5,400
2.0	820	1,320	225	.....	255	11,250	490	250	.....	710	4,100	6,000
2.2	990	1,652	300	.....	305	12,080	640	300	.....	740	4,750	6,600
2.4	1,180	1,984	445	.....	370	12,930	810	350	.....	770	5,400	7,250
2.6	1,400	2,330	610	.....	475	13,800	1,000	400	.....	800	6,050	7,950
2.8	1,620	2,720	805	.....	610	14,680	1,210	460	650	.....	6,700	8,650
3.0	1,860	3,150	1,060	.....	760	15,600	1,430	540	690	.....	7,350	9,400
3.2	2,120	3,620	1,360	.....	912	16,550	1,660	640	740	.....	8,000	10,200
3.4	2,380	4,160	1,670	.....	1,064	17,550	1,900	760	810	.....	8,650	11,000
3.6	2,660	4,800	1,990	.....	1,216	18,550	2,140	900	900	.....	9,300	11,900
3.8	2,950	5,530	2,320	.....	1,368	19,600	2,390	1,050	1,010	.....	9,950	12,900
4.0	3,290	6,320	2,650	.....	1,520	20,800	2,640	1,210	1,160	.....	.....	14,000
4.2	3,710	7,150	3,020	.....	1,672	22,040	2,900	1,390	1,350	.....	.....	15,200
4.4	4,210	8,000	3,390	.....	1,824	23,280	3,170	1,570	1,580	.....	.....	16,400
4.6	4,760	8,850	3,770	225	1,976	24,520	3,450	1,750	1,870	.....	.....	17,600
4.8	5,350	9,700	4,160	280	2,128	25,760	3,745	1,940	2,210	.....	.....	19,000
5.0	6,020	10,550	4,550	340	2,280	27,000	4,060	2,140	2,600	.....	.....	20,400
5.5	7,920	12,675	5,600	620	2,660	30,100	4,930	2,670	3,600	.....	.....	25,000
6.0	9,820	14,800	6,750	1,280	3,040	33,200	5,830	3,230	4,600	.....	.....	30,650
6.5	11,720	16,925	7,975	2,130	3,420	36,300	.....	3,870	5,600	.....	.....	36,900
7.0	13,620	19,050	9,300	2,980	3,800	39,400	.....	4,610	6,600	.....	.....	43,150
7.5	15,520	21,300	10,720	3,830	4,180	42,500	.....	5,475	7,600	.....	.....	49,400
8.0	17,420	23,550	12,275	4,680	4,560	45,600	.....	6,400	8,600	.....	.....	55,650
8.5	19,320	26,050	14,087	5,530	4,940	48,700	.....	7,325	9,600	.....	.....	.....
9.0	21,220	28,550	16,100	6,380	5,320	51,800	.....	8,250	.....	.....	.....	.....
9.5	23,120	31,050	18,275	7,230	.....	54,900	.....	9,175	.....	.....	.....	.....
10.0	25,020	33,550	20,600	8,080	.....	58,000	.....	10,100	.....	.....	.....	.....
11.0	28,820	38,550	25,600	9,780	.....	64,200	.....	11,950	.....	.....	.....	.....
12.0	.....	.....	30,600	11,480	.....	70,400	.....	13,800	.....	.....	.....	.....
13.0	.....	.....	35,600	13,180	.....	76,600	.....	.....	.....	.....	.....	.....
14.0	.....	.....	.....	14,880	.....	82,800	.....	.....	.....	.....	.....	.....
15.0	.....	.....	.....	16,580	.....	89,000	.....	.....	.....	.....	.....	.....
16.0	.....	.....	.....	18,280	.....	95,200	.....	.....	.....	.....	.....	.....
17.0	.....	.....	.....	19,980	.....	101,400	.....	.....	.....	.....	.....	.....
18.0	.....	.....	.....	21,680	.....	107,600	.....	.....	.....	.....	.....	.....
19.0	.....	.....	.....	.....	.....	113,800	.....	.....	.....	.....	.....	.....
20.0	.....	.....	.....	.....	.....	120,000	.....	.....	.....	.....	.....	.....
22.0	.....	.....	.....	.....	.....	132,400	.....	.....	.....	.....	.....	.....
24.0	.....	.....	.....	.....	.....	144,800	.....	.....	.....	.....	.....	.....
26.0	.....	.....	.....	.....	.....	157,200	.....	.....	.....	.....	.....	.....
28.0	.....	.....	.....	.....	.....	169,600	.....	.....	.....	.....	.....	.....
30.0	.....	.....	.....	.....	.....	182,000	.....	.....	.....	.....	.....	.....
32.0	.....	.....	.....	.....	.....	194,400	.....	.....	.....	.....	.....	.....
34.0	.....	.....	.....	.....	.....	206,800	.....	.....	.....	.....	.....	.....
36.0	.....	.....	.....	.....	.....	219,200	.....	.....	.....	.....	.....	.....
40.0	.....	.....	.....	.....	.....	244,000	.....	.....	.....	.....	.....	.....

a Gage heights in the table should be increased by 8 feet, in order to correspond with gage heights on the rod at Columbus.

b Gage heights in the table should be increased by 88 feet, in order to correspond with gage heights on the rod at Townsend.

Rating tables for stations in Montana, Wyoming, Nebraska, and Colorado.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 37.]

Gage height in feet.	Discharge in second-feet.											
	209. Milk River at Havre, Montana, Jan. 1 to Sept. 17.	209. Milk River at Havre, Montana, Sept. 18 to Dec. 31.	212. Clear Creek at Buffalo, Wyoming.	214. Laramie River at Woods Landing, Wyoming.	216. Laramie River at Uva, Wyoming.	217. North Platte River at Orin Junction, Wyoming.	218. North Platte River at Gering, Nebraska.a	219. North Platte River at Camp Clarke, Nebraska.	220. North Platte River at North Platte, Nebraska, Jan. 1 to Sept. 20.	220. North Platte River at North Platte, Nebraska, Oct. 4 to Dec. 31.	222. Goose Creek at Lake Cheesman, Colorado.	223. South Fork of South Platte River at Lake Cheesman, Colorado.
0.2	90	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....
0.3	98	.....	17	40	.....	.....	.....	.....	.....	.....	.....	.....
0.4	110	.....	25	45	.....	.....	.....	.....	.....	.....	.....	.....
0.5	124	.....	33	50	5	.....	.....	.....	.....	.....	.....	.....
0.6	140	.....	46	60	10	0	.....	.....	.....	.....	.....	.....
0.7	160	.....	64	70	15	40	.....	.....	.....	.....	7	.....
0.8	183	.....	82	85	21	100	.....	.....	.....	.....	9	21
0.9	208	.....	104	100	30	170	507	.....	.....	.....	12	36
1.0	235	80	134	125	40	240	893	.....	.....	.....	24	49
1.1	265	84	169	155	50	310	1,316	.....	.....	.....	38	65
1.2	295	90	209	200	62	380	1,777	.....	.....	.....	53	86
1.3	330	98	246	245	80	450	2,275	.....	.....	.....	68	115
1.4	365	110	286	290	100	525	2,811	.....	.....	.....	83	145
1.5	400	124	323	350	120	600	3,385	.....	889	.....	98	175
1.6	440	140	365	410	140	680	3,997	.....	1,149	622	.....	205
1.7	480	160	406	475	160	760	4,647	.....	1,495	713	.....	234
1.8	525	183	447	550	185	850	5,335	.....	1,845	984	.....	264
1.9	570	208	504	630	210	940	6,061	.....	2,215	1,270	.....	294
2.0	620	235	558	720	240	1,030	6,824	600	2,619	1,557	.....	323
2.2	725	295	657	960	300	1,230	8,465	1,049	3,427	2,275	.....	383
2.4	845	365	752	1,240	370	1,480	10,257	1,646	4,235	3,138	.....	442
2.6	980	.....	856	1,530	450	1,760	12,200	2,391	5,197	4,001	.....	501
2.8	1,135	.....	.....	1,820	540	2,070	14,295	3,285	6,317	.....	.....	561
3.0	1,305	.....	.....	2,110	660	2,400	16,541	4,327	7,437	.....	.....	621
3.2	1,480	.....	.....	2,400	810	2,780	18,939	5,517	8,557	.....	.....	680
3.4	1,680	.....	.....	2,690	1,000	3,240	21,489	6,855	9,851	.....	.....	740
3.6	1,880	.....	.....	2,980	1,200	3,790	24,189	8,342	11,330	.....	.....	800
3.8	2,080	.....	.....	3,270	1,405	4,555	.....	9,977	12,962	.....	.....	860
4.0	2,280	.....	.....	3,560	1,611	5,445	.....	11,760	14,606	.....	.....	.....
4.2	2,480	.....	.....	3,850	1,817	6,335	.....	13,691	16,257	.....	.....	.....
4.4	2,680	.....	.....	4,140	2,023	7,225	.....	15,771	17,894	.....	.....	.....
4.6	2,880	.....	.....	4,430	2,229	8,115	.....	18,000	.....	.....	.....	.....
4.8	.....	.....	.....	.....	2,435	9,005	.....	20,375	.....	.....	.....	.....
5.0	.....	.....	.....	.....	2,641	9,895	.....	22,900	.....	.....	.....	.....
5.2	.....	.....	.....	.....	2,847	10,785	.....	25,573	.....	.....	.....	.....
5.4	.....	.....	.....	.....	3,053	11,760	.....	28,394	.....	.....	.....	.....
5.6	.....	.....	.....	.....	3,259	12,835	.....	.....	.....	.....	.....	.....
5.8	.....	.....	.....	.....	3,465	14,020	.....	.....	.....	.....	.....	.....
6.0	.....	.....	.....	.....	3,611	15,230	.....	.....	.....	.....	.....	.....
6.2	.....	.....	.....	.....	.....	16,480	.....	.....	.....	.....	.....	.....
6.4	.....	.....	.....	.....	.....	17,770	.....	.....	.....	.....	.....	.....
6.6	.....	.....	.....	.....	.....	19,100	.....	.....	.....	.....	.....	.....
6.8	.....	.....	.....	.....	.....	20,470	.....	.....	.....	.....	.....	.....
7.0	.....	.....	.....	.....	.....	21,880	.....	.....	.....	.....	.....	.....
7.2	.....	.....	.....	.....	.....	23,330	.....	.....	.....	.....	.....	.....

a These rating tables were applied by the indirect method described on pages 323 et seq. of the Nineteenth Annual Report, Part IV.

Rating tables for stations in Colorado and Nebraska.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 37.]

Gage height in feet.	Discharge in second-feet.											
	224. South Platte River at Platte Canyon, Colorado,	225. South Platte River at Denver, Colorado.	226. South Platte River at Orchard, Colorado, Jan. 1 to Mar. 18,	226. South Platte River at Orchard, Colorado, Mar. 19 to Dec. 31,	227. Bear Creek at Morrison, Colorado.	228. Clear Creek at Forkscreek, Colorado,	229. South Boulder Creek at Marshall, Colorado,	231. Boulder Creek at Boulder, Colorado,	232. St. Vrain Creek at Lyons, Colorado,	233. Big Thompson Creek at Arkins, Colorado,	237. North Loup River at St. Paul, Nebraska. *b*	238. Middle Loup River at St. Paul, Nebraska. *b*
	a											
0.0	125	.....	.....	.....	.....	.....	.....	0	.....	.....	.....	.....
0.1	146	.....	.....	.....	0	.....	.....	7	.....	.....	.....	.....
0.2	168	.....	.....	.....	1	.....	.....	14	.....	4	.....	.....
0.3	190	.....	.....	.....	2	.....	.....	21	.....	8	.....	.....
0.4	213	.....	.....	.....	2	.....	.....	28	.....	19	.....	.....
0.5	236	.....	.....	.....	3	.....	.....	36	.....	35	.....	.....
0.6	260	.....	.....	.....	4	.....	.....	45	.....	60	.....	.....
0.7	284	.....	.....	.....	5	.....	7	55	.....	88	.....	.....
0.8	308	.....	.....	.....	7	.....	13	67	.....	116	.....	.....
0.9	333	.....	.....	.....	8	.....	20	80	.....	146	.....	.....
1.0	359	.....	.....	.....	9	.....	29	95	.....	176	.....	625
1.1	386	.....	.....	.....	10	.....	39	113	.....	206	.....	655
1.2	413	.....	.....	.....	11	.....	49	133	.....	236	.....	685
1.3	441	.....	.....	.....	12	.....	60	156	.....	267	.....	715
1.4	470	.....	.....	.....	13	32	72	182	.....	299	.....	745
1.5	500	.....	.....	.....	15	44	86	211	.....	331	465	780
1.6	531	.....	.....	.....	16	58	102	242	.....	365	530	820
1.7	563	.....	.....	.....	17	75	121	276	.....	399	600	865
1.8	596	.....	.....	.....	19	93	143	321	.....	433	680	925
1.9	631	.....	.....	19	21	112	167	366	13	469	750	990
2.0	669	.....	0	40	22	133	193	412	25	510	835	1,065
2.2	754	.....	40	115	25	179	248	504	51	619	1,000	1,250
2.4	850	.....	113	206	27	235	308	596	80	769	1,175	1,480
2.6	954	.....	195	340	31	299	375	688	113	1,003	1,360	1,740
2.8	1,066	.....	288	614	34	367	452	780	155	1,251	1,560	2,050
3.0	1,185	.....	408	936	37	441	536	.....	204	1,499	1,760	2,390
3.2	1,305	.....	593	1,258	41	522	.....	.....	263	1,747	1,960	.....
3.4	1,425	.....	968	1,580	46	614	.....	.....	353	.....	2,175	.....
3.6	1,545	.....	1,342	1,902	54	719	.....	.....	477	.....	2,400	.....
3.8	1,665	.....	1,716	2,224	64	832	.....	.....	601	.....	2,625	.....
4.0	1,785	.....	2,090	2,546	80	946	.....	.....	729	.....	2,900	.....
4.2	1,905	.....	2,464	2,868	99	1,060	.....	.....	857	.....	.....	.....
4.4	2,025	.....	2,838	3,190	119	1,174	.....	.....	985	.....	.....	.....
4.6	2,145	.....	3,214	3,512	141	1,288	.....	.....	1,113	.....	.....	.....
4.8	.....	52	3,590	3,834	166	1,402	.....	.....	.....	.....	.....	.....
5.0	.....	81	3,966	4,156	195	.....	.....	.....	.....	.....	.....	.....
5.2	.....	121	.....	.....	225	.....	.....	.....	.....	.....	.....	.....
5.4	.....	172	.....	.....	257	.....	.....	.....	.....	.....	.....	.....
5.6	.....	232	.....	.....	290	.....	.....	.....	.....	.....	.....	.....
5.8	.....	309	.....	.....	325	.....	.....	.....	.....	.....	.....	.....
6.0	.....	422	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6.2	.....	588	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6.4	.....	755	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6.6	.....	922	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6.8	.....	1,088	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7.0	.....	1,255	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7.2	.....	1,422	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

a Continued: Gage height −0.1, discharge 104; gage height −0.2, discharge 87; gage height −0.3, discharge 75; gage height −0.4, discharge 64; gage height −0.5, discharge 55; gage height −0.6, discharge 48; gage height −0.7, discharge 41; gage height −0.8, discharge 35; gage height −0.9, discharge 30; gage height −1.0, discharge 26; gage height −1.1, discharge 22; gage height −1.2, discharge 18.

b These rating tables were applied by the indirect method described on pages 323 et seq. of the Nineteenth Annual Report, Part IV.

Rating tables for stations in Nebraska, Kansas, and Colorado.

[Number in box head refers to page in Water-Supply and Irrigation Paper No 37.]

Gage height in feet.	Discharge in second-feet.											
	240. Loup River at Columbus, Nebraska.*a*	242. Platte River at Columbus, Nebraska.*a*	243. Elkhorn River at Norfolk, Nebraska.*a*	244. Elkhorn River at Arlington, Nebraska.*a*	245. Republican River at Superior, Nebraska.	248. Republican River at Junction, Kansas.	249. Solomon River at Niles, Kansas.	250. Saline River at Salina, Kansas.	251. Smoky Hill River at Ellsworth, Kansas.	252. Blue River at Manhattan, Kansas.	253. Kansas River at Lecompton, Kansas, July 9 to Dec. 31.*b*	256. Lake Creek at Twin Lakes, Colorado.
0.2	.....	.....	.....	.....	90	.....	.....	.....	.....	.....	.....	.....
0.3	.....	.....	.....	.....	140	.....	.....	.....	.....	.....	.....	.....
0.4	.....	.....	.....	.....	200	.....	.....	.....	.....	.....	.....	.....
0.5	.....	.....	115	303	270	.....	.....	.....	.....	.....	.....	.....
0.6	.....	.....	140	340	350	.....	.....	.....	.....	.....	.....	.....
0.7	.....	.....	166	377	445	.....	.....	.....	.....	.....	.....	.....
0.8	.....	.....	194	415	560	.....	.....	.....	.....	.....	.....	.....
0.9	.....	.....	224	452	700	.....	.....	.....	.....	.....	.....	.....
1.0	.....	.....	256	490	860	.....	.....	.....	10	.....	.....	.....
1.2	.....	.....	323	564	1,200	.....	.....	.....	28	.....	.....	.....
1.4	.....	.....	396	639	1,580	.....	.....	.....	56	.....	.....	.....
1.6	.....	.....	477	714		.....	.....	.....	94	.....	.....	.....
1.8	.....	.....	562	789		.....	.....	.....	135	.....	.....	.....
2.0	.....	.....	660	863		.....	.....	.....	180	.....	1,850	.....
2.2	.....	.....	820	938		.....	.....	.....	230	.....	2,070	.....
2.4	.....	.....	1,010	1,013		.....	.....	.....	280	.....	2,320	.....
2.6	.....	1,676	.....	1,088		115	.....	.....	335	.....	2,580	411
2.8	.....	2,324	.....	1,162		205	.....	.....	390	.....	2,860	496
3.0	.....	3,100	.....	1,240		295	.....	40	450	150	3,150	588
3.2	.....	4,000	.....	1,339		395	.....	60	520	200	3,460	696
3.4	.....	5,000	.....	1,462		500	.....	70	610	270	3,780	834
3.6	.....	6,050	.....	1,610		615	.....	80	710	340	4,120	1,006
3.8	.....	7,400	.....	1,781		735	.....	95	830	420	4,480	1,208
4.0	898	9,200	.....	1,977		870	30	110	960	500	4,850	.....
4.2	1,241	11,300	.....	2,197		1,020	45	125	1,100	590	5,240	.....
4.4	1,620	13,450	.....	2,441		1,180	62	140	1,250	680	5,640	.....
4.6	2,040	16,400	.....	.....		1,360	81	156	1,400	770	6,060	.....
4.8	2,500	19,700	.....	.....		1,570	100	173	1,550	860	6,500	.....
5.0	2,995	23,700	.....	.....		1,780	120	190	1,700	960	6,950	.....
5.2	3,530	28,400	.....	.....		2,030	142	205	1,850	1,060	7,420	.....
5.4	4,101	.....	.....	.....		2,320	165	220	2,000	1,160	7,930	.....
5.6	4,712	.....	.....	.....		2,610	190	236	2,150	1,270	8,470	.....
5.8	5,358	.....	.....	.....		2,910	215	254	2,300	1,380	9,030	.....
6.0	6,040	.....	.....	.....		3,230	242	270	2,460	1,500	9,600	.....
6.5	7,910	.....	.....	.....		4,080	319	315	2,865	1,825	11,200	.....
7.0	.....	.....	.....	.....		.....	400	360	3,290	2,175	13,000	.....
7.5	.....	.....	.....	.....		.....	490	405	3,715	2,560	14,900	.....
8.0	.....	.....	.....	.....		.....	600	457	4,160	2,970	16,800	.....
8.5	.....	.....	.....	.....		.....	713	514	4,650	3,400	.....	.....
9.0	.....	.....	.....	.....		.....	834	565	5,150	3,850	.....	.....
9.5	.....	.....	.....	.....		.....	959	627	5,660	4,315	.....	.....
10.0	.....	.....	.....	.....		.....	1,087	680	6,230	4,800	.....	.....
10.5	.....	.....	.....	.....		.....	1,217	737	6,835	5,325	.....	.....
11.0	.....	.....	.....	.....		.....	1,351	800	7,460	5,870	.....	.....
11.5	.....	.....	.....	.....		.....	1,487	862	8,170	6,425	.....	.....
12.0	.....	.....	.....	.....		.....	1,625	927	8,950	7,000	.....	.....
12.5	.....	.....	.....	.....		.....	1,770	997	9,810	7,605	.....	.....
13.0	.....	.....	.....	.....		.....	1,920	1,060	10,986	8,240	.....	.....
13.5	.....	.....	.....	.....		.....	2,070	.....	.....	8,970	.....	.....
14.0	.....	.....	.....	.....		.....	2,220	.....	.....	9,860	.....	.....
14.5	.....	.....	.....	.....		.....	2,380	.....	.....	10,910	.....	.....
15.0	.....	.....	.....	.....		.....	2,540	.....	.....	12,030	.....	.....
16.0	.....	.....	.....	.....		.....	2,870	.....	.....	14,280	.....	.....
17.0	.....	.....	.....	.....		.....	3,220	.....	.....	16,530	.....	.....
18.0	.....	.....	.....	.....		.....	3,590	.....	.....	18,780	.....	.....
20.0	.....	.....	.....	.....		.....	4,450	.....	.....	23,280	.....	.....

Discharges represent flow passing over dam only. Discharge of millrace should be added to give total flow of stream.

a These rating tables were applied by the indirect method described on pages 323 et seq. of the Nineteenth Annual Report, Part IV.

b Rating table from April 16 to July 8, 1899, as follows: Gage height 3.00, discharge 2,150; gage height 3.50, discharge 2,800; gage height 4.00, discharge 3,600; gage height 5.00, discharge 5,800; gage height 6.00, discharge 9,200; gage height 7.00, discharge 13,000; gage height 10.00, discharge 24,800.

Rating tables for stations in Colorado and Kansas.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 37.]

Gage height in feet.	Discharge in second-feet.											
	258. Arkansas River at Salida, Colorado.	258. Arkansas River at Canyon, Colorado.	259. Arkansas River at Pueblo, Colorado, Jan. 1 to June 21.	259. Arkansas River at Pueblo, Colorado, June 22 to Dec. 31.	260. Arkansas River at Nepesta, Colorado.	261. Arkansas River at Rockyford, Colorado.	263. Purgatory River at Trinidad, Colorado.	265. Arkansas River at Hutchinson, Kansas.	265. Verdigris River at Liberty, Kansas.	267. Neosho River at Iola, Kansas.	277. Rio Grande at Del Norte, Colorado.	279. Rio Grande at Cenicero, Colorado.
−0.6	.....	.....	.....	150	.....	.....	.....	.....	.....	.....	.....	.....
−0.5	.....	.....	.....	180	.....	.....	.....	.....	.....	.....	.....	.....
−0.4	.....	.....	.....	213	.....	.....	.....	.....	.....	.....	.....	.....
−0.3	.....	.....	.....	250	.....	.....	.....	.....	.....	.....	.....	.....
−0.2	.....	.....	.....	295	.....	.....	.....	.....	.....	.....	.....	.....
−0.1	.....	.....	.....	348	.....	.....	.....	.....	.....	.....	.....	.....
0.0	.....	.....	136	409	.....	.....	.....	.....	.....	.....	.....	.....
0.1	.....	.....	178	478	.....	.....	.....	.....	.....	.....	.....	.....
0.2	.....	.....	232	555	.....	.....	.....	.....	.....	.....	.....	.....
0.3	.....	.....	300	640	.....	.....	.....	.....	.....	.....	.....	.....
0.4	240	.....	372	733	.....	.....	.....	.....	.....	.....	.....	.....
0.5	256	.....	448	834	.....	.....	.....	.....	.....	.....	.....	.....
0.6	274	.....	527	941	.....	75	.....	.....	.....	.....	.....	.....
0.7	294	.....	609	1,050	.....	95	.....	.....	.....	.....	.....	9
0.8	317	.....	695	1,162	.....	115	.....	.....	.....	.....	.....	12
0.9	342	.....	784	1,276	.....	140	.....	.....	.....	.....	.....	20
1.0	368	.....	876	1,391	.....	190	.....	.....	.....	.....	.....	31
1.1	396	.....	972	1,507	.....	270	.....	25	.....	.....	.....	46
1.2	426	.....	1,070	1,624	.....	370	.....	30	.....	.....	.....	65
1.3	458	.....	1,172	1,743	.....	470	.....	40	.....	.....	218	93
1.4	494	.....	1,278	1,864	.....	570	.....	52	.....	.....	280	129
1.5	537	.....	1,392	1,988	.....	670	.....	70	0	.....	342	170
1.6	594	.....	1,510	2,114	.....	770	.....	90	2	.....	405	212
1.7	670	.....	1,633	2,240	.....	870	.....	115	5	0	470	254
1.8	764	.....	1,760	2,366	.....	970	.....	145	9	1	537	297
1.9	859	.....	1,892	2,492	.....	1,070	.....	180	14	25	606	339
2.0	954	135	2,028	2,618	.....	1,170	.....	220	20	50	678	381
2.2	1,144	186	2,314	2,870	.....	1,370	.....	385	39	110	829	.....
2.4	1,334	242	2,617	3,122	.....	1,570	.....	570	68	180	988	.....
2.6	1,524	316	2,936	3,374	.....	1,770	.....	800	110	260	1,161	.....
2.8	1,714	408	3,260	3,626	154	1,970	.....	1,040	171	350	1,350	.....
3.0	1,904	560	3,588	3,878	191	2,170	.....	1,300	256	450	1,565	.....
3.2	2,094	807	3,914	4,130	235	2,370	.....	1,585	351	565	1,809	.....
3.4	2,284	1,057	4,240	4,383	285	2,570	16	1,895	450	700	2,061	.....
3.6	2,474	1,307	4,565	4,637	346	2,770	52	2,210	553	865	2,315	.....
3.8	2,664	1,557	4,891	4,891	427	2,970	109	2,570	660	1,050	.....	.....
4.0	2,854	1,807	.....	.....	610	3,170	230	3,010	770	1,250	.....	.....
4.2	3,044	2,057	.....	.....	974	3,370	492	3,600	890	1,465	.....	.....
4.4	3,234	2,307	.....	.....	1,337	3,570	1,012	4,210	1,010	1,700	.....	.....
4.6	3,424	2,557	.....	.....	1,701	.....	1,552	4,950	1,136	1,960	.....	.....
4.8	3,614	2,807	.....	.....	2,064	.....	2,092	5,810	1,268	2,250	.....	.....
5.0	3,804	3,057	.....	.....	2,428	.....	2,632	.....	1,400	2,550	.....	.....
5.5	.....	3,682	.....	.....	3,337	.....	.....	.....	1,760	3,310	.....	.....
6.0	.....	4,307	.....	.....	4,246	.....	.....	.....	2,160	4,100	.....	.....
6.5	.....	.....	.....	.....	5,156	.....	.....	.....	2,570	4,900	.....	.....
7.0	.....	.....	.....	.....	6,064	.....	.....	.....	2,980	5,700	.....	.....
7.5	.....	.....	.....	.....	6,521	.....	.....	.....	3,390	6,500	.....	.....
8.0	.....	.....	.....	.....	.....	.....	.....	.....	3,800	7,325	.....	.....
8.5	.....	.....	.....	.....	.....	.....	.....	.....	4,210	8,137	.....	.....
9.0	.....	.....	.....	.....	.....	.....	.....	.....	4,620	8,950	.....	.....
9.5	.....	.....	.....	.....	.....	.....	.....	.....	5,030	9,762	.....	.....
10.0	.....	.....	.....	.....	.....	.....	.....	.....	5,440	10,575	.....	.....
12.0	.....	.....	.....	.....	.....	.....	.....	.....	7,080	13,850	.....	.....
14.0	.....	.....	.....	.....	.....	.....	.....	.....	8,720	17,150	.....	.....
16.0	.....	.....	.....	.....	.....	.....	.....	.....	10,360	20,450	.....	.....
18.0	.....	.....	.....	.....	.....	.....	.....	.....	12,150	23,750	.....	.....

Rating tables for stations in New Mexico, Wyoming, Utah, and Colorado.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 37 or No. 38.]

Gage height in feet.	Discharge in second-feet.											
	280. Rio Grande at Embudo, New Mexico.	281. Rio Grande at Rio Grande, New Mexico.	286. Green River at Greenriver, Wyoming.	287. Black Fork of Green River at Granger, Wyoming.	292. Green River at Blake, Utah.	294. Grand River at Grand Junction, Colorado, right channel.	294. Grand River at Grand Junction, Colorado, left channel.	296. Uncompahgre River at Fort Crawford, Colorado.	297. Gunnison River at Grand Junction, Colorado.	298. Dolores River at Dolores, Colorado.	306. San Miguel River at Fallcreek, Colorado.	307. San Juan River at Arboles, Colorado.
−0.1	.....	.....	.....	70	.....	.....	.....	.....	.....	.....	.....	.....
0.0	.....	.....	.....	80	.....	.....	0	.....	.....	.....	.....	.....
0.1	.....	.....	.....	90	.....	.....	15	.....	.....	.....	.....	.....
0.2	.....	.....	.....	100	.....	.....	33	.....	.....	.....	.....	.....
0.3	.....	.....	.....	120	.....	.....	50	.....	.....	.....	.....	.....
0.4	.....	.....	.....	150	.....	.....	70	.....	.....	.....	.....	.....
0.5	.....	.....	830	180	.....	.....	92	.....	.....	.....	.....	.....
0.6	.....	.....	910	210	.....	.....	113	.....	.....	.....	.....	.....
0.7	.....	.....	990	245	.....	.....	137	.....	.....	.....	.....	.....
0.8	.....	.....	1,070	280	.....	.....	162	.....	.....	.....	.....	.....
0.9	.....	.....	1,150	315	.....	.....	195	.....	.....	.....	.....	.....
1.0	.....	.....	1,240	350	1,000	.....	228	.....	.....	.....	.....	.....
1.2	.....	.....	1,430	420	1,080	.....	315	.....	.....	.....	.....	.....
1.4	.....	.....	1,640	510	1,160	.....	433	.....	788	.....	.....	.....
1.6	.....	.....	1,870	610	1,250	.....	583	.....	848	.....	.....	.....
1.8	.....	.....	2,120	720	1,400	.....	765	.....	908	.....	.....	.....
2.0	.....	.....	2,390	840	1,600	.....	978	.....	968	.....	.....	.....
2.2	.....	.....	2,700	970	2,020	.....	1,221	.....	1,061	.....	25	.....
2.4	.....	.....	3,080	1,130	2,440	.....	1,492	.....	1,356	20	64	.....
2.6	.....	.....	3,540	1,320	2,860	.....	1,791	.....	1,652	37	105	.....
2.8	.....	.....	4,080	1,530	3,280	.....	2,118	5	1,948	82	150	.....
3.0	.....	.....	4,710	1,780	3,700	.....	2,473	10	2,246	164	204	.....
3.2	.....	.....	5,480	2,060	4,120	.....	2,857	19	2,546	280	265	.....
3.4	.....	.....	6,340	2,340	4,540	1,650	3,267	33	2,847	412	340	.....
3.6	.....	100	7,263	2,620	4,960	1,740	3,701	59	3,162	555	449	.....
3.8	.....	120	8,189	2,900	5,380	1,860	4,156	102	3,512	700	682	.....
4.0	.....	150	9,115	3,180	5,800	1,990	4,631	150	3,902	847	934	.....
4.2	.....	190	10,041	3,460	6,220	2,180	5,126	206	4,332	1,001	.....	.....
4.4	.....	230	10,967	3,740	6,650	2,450	5,641	278	4,802	1,160	.....	.....
4.6	.....	280	11,893	4,020	7,350	2,770	6,176	389	5,312	1,327	.....	.....
4.8	.....	340	12,819	4,300	8,100	3,120	6,731	512	5,862	1,506	.....	.....
5.0	.....	420	13,745	4,580	9,000	3,480	7,306	636	6,452	.....	.....	.....
5.2	.....	510	14,671	4,860	10,200	3,860	7,898	760	7,082	.....	.....	.....
5.4	.....	610	15,597	5,140	11,800	4,260	8,501	884	7,736	.....	.....	.....
5.6	.....	740	16,523	5,420	13,700	4,680	9,109	1,008	8,430	.....	.....	96
5.8	.....	890	17,449	5,700	15,600	5,120	9,719	1,132	9,164	.....	.....	138
6.0	.....	1,090	18,375	5,960	17,500	5,590	10,329	.....	9,938	.....	.....	200
6.2	.....	1,330	19,301	6,240	19,400	6,080	10,939	.....	10,752	.....	.....	328
6.4	.....	1,590	20,227	6,520	21,300	6,590	11,549	.....	11,606	.....	.....	516
6.6	65	1,910	21,153	.....	23,200	7,130	.....	.....	12,500	.....	.....	737
6.8	115	2,250	.....	.....	25,100	7,690	.....	.....	13,434	.....	.....	1,011
7.0	185	2,670	.....	.....	27,000	8,270	.....	.....	14,380	.....	.....	1,286
7.5	375	3,770	.....	.....	31,750	9,860	.....	.....	16,750	.....	.....	1,976
8.0	610	4,910	.....	.....	36,500	11,610	.....	.....	.....	.....	.....	.....
8.5	890	6,100	.....	.....	41,250	13,530	.....	.....	.....	.....	.....	.....
9.0	1,250	7,300	.....	.....	46,000	15,610	.....	.....	.....	.....	.....	.....
9.5	1,625	8,500	.....	.....	50,750	17,900	.....	.....	.....	.....	.....	.....
10.0	.....	9,700	.....	.....	55,500	20,390	.....	.....	.....	.....	.....	.....
10.5	.....	.....	.....	.....	60,250	23,030	.....	.....	.....	.....	.....	.....
11.0	.....	.....	.....	.....	65,000	25,800	.....	.....	.....	.....	.....	.....
11.5	.....	.....	.....	.....	.....	28,600	.....	.....	.....	.....	.....	.....

Rating tables for stations in Colorado, Arizona, Nevada, and Idaho.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 38.]

Gage height in feet.	Discharge in second-feet.											
	308. Piedra River at Arboles, Colorado.	309. Los Pinos River at Ignacio, Colorado.	310. Animas River at Durango, Colorado.	311. Florida River at Durango, Colorado.	312. Mancos River at Mancos, Colorado.	313. Gila River at San Carlos, Arizona.	325. North Fork of Humboldt River at Peko, Nevada.	326. Humboldt River at Elko, Nevada.	328. South Fork of Humboldt River at Mason's ranch, Nevada.	329. Humboldt River at Golconda, Nevada.	330. Humboldt River at Oreana, Nevada.	332. Bear River at Battlecreek, Idaho, Aug. 4 to Dec. 31. *a*
0.4	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....
0.5	.....	.....	.....	.....	.....	.....	.....	.....	15	15	.....	.....
0.6	.....	.....	.....	4	.....	.....	.....	.....	24	17	.....	.....
0.7	.....	.....	.....	9	0	.....	.....	.....	35	20	.....	.....
0.8	.....	.....	.....	16	1	.....	.....	.....	47	24	47	.....
0.9	.....	.....	.....	24	3	.....	.....	.....	60	29	59	.....
1.0	.....	.....	.....	32	5	.....	.....	.....	74	35	72	.....
1.1	.....	.....	.....	40	8	.....	.....	.....	89	41	87	.....
1.2	.....	.....	.....	50	12	.....	.....	.....	105	47	104	.....
1.3	.....	.....	.....	62	19	.....	.....	.....	122	54	123	.....
1.4	.....	.....	.....	75	29	.....	0.2	.....	141	62	144	.....
1.5	.....	.....	.....	89	42	60	1.0	.....	161	70	167	.....
1.6	.....	.....	.....	105	60	80	2.5	.....	182	78	191	930
1.7	.....	.....	.....	121	81	110	5	1	204	87	217	980
1.8	.....	.....	.....	139	102	140	8	7	227	96	245	1,030
1.9	.....	.....	.....	158	123	170	11	14	251	105	275	1,085
2.0	.....	.....	.....	179	144	200	14	22	276	114	308	1,140
2.1	.....	.....	.....	200	165	230	18	32	301	124	343	1,200
2.2	.....	36	.....	223	186	260	23	43	327	134	381	1,260
2.3	.....	49	.....	.....	207	290	29	56	354	145	422	1,325
2.4	25	67	.....	.....	228	330	35	70	382	156	466	1,390
2.5	38	89	.....	.....	249	370	42	86	410	168	512	1,460
2.6	52	124	.....	.....	270	410	50	104	439	180	561	1,530
2.7	68	180	.....	.....	291	460	59	123	469	193	613	1,605
2.8	88	236	.....	.....	312	520	69	144	499	206	668	1,680
2.9	111	292	.....	.....	333	590	80	166	529	220	725	1,760
3.0	138	349	.....	.....	354	680	92	190	559	235	785	1,845
3.2	200	463	.....	.....	.....	960	122	240	619	266	914	2,030
3.4	277	577	.....	.....	.....	1,498	160	292	679	298	1,055	.....
3.6	365	691	.....	.....	.....	2,174	207	346	740	332	1,205	.....
3.8	467	805	.....	.....	.....	2,850	263	402	801	367	1,362	.....
4.0	583	919	.....	.....	.....	3,526	327	461	862	404	1,523	.....
4.2	704	1,033	.....	.....	.....	4,202	396	525	922	443	1,688	.....
4.4	835	1,147	.....	.....	.....	4,878	469	594	983	485	1,858	.....
4.6	974	1,261	.....	.....	.....	5,554	546	667	1,045	530	2,033	.....
4.8	1,112	1,375	.....	.....	.....	6,230	628	743	1,106	578	2,212	.....
5.0	1,251	.....	.....	.....	.....	6,906	715	822	1,168	629	2,395	.....
5.2	1,390	.....	.....	.....	.....	7,582	806	903	1,230	684	.....	.....
5.4	1,529	.....	.....	.....	.....	8,258	899	987	1,292	742	.....	.....
5.6	.....	.....	.....	.....	.....	8,934	996	1,073	1,354	803	.....	.....
5.8	.....	.....	.....	.....	.....	9,610	1,094	1,166	1,416	868	.....	.....
6.0	.....	.....	.....	.....	.....	10,286	1,192	1,257	1,478	937	.....	.....
6.2	.....	.....	.....	.....	.....	.....	1,290	1,352	.....	1,011	.....	.....
6.4	.....	.....	168	.....	.....	.....	1,388	1,449	.....	1,093	.....	.....
6.6	.....	.....	237	.....	.....	.....	1,486	1,550	.....	1,183	.....	.....
6.8	.....	.....	315	.....	.....	.....	1,584	1,655	.....	1,281	.....	.....
7.0	.....	.....	402	.....	.....	.....	1,682	1,763	.....	1,387	.....	.....
7.2	.....	.....	504	.....	.....	.....	.....	1,873	.....	1,501	.....	.....
7.4	.....	.....	624	.....	.....	.....	.....	1,986	.....	1,623	.....	.....
7.6	.....	.....	786	.....	.....	.....	.....	2,101	.....	1,753	.....	.....
7.8	.....	.....	970	.....	.....	.....	.....	2,218	.....	1,888	.....	.....
8.0	.....	.....	1,160	.....	.....	.....	.....	2,339	.....	2,026	.....	.....
8.4	.....	.....	1,550	.....	.....	.....	.....	.....	.....	2,302	.....	.....
8.8	.....	.....	1,947	.....	.....	.....	.....	.....	.....	.....	.....	.....
9.2	.....	.....	2,364	.....	.....	.....	.....	.....	.....	.....	.....	.....
9.6	.....	.....	2,800	.....	.....	.....	.....	.....	.....	.....	.....	.....

a Rating table applicable from Jan. 1 to June 29 is the same as for 1898.

Rating tables for stations in Utah and Idaho.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 38.]

Gage height in feet.	Discharge in second-feet.											
	334. Logan River at Logan, Utah.	335. Bear River at Collinston, Utah.	337. Weber River at Uinta, Utah.	338. Provo River at Provo, Utah, Jan. 1 to June 22.	338. Provo River at Provo, Utah, June 23 to Oct. 21.	350. Portneuf River at Pocatello, Idaho.	351. Snake River at Montgomery, Idaho.	353. Little Wood River at Toponis, Idaho.	354. Malade River at Toponis, Idaho.	355. Malade River at Bliss, Idaho.	356. Bruneau River at Grandview, Idaho.	356. Boise River at Boise, Idaho.
0.9	.....	.....	.....	.....	.....	.....	.....	0.1	.....	.....	.....	.....
1.0	.....	.....	.....	.....	.....	.....	.....	0.5	.....	.....	10	867
1.1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	25	986
1.2	.....	790	.....	.....	.....	.....	.....	1	5	.....	45	1,105
1.3	.....	870	.....	.....	.....	.....	.....	2	6	.....	55	1,224
1.4	.....	950	.....	.....	.....	.....	.....	2	6	.....	65	1,343
1.5	.....	1,050	320	.....	.....	.....	.....	2	7	.....	80	1,462
1.6	.....	1,150	375	.....	.....	.....	.....	4	7	.....	100	1,581
1.7	.....	1,260	445	.....	.....	.....	.....	6	8	.....	120	1,700
1.8	.....	1,370	520	.....	.....	.....	.....	8	9	.....	140	1,819
1.9	.....	1,485	595	.....	.....	.....	.....	10	10	.....	170	1,938
2.0	.....	1,600	675	.....	.....	.....	4,400	12	12	.....	200	2,057
2.1	.....	1,720	766	.....	.....	.....	4,500	14	14	1,060	230	2,197
2.2	.....	1,840	857	.....	.....	.....	4,600	18	18	1,120	270	2,390
2.3	200	1,965	948	.....	.....	.....	4,700	22	30	1,200	310	2,585
2.4	210	2,090	1,039	.....	.....	.....	4,800	26	45	1,300	360	2,780
2.5	230	2,215	1,130	.....	.....	.....	4,900	30	65	1,410	420	2,975
2.6	255	2,340	1,221	.....	.....	.....	5,000	34	85	1,540	485	3,170
2.7	280	2,465	1,312	.....	.....	.....	5,150	38	105	1,680	555	3,365
2.8	310	2,590	1,403	.....	.....	.....	5,300	43	130	1,825	630	3,560
2.9	345	2,715	1,494	.....	.....	.....	5,450	49	155	1,975	705	3,755
3.0	380	2,840	1,585	.....	.....	.....	5,600	55	180	2,125	780	3,950
3.1	420	2,970	1,676	.....	.....	.....	5,800	61	210	2,275	856	4,160
3.2	465	3,100	1,767	.....	.....	.....	6,000	67	245	2,425	932	4,370
3.3	515	3,230	1,858	.....	.....	.....	6,200	74	280	2,575	1,008	4,580
3.4	570	3,360	1,949	.....	.....	.....	6,400	81	325	2,725	1,084	4,820
3.5	630	3,495	2,040	.....	.....	.....	6,600	88	370	2,875	1,160	5,060
3.6	695	3,630	2,131	128	.....	.....	6,800	95	420	3,025	1,236	5,300
3.7	765	3,765	2,222	146	.....	.....	7,000	102	470	3,175	1,312	5,575
3.8	845	3,900	2,313	167	.....	.....	7,250	109	525	3,325	1,388	5,850
3.9	935	4,040	2,404	190	.....	.....	7,500	116	580	.....	1,464	6,125
4.0	1,020	4,180	2,495	216	.....	.....	7,750	124	640	.....	1,540	6,400
4.2	1,202	4,460	2,677	287	.....	.....	8,300	140	780	.....	1,692	7,000
4.4	1,384	4,750	2,859	390	.....	.....	8,900	156	920	.....	1,844	7,600
4.6	1,566	5,040	3,041	510	330	.....	9,550	173	1,060	.....	1,996	8,320
4.8	1,748	5,340	3,223	652	370	.....	10,250	194	1,210	.....	2,148	9,060
5.0	1,930	5,650	3,405	812	437	.....	10,950	219	1,370	.....	2,300	9,800
5.2	.....	5,970	3,587	972	533	.....	11,650	247	1,530	.....	2,452	10,540
5.4	.....	6,300	3,769	1,132	690	.....	12,400	275	1,690	.....	2,604	11,280
5.6	.....	6,640	3,951	1,292	850	.....	13,200	303	1,860	.....	2,756	12,020
5.8	.....	.....	4,133	1,454	1,010	.....	14,000	.....	2,030	.....	2,908	12,760
6.0	.....	.....	4,315	1,616	1,170	.....	14,820	.....	2,210	.....	3,060	13,500
6.2	.....	.....	4,497	1,780	1,330	.....	15,720	.....	2,390	.....	3,218	14,240
6.4	.....	.....	4,679	1,950	1,490	.....	16,660	.....	2,575	.....	3,376	14,980
6.6	.....	.....	.....	2,120	1,650	72	17,600	.....	2,766	.....	3,534	15,720
6.8	.....	.....	.....	2,290	1,810	100	18,540	.....	2,958	.....	3,692	16,460
7.0	.....	.....	.....	2,460	1,970	130	19,480	.....	3,150	.....	3,850	17,200
7.2	.....	.....	.....	2,630	2,130	170	20,420	.....	.....	.....	.....	17,940
7.4	.....	.....	.....	2,800	2,290	210	21,360	.....	.....	.....	.....	18,680
7.6	.....	.....	.....	2,970	2,450	250	22,300	.....	.....	.....	.....	19,420
7.8	.....	.....	.....	3,140	.....	295	23,240	.....	.....	.....	.....	.....
8.0	.....	.....	.....	3,310	.....	345	24,180	.....	.....	.....	.....	.....
8.5	.....	.....	.....	.....	.....	470	26,530	.....	.....	.....	.....	.....
9.0	.....	.....	.....	.....	.....	595	28,880	.....	.....	.....	.....	.....
9.5	.....	.....	.....	.....	.....	730	31,230	.....	.....	.....	.....	.....
10.0	.....	.....	.....	.....	.....	880	33,580	.....	.....	.....	.....	.....

Rating tables for stations in Idaho, Washington, Montana, and Oregon.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 38.]

Gage height in feet.	Discharge in second-feet.											
	359. Weiser River at Weiser, Idaho.	360. Palouse River at Hooper, Washington.	362. Big Blackfoot River at Bonner, Montana, Jan. 1 to June 30.	362. Big Blackfoot River at Bonner, Montana, July 1 to Dec. 31.	363. Rattlesnake Creek at Missoula, Montana.	364. Missoula River at Missoula, Montana, rod No. 3.	368. Bitterroot River at Missoula, Montana.	369. Spokane River at Spokane, Washington.	372. Naches River at North Yakima, Washington.	373. Yakima River at Union Gap, Washington.	375. Yakima River at Kiona, Washington.	376. Umatilla River at Gibbon, Oregon.
0.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	56
0.1	.....	.....	720	.....	.....	.....	.....	.....	.....	.....	.....	65
0.2	.....	.....	740	.....	.....	.....	.....	.....	.....	.....	.....	74
0.3	.....	.....	760	.....	.....	.....	.....	.....	.....	.....	.....	83
0.4	.....	.....	780	.....	.....	.....	.....	.....	.....	.....	.....	92
0.5	75	.....	800	865	.....	.....	.....	.....	.....	.....	.....	106
0.6	105	.....	825	890	.....	.....	.....	.....	.....	.....	.....	124
0.7	140	.....	850	940	.....	.....	.....	.....	.....	.....	.....	146
0.8	175	.....	875	990	.....	.....	.....	.....	.....	.....	.....	172
0.9	215	.....	900	1,050	.....	.....	.....	.....	.....	.....	.....	202
1.0	260	.....	950	1,110	.....	.....	.....	1,341	.....	.....	.....	233
1.1	310	.....	1,000	1,170	.....	.....	.....	1,474	.....	.....	.....	264
1.2	360	.....	1,060	1,240	.....	.....	910	1,611	.....	.....	.....	298
1.3	415	.....	1,120	1,310	.....	.....	950	1,752	.....	.....	.....	334
1.4	470	20	1,185	1,380	.....	.....	1,010	1,897	.....	.....	.....	372
1.5	530	22	1,250	1,460	.....	.....	1,080	2,046	.....	.....	.....	412
1.6	595	26	1,340	1,540	.....	.....	1,165	2,199	.....	.....	.....	454
1.7	660	32	1,440	1,630	.....	.....	1,255	2,356	.....	.....	.....	498
1.8	730	40	1,550	1,720	.....	.....	1,350	2,517	.....	.....	.....	544
1.9	800	50	1,670	1,820	.....	.....	1,445	2,682	.....	.....	.....	592
2.0	875	61	1,800	1,930	.....	.....	1,540	2,851	.....	.....	.....	642
2.2	1,025	86	2,050	2,160	.....	.....	1,730	3,201	.....	.....	.....	748
2.4	1,200	115	2,305	2,430	40	.....	1,930	3,566	.....	.....	.....	862
2.6	1,385	148	2,575	2,730	49	.....	2,160	3,946	.....	.....	.....	984
2.8	1,580	185	2,860	3,050	62	.....	2,410	4,340	.....	.....	.....	1,114
3.0	1,780	226	3,180	3,370	87	.....	2,680	4,749	.....	.....	.....	1,252
3.2	2,000	271	3,540	3,690	120	.....	2,960	5,172	.....	.....	.....	1,398
3.4	2,220	320	3,925	4,040	163	1,600	3,260	5,609	.....	.....	.....	1,552
3.6	2,450	377	4,400	4,450	220	1,800	3,570	6,059	.....	.....	566	1,714
3.8	2,690	446	4,900	4,900	295	2,000	3,890	6,523	.....	.....	663	1,884
4.0	2,940	525	5,400	5,400	385	2,240	4,230	7,000	.....	600	780	2,061
4.2	3,200	620	5,904	.....	490	2,500	4,600	7,489	.....	800	917	2,245
4.4	3,460	735	6,408	.....	623	2,800	5,000	7,990	.....	1,000	1,074	2,435
4.6	3,720	866	6,912	.....	777	3,100	5,440	8,503	.....	1,230	1,252	2,633
4.8	3,980	998	7,416	.....	931	3,500	5,910	9,028	.....	1,480	1,468	2,839
5.0	4,240	1,130	7,920	.....	1,085	3,900	6,400	9,565	.....	1,730	1,705	3,052
5.2	4,500	1,262	8,424	.....	1,239	4,400	6,930	10,114	.....	2,000	1,962	3,272
5.4	4,760	1,394	8,928	.....	1,393	4,900	7,500	10,673	.....	2,300	2,240	3,498
5.6	5,020	1,526	9,432	.....	1,547	5,400	8,100	11,243	500	2,600	2,534	3,730
5.8	5,280	1,658	9,936	.....	1,701	6,000	8,700	11,824	700	2,900	2,842	3,970
6.0	5,540	1,790	10,440	.....	1,855	6,600	9,300	12,416	950	3,200	3,160	4,217
6.2	5,800	1,922	10,944	.....	2,009	7,300	9,900	13,019	1,200	3,500	3,490	.....
6.4	6,060	2,054	11,448	.....	.....	8,000	10,500	13,631	1,500	3,900	3,834	.....
6.6	6,320	2,186	11,952	.....	.....	8,700	11,100	14,253	1,800	4,300	4,190	.....
6.8	6,580	2,318	12,456	.....	.....	9,400	11,700	14,885	2,150	4,750	4,556	.....
7.0	.....	2,450	12,960	.....	.....	10,200	12,300	15,525	2,500	5,200	4,935	.....
7.5	.....	2,780	14,220	.....	.....	12,200	14,075	17,160	3,450	6,650	5,935	.....
8.0	.....	3,110	15,480	.....	.....	14,700	16,000	18,845	4,550	8,400	6,995	.....
8.5	.....	3,440	16,740	.....	.....	17,200	18,150	20,577	5,800	10,150	8,120	.....
9.0	.....	3,770	18,000	.....	.....	20,200	20,500	22,351	7,300	12,030	9,320	.....
9.5	.....	4,100	.....	.....	.....	24,000	23,050	24,165	8,800	14,180	10,614	.....
10.0	.....	4,430	.....	.....	.....	28,350	25,900	26,012	.....	16,510	12,045	.....
11.0	.....	5,090	.....	.....	.....	.....	33,500	29,787	.....	21,690	15,045	.....
12.0	.....	5,750	.....	.....	.....	.....	42,250	33,653	.....	27,550	18,045	.....
13.0	.....	6,410	.....	.....	.....	.....	.....	.....	.....	.....	21,045	.....
14.0	.....	7,070	.....	.....	.....	.....	.....	.....	.....	.....	24,045	.....

Rating tables for stations in Oregon, Washington, and California.

[Number in box head refers to page in Water-Supply and Irrigation Paper No. 38 or No. 39.]

Gage height in feet.	Discharge in second-feet.											
	377. Deschutes River at Moro, Oregon.	380. Hood River at Tucker, Oregon.	381. White River at Buckley, Washington.	383. Dungeness River at Dungeness, Washington.	384. Elwha River at McDonald, Washington.	386. Calowa River at Forks, Washington.	386. Soduck River at Quillayute, Washington.	387. Sacramento River at Jellys Ferry, California.	391. Stanislaus River at Oakdale, California.	393. Tuolumne River at Lagrange, California.	395. San Joaquin River at Herndon, California.	405. Kings River at Red Mountain, California.
0.0	.....	.....	.....	.....	.....	[a] 130	.....	.....	.....	.....	.....	.....
0.2	.....	.....	.....	.....	.....	180	.....	.....	.....	.....	.....	.....
0.4	.....	.....	.....	.....	.....	230	.....	.....	.....	.....	.....	.....
0.6	.....	.....	.....	.....	.....	286	.....	.....	.....	.....	.....	.....
0.8	.....	.....	.....	.....	.....	348	.....	.....	.....	.....	.....	.....
1.0	5,000	.....	900	.....	.....	410	.....	.....	.....	.....	.....	.....
1.2	5,100	.....	930	.....	.....	474	220	.....	.....	.....	.....	.....
1.4	5,200	.....	980	.....	485	538	260	.....	.....	.....	.....	.....
1.6	5,330	486	1,070	.....	510	604	310	.....	.....	.....	.....	.....
1.8	5,500	560	1,225	.....	550	672	360	.....	.....	.....	.....	.....
2.0	5,750	642	1,500	.....	615	740	420	.....	.....	.....	.....	.....
2.2	6,240	732	1,900	.....	710	816	490	.....	.....	.....	60	.....
2.4	6,800	830	2,300	186	840	892	560	.....	.....	.....	100	.....
2.6	7,360	936	2,700	190	1,000	974	630	.....	.....	.....	170	.....
2.8	7,920	1,050	3,100	197	1,165	1,062	700	.....	.....	.....	280	.....
3.0	8,480	1,172	3,500	205	1,345	1,150	770	.....	.....	.....	445	.....
3.2	9,040	1,302	3,900	220	1,535	1,254	850	.....	.....	.....	640	.....
3.4	9,600	1,440	4,300	255	1,725	1,358	930	.....	.....	0	850	.....
3.6	10,160	1,586	4,700	310	1,920	1,472	1,010	.....	.....	15	1,060	180
3.8	10,720	1,730	5,100	382	2,120	1,596	1,090	.....	.....	45	1,285	250
4.0	11,280	1,900	5,500	480	2,320	1,720	1,180	2,400	.....	85	1,520	320
4.2	11,840	2,110	5,900	585	2,520	1,876	1,270	2,670	50	140	1,765	400
4.4	12,400	2,360	6,300	700	2,720	2,032	1,360	2,970	90	250	2,030	480
4.6	12,960	2,550	6,700	820	2,920	2,212	1,460	3,290	175	410	2,315	572
4.8	13,520	2,850	7,100	940	3,120	2,416	1,570	3,630	265	570	2,620	676
5.0	14,080	3,150	7,500	1,060	3,320	2,620	1,690	3,980	370	750	2,940	780
5.2	.....	3,450	7,900	1,180	3,520	2,880	1,810	4,360	485	950	3,275	908
5.4	.....	3,750	8,300	1,300	3,720	3,226	1,940	4,760	620	1,180	3,620	1,036
5.6	.....	4,050	8,700	1,420	3,920	3,536	2,080	5,170	760	1,440	3,985	1,170
5.8	.....	4,350	9,100	1,540	4,120	3,808	2,240	5,590	900	1,740	4,370	1,310
6.0	.....	4,650	9,500	1,660	4,320	4,080	2,400	6,030	1,045	2,080	4,775	1,450
6.5	.....	5,400	.....	1,960	4,820	4,760	2,810	7,265	1,450	3,100	5,850	1,930
7.0	.....	6,150	.....	2,260	5,320	5,440	3,260	8,630	1,925	4,320	7,090	2,450
7.5	.....	6,900	.....	2,560	5,820	6,120	3,760	10,100	2,450	5,760	8,410	3,120
8.0	.....	7,650	.....	2,860	6,320	6,800	4,260	11,600	3,020	7,400	9,730	3,920
8.5	.....	8,400	.....	3,160	6,820	7,480	4,760	13,100	3,625	9,000	11,060	4,870
9.0	.....	9,150	.....	3,460	7,320	8,160	5,260	14,600	4,250	10,600	12,400	6,000
9.5	.....	9,900	.....	.....	7,820	8,840	5,760	16,100	4,887	12,200	13,750	7,800
10.0	.....	10,650	.....	.....	8,320	9,520	6,260	17,600	5,525	13,800	15,110	8,800
11.0	.....	12,150	.....	.....	.....	10,880	7,260	20,800	6,800	17,000	.....	11,800
12.0	.....	.....	.....	.....	.....	.....	8,260	24,400	8,075	20,200	.....	14,800
13.0	.....	.....	.....	.....	.....	.....	9,260	28,400	9,350	23,400	.....	17,800
14.0	.....	.....	.....	.....	.....	.....	.....	32,400	10,625	.....	.....	20,800
15.0	.....	.....	.....	.....	.....	.....	.....	36,800	11,900	.....	.....	.....
16.0	.....	.....	.....	.....	.....	.....	.....	41,600	13,175	.....	.....	.....
17.0	.....	.....	.....	.....	.....	.....	.....	46,600	.....	.....	.....	.....
18.0	.....	.....	.....	.....	.....	.....	.....	52,300	.....	.....	.....	.....
19.0	.....	.....	.....	.....	.....	.....	.....	58,200	.....	.....	.....	.....
20.0	.....	.....	.....	.....	.....	.....	.....	64,200	.....	.....	.....	.....
22.0	.....	.....	.....	.....	.....	.....	.....	76,800	.....	.....	.....	.....
24.0	.....	.....	.....	.....	.....	.....	.....	90,000	.....	.....	.....	.....
26.0	.....	.....	.....	.....	.....	.....	.....	103,200	.....	.....	.....	.....
28.0	.....	.....	.....	.....	.....	.....	.....	116,400	.....	.....	.....	.....
30.0	.....	.....	.....	.....	.....	.....	.....	129,600	.....	.....	.....	.....
32.0	.....	.....	.....	.....	.....	.....	.....	142,800	.....	.....	.....	.....
34.0	.....	.....	.....	.....	.....	.....	.....	156,000	.....	.....	.....	.....

[a] Continued: Gage height −0.1, discharge 105; gage height −0.2, discharge 80; gage height −0.3, discharge 60; gage height −0.4, discharge 40; gage height −0.5, discharge 30; gage height −0.6, discharge 20; gage height −0.7, discharge 10.

ERRATA IN VARIOUS PUBLICATIONS.

In preparing for publication the results of field work for 1899 frequent reference has been made to earlier publications and a number of errors have been discovered. Some of these are of relatively little importance, but they are noted in the interest of accuracy. The following list gives corrections which can be made in various Annual Reports and in Water-Supply and Irrigation Papers.

Water-Supply and Irrigation Paper No. 15:

Page 51, tenth line from bottom, for 20 miles read 11 miles.

Page 85, in table of daily gage heights, May 25, for 7.72 read 4.72.

Water-Supply and Irrigation Paper No. 16:

Page 190, in table of daily gage heights, December 23 and 24, for 2.11 read 2.92.

Water-Supply and Irrigation Paper No. 33:

Page 62, third line from top, for 57 cubic yards read 5.7 cubic yards.

Page 65, eleventh line from top, for 206,000 read 119,000.

Page 65, nineteenth line from top, for 344,398 read 344,308.

Water-Supply and Irrigation Paper No. 36:

Page 107, third line from top, for Danville read Clarksville.

Eighteenth Annual Report, Part IV:

Page 19, ninth line from top, for Conoloway Creek, read Tonoloway Creek.

Page 30, in list of discharge measurements, March 25, 1895, under area of section, for 10,524 read 6,257; July 10, 1895, under area of section, for 4,695 read 4,118; for November 16, 1895, read November 6, 1895.

Page 39, fifth line from top, before Staunton insert Natural Bridge.

Page 43, in list of discharge measurements, deduct 0.53 from all gage heights for 1896.

Page 45, in list of discharge measurements, under gage heights, for 0.07 read −0.07; for 3.43 read 1.37; for 3.20 read 0.97; for 4.70 read 2.06; for 2.00 read 0.04.

Page 65, drainage area of Catawba River at Catawba, North Carolina, for 3,492 read 1,535.

Page 113, last three lines, the description of the bench marks refers to the Alderson, West Virginia, station, and not to the Fayette, West Virginia, station.

Page 119, twenty-eighth line from top, for Como read Cowee.

Page 221, in rating table for Kansas River for 1895, opposite gage height 2.60, for 9,440 read 9,340.

Page 283, at top of page, drainage area of Piedra River, for 650 read 670.

Page 351, in list of discharge measurements, under gage height, opposite August 7, 1896, for 1.45 read 1.92.

Page 368, shift all figures at bottom of diagram one space to the left.

Nineteenth Annual Report, Part IV:

Page 319, middle of page, drainage area of Boulder Creek, for 102 read 179.

Page 333, last line of text, for Middle Loup River read Loup River.

Page 349, in footnote, for 1896 read 1895.

Page 514, fig. 184, the February flood should reach to 13,200.

Page 515, in table of estimated monthly discharge of San Joaquin River, the minimum for December (60) should read 535, and the minimum for the year should read 105 instead of 60.

Twentieth Annual Report, Part IV:

Page 165, the figures on the left of the hydrograph for Savannah River, except 0, should be moved up one division. Insert 5,000 opposite the first division.

Page 211, the figures on the left of the hydrograph for Tennessee River should all be multiplied by 10.

Page 286, middle of page, drainage area of Boulder Creek, 102 square miles should read 179 square miles.

Page 410, sixteenth line from bottom, for 402 read 404.

Page 485, footnote refers to measurements in table on ninth and second lines from bottom only.

INDEX TO PAPERS NOS. 35 TO 39.

[The Water-Supply and Irrigation Papers are limited by law to 100 pages each. It was therefore necessary to divide the report on the operations at river stations for 1899 into five parts. Paper No. 35 contains pages 1 to 100; Paper No. 36, pages 101 to 198; Paper No. 37, pages 199 to 298; Paper No. 38, pages 299 to 396; Paper No. 39, pages 397 to 471.]

C.

D.

M.

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 "A preliminary report on the geology and water resources of Nebraska west of the one hundred and third meridian," by N. H. Darton.

1900.

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

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

WATER-SUPPLY AND IRRIGATION PAPERS, 1896–1900.

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

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

WATER-SUPPLY AND IRRIGATION PAPERS.

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

In addition to the above, there are in various stages of preparation other papers relating to the measurement of streams, the storage of water, the amount available from underground sources, the efficiency of windmills, the cost of pumping, and other details relating to the methods of utilizing the water resources of the country. 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 maximum number of copies available for the use of the Geological Survey is 1,000. This number falls far short of the demand, so that it is impossible to supply all requests. Attempts are made to send these pamphlets to persons who have rendered assistance in their preparation through replies to schedules or who have furnished data. Requests specifying a certain paper and stating a reason for asking for it are granted whenever practicable, but it is impossible to comply with general and indiscriminate 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.