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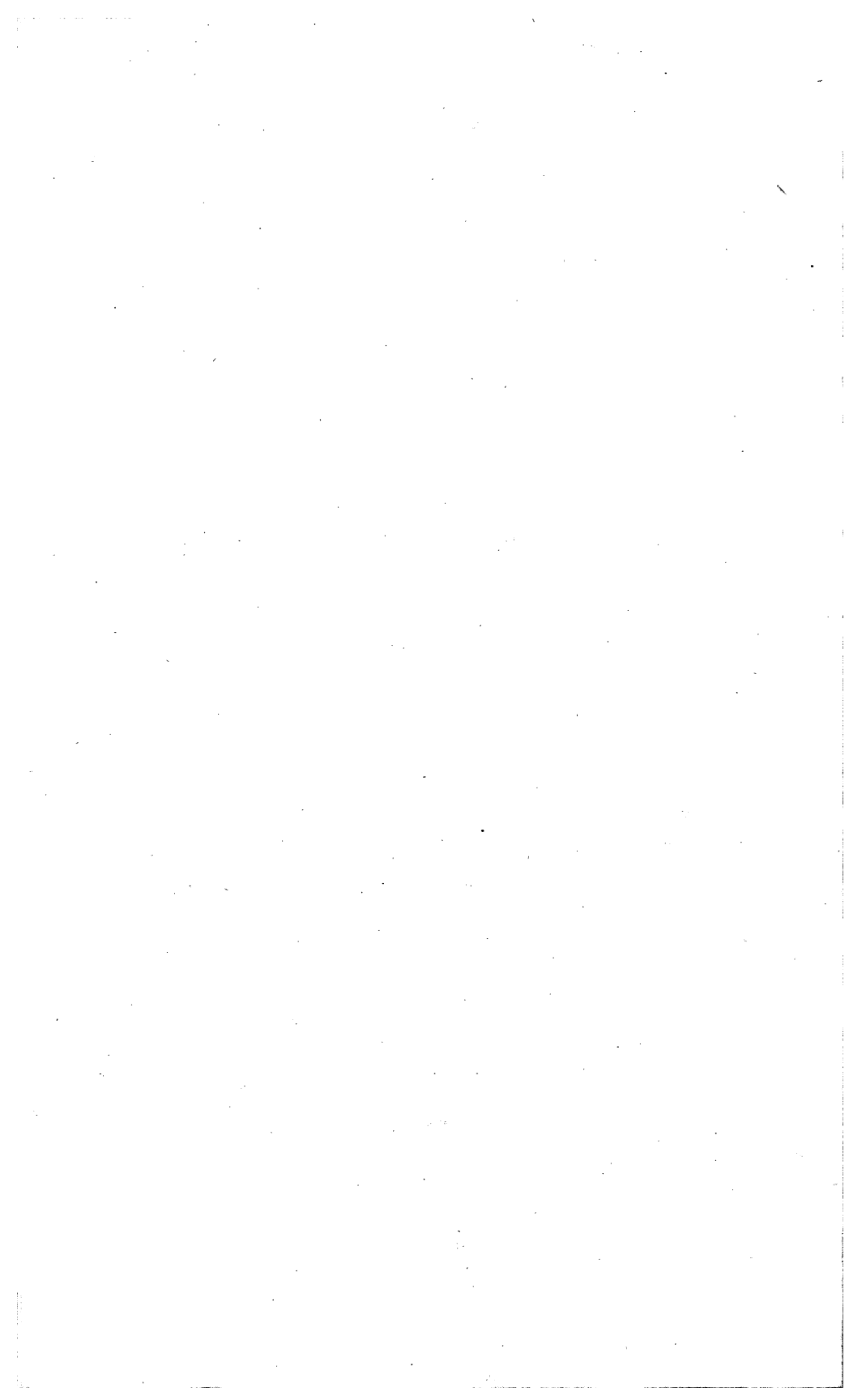
OF THE

UNITED STATES GEOLOGICAL SURVEY

No. 39

OPERATIONS AT RIVER STATIONS, 1899.—PART V

WASHINGTON
GOVERNMENT PRINTING OFFICE
1900



UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

OPERATIONS AT RIVER STATIONS, 1899

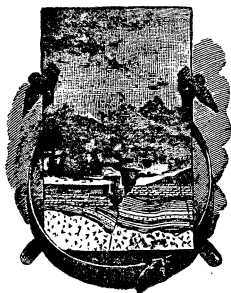
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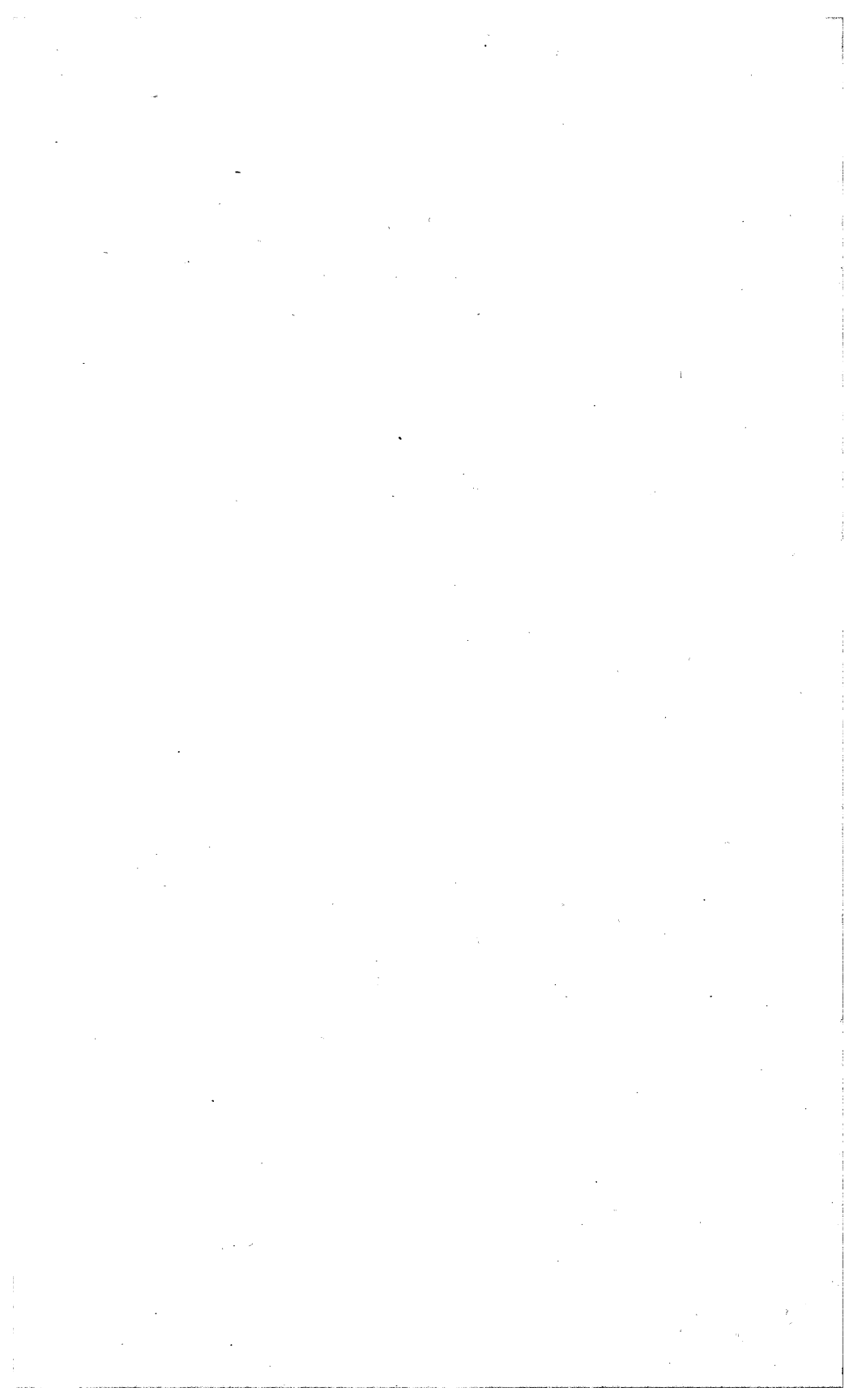
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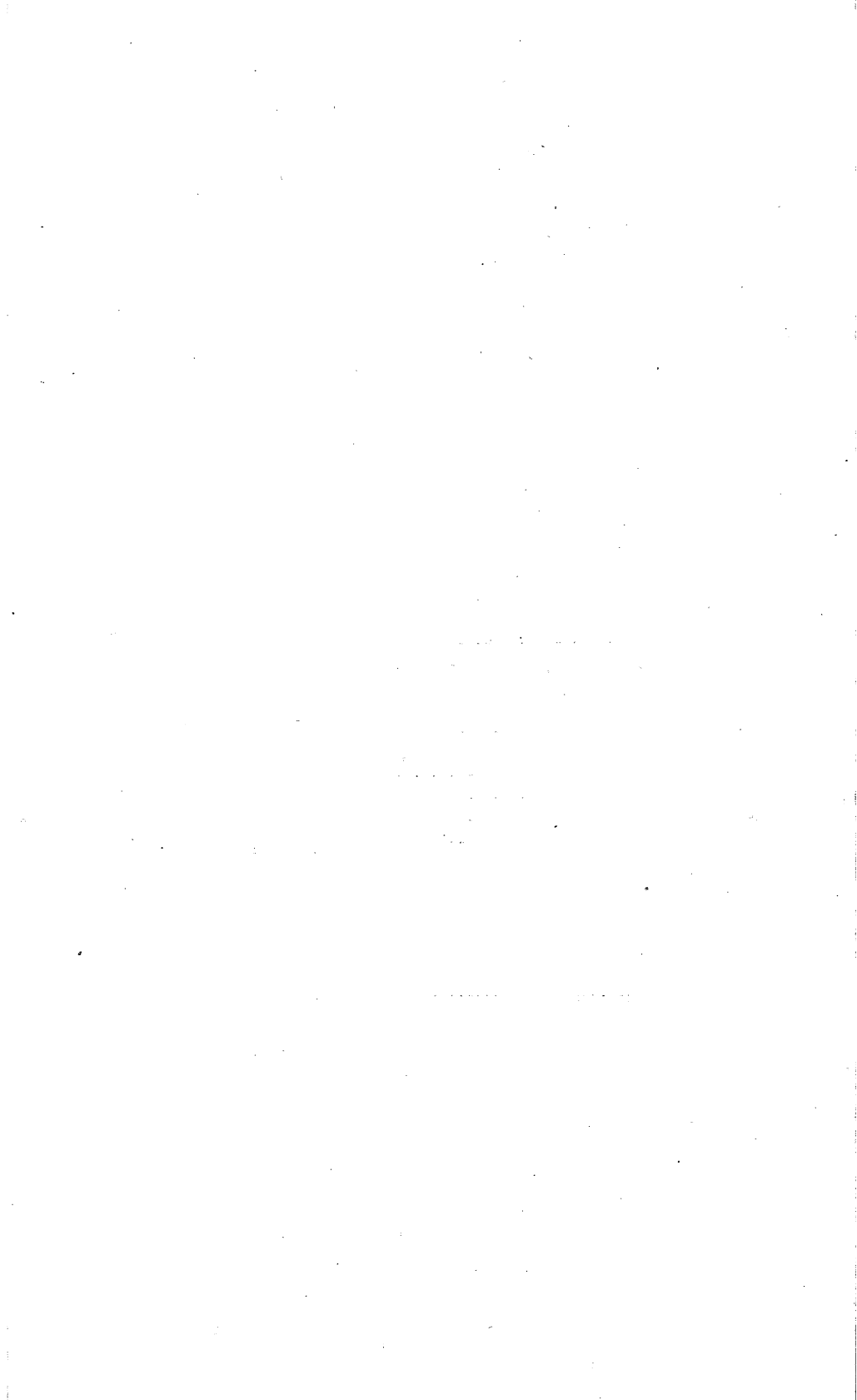
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OPERATIONS AT RIVER STATIONS, 1899.

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.
	<i>Feet.</i>	<i>Second-feet.</i>		<i>Feet.</i>	<i>Second-feet.</i>
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.

¹Continued 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	5.60	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	6.25	5.58	4.00	3.00	3.08	4.00	5.17	6.00
30	4.16	4.75	4.66	6.75	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	1,811	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	509	297	346	368	368
9.	361	791	789	2,141	4,504	3,067	1,002	525	297	297	345	733
10.	365	660	818	2,354	4,425	3,062	958	511	288	303	322	680
11.	357	632	837	2,580	4,505	2,890	957	493	287	309	329	564
12.	357	606	827	2,511	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	368	303	401
20.	315	619	936	3,973	4,470	1,423	847	424	268	356	312	406
21.	324	635	906	3,631	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	1,993	840	459	280	347	317	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	1,431	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	659	418	474	580	694	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	887	593	248	125	93	157	154	192
18.....	359	454	374	755	807	621	238	120	95	157	159	189
19.....	348	450	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	582	189	117	97	147	182	204
23.....	340	395	332	777	620	520	188	111	100	147	177	208
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	.....	709	877	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.
<i>Feet.</i>	<i>Second-feet.</i>	<i>Feet.</i>	<i>Second-feet.</i>
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. Lipincott during 1899:

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

1899.

Date.	Discharge.	Date.	Discharge.
	<i>Second-feet.</i>		<i>Second-feet.</i>
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.
	<i>Second-feet.</i>		<i>Second-feet.</i>
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.
<i>Feet.</i>	<i>Second-feet.</i>	<i>Feet.</i>	<i>Second-feet.</i>	<i>Feet.</i>	<i>Second-feet.</i>
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	23.5	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	20.8	28.0	17.5	22.2	4.0	5.0	3.4	3.7	12.0	16.2
2.....	24.2	28.0	20.8	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	18.5	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.		1894.	
	<i>Second-feet.</i>		<i>Second-feet.</i>
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
1893.		September 30.....	40.78
September 7.....	49.20	1896.	
September 18.....	49.20	March 3.....	18.08
September 25.....	46.34	April 23.....	19.14
October 4.....	45.30	April 24.....	18.60
1894.		April 25.....	20.52
June 6.....	17.96	May 3.....	18.52
June 8.....	15.50	May 4.....	17.26
July 10.....	13.22	May 10.....	18.16
July 11.....	13.22	May 25.....	15.32
July 25.....	13.36	May 26.....	12.84

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.			68.0				36.9		
4.						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.....								10.6
12.....								
13.....								
14.....			60.0					
15.....								
16.....	24.0				34.0			
17.....								
18.....		80.0						
19.....								
20.....					60.0			
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.....				14.....				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	72.1a	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 boulder 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 Warm Springs, California.

1899.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	<i>Feet.</i>	<i>Second-feet.</i>		<i>Feet.</i>	<i>Second-feet.</i>
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 Warm Springs, California, applicable from January 1 to April 15, 1899.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
<i>Feet.</i>	<i>Second-feet.</i>	<i>Feet.</i>	<i>Second-feet.</i>	<i>Feet.</i>	<i>Second-feet.</i>
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 Warm Springs, California, applicable from April 16 to December 31, 1899.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
<i>Feet.</i>	<i>Second-feet.</i>	<i>Feet.</i>	<i>Second-feet.</i>	<i>Feet.</i>	<i>Second-feet.</i>
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.
	<i>Second-feet.</i>		<i>Second-feet.</i>
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.		<i>Second-feet.</i>
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 Warm Springs, 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

Discharge, in second-feet, of Mill Creek at head of Crafton sanja, 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	7	4.8	5.6	4.9	6.2	6.4	9.8
14		12	10	11	12	8	4.8	5.3	4.9	8.5	11.2	9.6
15		12	10	11	12	7	4.8	5.3	4.9	8.5	11.2	9.6
16		12	10	12	12	8	7.2	6.2	5.2	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	11	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	5.3	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 underground 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.			<i>Second-feet.</i>
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.			<i>Second-feet.</i>
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	Whittings, 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.			<i>Second-feet.</i>
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 $2\frac{1}{2}$ 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.
	<i>Second-feet.</i>		<i>Second-feet.</i>
January 27.....	0.74	April 22.....	3.71
February 4.....	1.62	April 29.....	3.25
February 11.....	3.87	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.....	2.98	July 25.....	3.67

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

1899.

Date.	Discharge.	Date.	Discharge.
	<i>Second-feet.</i>		<i>Second-feet.</i>
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.
	<i>Second-feet.</i>		<i>Second-feet.</i>
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.
	<i>Second-feet.</i>		<i>Second-feet.</i>
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.	Dis-charge.	Total for year.	Run-off.		Rain.
	<i>Sec. feet.</i>	<i>Acre-feet.</i>	<i>Inches.</i>	<i>Sec. feet.</i>	
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.
January 1 to June 30.....	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
July 4.....	.773	25.177	October 10.....	1.312	
July 11.....	1.031		October 17.....	1.066	
July 18.....	1.722		October 24.....	.984	
July 25.....	1.724		October 31.....	1.312	
August 1.....	1.968		November 7.....	.902	5.272
August 8.....	1.617	8.062	November 14.....	1.025	
August 15.....	.269		November 21.....	1.148	
August 22.....	1.886		November 28.....	.920	
August 29.....	1.845		December 5.....	.234	4.229
September 5.....	1.783		December 12.....	.586	
September 12.....	1.722		December 19.....	.574	
September 19.....	.492	7.997	December 26.....	.492	
September 26.....	1.230		December 31.....	.631	2.775
October 3.....	1.640		Total for 1897.....		60.048
	1.394				
	.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.
	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
January 2.....{	a 0.631		July 10.....	1.722	
January 9.....	.107		July 17.....	1.968	
January 16.....	.328		July 24.....	1.804	
January 23.....	.246		July 31.....	1.886	
January 30.....	.492		August 7.....	1.804	8.153
February 7.....	.574		August 14.....	1.804	
February 13.....	.41	1.747	August 21.....	1.886	
February 20.....	.574		August 28.....	1.804	
February 27.....	.82		September 4.....{	.843	8.141
February 27.....	.730		September 11.....	1.125	
March 6.....{	.129	2.671	September 18.....	1.722	
March 13.....	.773		September 25.....	1.804	
March 20.....	.738		September 25.....	1.599	
March 27.....	.82		October 2.....{	.989	7.239
April 3.....{	1.248	4.249	October 9.....	.395	
April 10.....	.670		October 16.....	1.230	
April 17.....	.519		October 23.....	1.189	
April 24.....	1.066		October 30.....	1.025	
April 24.....	1.148		October 30.....	.984	
May 1.....{	1.353	5.351	November 6.....{	.176	4.999
May 8.....	1.265		November 13.....	1.054	
May 15.....	.211		November 20.....	1.066	
May 22.....	1.230		November 27.....	.820	
May 29.....	1.23		December 4.....{	.738	4.012
June 5.....{	1.066	5.611	December 11.....	.334	
June 12.....	1.394		December 18.....	.445	
June 19.....	.480		December 25.....	No record.	
June 26.....	1.201		December 31.....	No record.	
July 3.....{	1.640	7.193	December 31.....	.422	.867
July 3.....	1.517		Total for 1898.....		60.233
July 3.....	1.804				
July 3.....	1.031				
July 3.....	.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	
January 8.....	.070		March 19.....	.902	
January 15.....	.328		March 26.....	.656	
January 22.....	.246		April 2.....{	.878	4.366
January 29.....	.533		April 9.....	.352	
February 5.....{	.820	2.162	April 16.....	1.148	
February 12.....	.165		April 23.....	1.230	
February 19.....	.411		April 30.....	1.886	
February 26.....	.656			1.312	5.928
February 26.....	.802		Total for 1899,		15.426
February 26.....	.820		to April 30.....		
March 5.....{	.281	2.970			
March 5.....	.703				

a Evaporation during last six days in 1898.

Rainfall at Sweetwater dam, California.

Month.	1898.	1899.	Month.	1898.	1899.
	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
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	Total.....	5.97	7.77
July.....	0.00	.00			

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.
			<i>Second-feet.</i>
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.
			<i>Second-feet.</i>
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.
			<i>Second-feet.</i>
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 pumps 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.
			<i>Second-feet.</i>
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 turn-out.	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 head-works in canyon.	0.48

Miscellaneous discharge measurements in California in 1899—Continued.

Date.	Stream.	Locality.	Discharge.
			<i>Second-feet.</i>
August 25.....	City Creek.....	In cement ditch near head-works 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 Gallagher 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. head-works.	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.
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
Crocker.....	H. R. Crocker	.....do.....	Sequoia.....	37 48	119 53	4,458
Yosemite.....	.....do.....	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.....	Teachapi.....	.....	.....	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 head-works.....	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
Second Garrotte	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
Crocker's	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 head-works	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
Sweet water 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.
Ash Creek	At mouth	May 15	<i>Sec.-feet.</i> 0.76	C. B. Channel.
Baker Creek	North line sec. 19, T. 31 N., R. 13 W.	June 19	.....	Do.
Beaver Creek	At Hyer's, sec. 20, T. 34 N., R. 46 W.	May 22	.....	Do.
Birdwood Creek	1 mile above mouth	May 25	183.47	H. H. Fickens.
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	.....	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.	Dis-charge.	Hydrographer.
Cedar irrigation ditch.	Ericson.....	May 17	<i>Sec.-feet.</i> 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	1/2 mile east of Kimball	Aug. 11	2.04	Do.
Do	1/2 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.	Dis-charge.	Hydrographer.
			<i>Sec.-feet.</i>	
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 Elk- horn 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.
Stinking water 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 Lumberville, 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.	88. 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					1,800	
0.8						5,900					2,400	
1.0						7,000					3,200	
1.2						8,200				1,140	3,900	
1.4						9,450				1,370	4,700	
1.6						10,750			58	1,650	5,500	
1.8			970	750		12,300			60	1,950	6,400	
2.0			1,350	1,050		13,900			105	2,260	7,300	
2.2		1,000	1,750	1,350		15,500			171	2,600	8,300	
2.4		1,200	2,250	1,700		17,300			253	2,960	9,300	
2.6	1,750	1,400	2,750	2,150		19,300			294	3,340	10,300	
2.8	2,100	1,600	3,300	2,650		21,300			356	3,740	11,300	
3.0	2,600	1,860	3,900	3,250	600	23,400			479	4,160	12,350	
3.2	3,300	2,120	4,550	4,000	1,000	25,625			544	4,600	13,450	
3.4	4,100	2,400	5,250	5,200	1,400	27,925	110		644	5,060	14,550	
3.6	5,050	2,700	6,000	7,500	1,820	30,300	155		766	5,540	15,650	
3.8	6,100	3,000	6,800	10,750	2,270	32,800	225		887	6,050	16,800	45
4.0	7,250	3,300	7,600	14,000	2,750	35,400	285		1,000	6,600	18,000	90
4.2	8,550	3,600	8,500	17,250	3,250	38,100	310	50	1,114	7,190	19,200	150
4.4	10,000	3,940	9,400	20,500	3,750	40,800	405	83	1,227	7,790	20,400	210
4.6	11,650	4,340	10,400	23,750	4,300	44,590	545	128	1,340	8,410	21,600	270
4.8	13,350	4,760	11,400	27,000	4,900	48,170	635	173	1,454	9,040	22,800	340
5.0	15,050	5,200	12,500	30,250	5,500	51,750	725	235	1,567	9,680	24,000	420
5.2	16,750	5,700	13,600	33,500	6,200	55,330	815	305	1,680	10,320	25,200	500
5.4	18,500	6,250	14,800	36,750	6,900	58,910	910	385	1,794	10,960	26,400	580
5.6	20,300	6,850	16,100	40,000	7,700	62,490	1,010	465	1,908	11,600	27,600	660
5.8	22,150	7,560	17,390	43,250	8,500	66,070	1,110	545	2,022	12,240	28,800	740
6.0	24,050	8,340	18,800	46,500	9,350	69,650	1,210	625	2,136	12,880	30,100	820
6.2	25,950	9,240	20,240	49,750	10,250	73,230	1,314	705	2,250	13,520	31,400	900
6.4	27,850	10,260	21,680	53,000	11,150	76,810	1,418	785	2,364	14,160	32,700	1,020
6.6	29,750	11,360	23,120	56,250	12,060	80,390	1,522	865	2,478	14,800	34,000	1,140
6.8	31,700	12,480	24,560	59,500	13,000	83,970	1,628	945	2,592	15,440	35,300	1,260
7.0	33,710	13,620	26,000	62,750	14,000	87,550	1,736	1,025	2,706	16,080	36,600	1,380
7.2	35,750	14,800	27,440	66,000	15,000	91,130	1,844	1,105	2,820	16,720	37,900	1,500
7.4	40,900	16,400	29,600	74,125	17,500	96,500	2,114	1,185	3,038		40,800	1,620
7.6	46,050	18,200	32,200	82,250	20,000	105,450		1,265	3,390		44,900	1,740
7.8	51,200	20,000	35,800		22,500	114,400		1,345			49,000	1,860
8.0	56,350	22,000	40,400		25,000	123,350		1,425			53,100	1,980
8.2	61,500	24,800	44,000		27,500	132,300		1,505			57,200	2,100
8.4		27,600	47,600		30,000	141,250		1,585			61,300	2,220
8.6		30,400	51,200		32,500	150,200		1,665			65,400	2,340
8.8		33,200	54,800		35,000	159,150		1,745			69,500	2,460
9.0		36,000	58,400			168,100		1,825			73,600	2,580
9.2		38,800	62,000			177,050		1,905			77,700	2,700
9.4		41,600				186,000		1,985			81,800	2,820
9.6		44,400				194,950		2,065			85,900	2,940
9.8		47,200				203,900		2,145			90,000	3,060
10.0		50,000				212,850		2,225			94,100	3,180
10.2		52,800				221,800		2,305			98,200	3,300
10.4						230,750		2,385			102,300	3,420
10.6						239,700		2,465			106,400	3,540
10.8						248,650		2,545			110,500	3,660
11.0						257,600		2,625			114,600	3,780
11.2						266,550		2,705			118,700	3,900
11.4								2,785			122,800	4,020
11.6								2,865			126,900	4,140
11.8								2,945				
12.0								3,025				
12.2								3,105				
12.4								3,185				
12.6								3,265				
12.8								3,345				
13.0								3,425				
13.2								3,505				
13.4								3,585				
13.6								3,665				
13.8								3,745				
14.0								3,825				
14.2								3,905				
14.4								3,985				
14.6								4,065				
14.8								4,145				
15.0								4,225				
15.2								4,305				
15.4								4,385				
15.6								4,465				
15.8								4,545				
16.0								4,625				
16.2								4,705				
16.4								4,785				
16.6								4,865				
16.8								4,945				
17.0								5,025				

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.]

Discharge in second-feet.												
Gage height in 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	540	370	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.	122. 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			
0.0									1,300			
0.2									1,425			400
0.4									1,552		580	480
0.6									1,681		620	580
0.8									1,812		690	680
1.0					563				1,945		770	780
1.2					665				2,080	120	850	900
1.4		600			767				2,218	147	940	1,020
1.6	1,550	780			869				2,358	175	1,040	1,150
1.8	2,030	1,350			971				2,500	212	1,140	1,280
2.0	2,390	1,650			1,073				2,644	255	1,250	1,420
2.2	2,830	1,960			1,175				2,790	290	1,360	1,560
2.4	3,380	2,300			1,277	1,990			2,938	345	1,480	1,700
2.6	4,060	2,660			1,379	2,190			3,089	390	1,600	1,850
2.8	4,880	3,020			1,481	2,490			3,243	435	1,720	2,000
3.0	5,750	3,400			1,583	2,870			3,400	480	1,840	2,150
3.2	6,682	3,820			1,685	3,420			3,560	525	1,960	2,300
3.4	7,516	4,260			1,787	4,160			3,720	570	2,080	2,470
3.6	8,400	4,720			1,889	5,036			3,890	615	2,200	2,650
3.8	9,284	5,200			1,991	5,924			4,070	660	2,320	2,850
4.0	10,168	5,680			2,093	6,812			4,260	705	2,440	3,050
4.2	11,052	6,160			2,195	7,700	2,350		4,460	750	2,560	3,250
4.4	11,936	6,640			2,310	8,588	2,470		4,672	795	2,680	3,450
4.6	12,820	7,120			2,435	9,476	2,695		4,888	840	2,800	3,650
4.8	13,704	7,600			2,570	10,364	2,725		5,108	885	2,920	3,900
5.0	14,588	8,080			2,710	11,252	2,860		5,332	930	3,040	4,150
5.2	15,472	8,560			2,860	12,140	3,000		5,560	975	3,160	4,400
5.4	16,356	9,040			3,020	13,028	3,160		5,788	1,020	3,280	4,660
5.6	17,240	9,520			3,180	13,916	3,340		6,016	1,065	3,400	4,920
5.8	18,124	10,000			3,340	14,804	3,540		6,244	1,110	3,520	5,180
6.0	19,008	10,480			3,500	15,692	3,760		6,472	1,155	3,640	5,440
6.5	21,218	11,680			3,660	16,580	4,000		6,700		3,760	5,700
7.0	23,428	12,880			4,060	18,800	4,620		7,270		4,060	6,370
7.5	25,638	14,080			4,460	21,020	5,300		7,840		4,360	7,000
8.0	27,848	15,280			4,860	23,240	6,050		8,410		4,660	7,650
8.5	30,058	16,480			5,260	25,460	6,800		8,980		5,010	8,300
9.0	32,268	17,680			5,660	27,680	7,600		9,550		5,410	8,950
9.5	34,478	18,880			6,060	29,900	8,400		10,120		5,810	9,600
10.0	36,688	20,080			6,460	32,120	9,250		10,690		6,250	10,250
11.0	40,108	22,480			6,860	34,340	10,100		11,260		6,820	10,900
12.0	45,528	24,880			7,660	38,780	11,900		12,400		8,120	12,200
13.0	49,948				8,460	43,220	13,800		13,540		10,010	13,500
14.0	54,368				9,260	47,660	15,800		14,680		12,900	14,800
15.0	58,788				10,060	52,100	17,900		15,820		16,000	16,100
16.0	62,208				10,860		20,100		16,960		19,200	17,400
18.0	72,048				11,660		22,400		18,100		22,400	18,700
20.0							27,300		20,380			21,300
22.0							33,300		22,660			23,900
24.0							41,000		24,940			26,500
26.0							52,000		27,220			29,100
							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. Coosawatee River at Carters, Georgia.	145. Oostanaula River at Resaca, Georgia.	146. Coosa River at Rome, Georgia.	149. Coosa River at Riverside, Alabama.	152. Tallapoosa River at Milledge, 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	2,800	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	4,200	260	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 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.
—0.2								<i>a</i>		
0.0										380
0.2										410
0.4										440
0.6										470
0.8										500
1.0		300				6,600				530
1.2		460				7,300	30	15		560
1.4		620				8,040	90	50		590
1.6		824				8,820	160	100		620
1.8						9,620	250	150		650
2.0	820	1,072				10,430	360	200		680
2.2	990	1,320	225		255	11,250	490	250		710
2.4	1,180	1,652	300		305	12,080	640	300		740
2.6	1,400	1,984	445		370	12,930	810	350		770
2.8	1,620	2,330	610		475	13,800	1,000	400		800
3.0	1,860	2,720	805		610	14,680	1,210	460	650	
3.2	2,120	3,150	1,060		760	15,600	1,430	540	690	
3.4	2,380	3,620	1,360		912	16,550	1,660	640	740	
3.6	2,660	4,160	1,670		1,064	17,550	1,900	760	810	
3.8	2,950	4,800	1,990		1,216	18,550	2,140	900	900	
4.0	3,290	5,530	2,320		1,368	19,600	2,390	1,050	1,010	
4.2	3,710	6,320	2,650		1,520	20,800	2,640	1,210	1,160	
4.4	4,210	7,150	3,020		1,672	22,040	2,900	1,390	1,350	
4.6	4,760	8,000	3,390		1,824	23,280	3,170	1,570	1,580	
4.8	5,350	8,850	3,770	225	1,976	24,520	3,450	1,750	1,870	
5.0	6,020	9,700	4,160	280	2,128	25,760	3,745	1,940	2,210	
5.2	7,920	10,550	4,550	340	2,280	27,000	4,060	2,140	2,600	
5.4	9,820	12,675	5,600	620	2,660	30,100	4,930	2,670	3,600	
5.6	11,720	14,800	6,750	1,280	3,040	33,200	5,880	3,230	4,600	
5.8	13,620	16,925	7,975	2,130	3,420	36,300		3,870	5,600	
6.0	15,520	19,050	9,300	2,980	3,800	39,400		4,610	6,600	
6.2	17,420	21,300	10,720	3,830	4,180	42,500		5,475	7,600	
6.4	19,320	23,550	12,275	4,680	4,560	45,600		6,400	8,600	
6.6	21,220	26,050	14,087	5,530	4,940	48,700		7,325	9,600	
6.8	23,120	28,550	16,100	6,380	5,320	51,800		8,250		
7.0	25,020	31,050	18,275	7,230		54,900		9,175		
7.2	26,920	33,550	20,600	8,080		58,000		10,100		
7.4	28,820	36,050	23,000	9,780		61,200		11,950		
7.6			25,600	11,480		64,400		13,800		
7.8			28,200	13,180		67,600				
8.0			30,800	14,880		70,800				
8.2			33,400	16,580		74,000				
8.4			36,000	18,280		77,200				
8.6			38,600	19,980		80,400				
8.8			41,200	21,680		83,600				
9.0			43,800			86,800				
9.2			46,400			90,000				
9.4			49,000			93,200				
9.6			51,600			96,400				
9.8			54,200			99,600				
10.0			56,800			102,800				
10.2			59,400			106,000				
10.4			62,000			109,200				
10.6			64,600			112,400				
10.8			67,200			115,600				
11.0			69,800			118,800				
11.2			72,400			122,000				
11.4			75,000			125,200				
11.6			77,600			128,400				
11.8			80,200			131,600				
12.0			82,800			134,800				
12.2			85,400			138,000				
12.4			88,000			141,200				
12.6			90,600			144,400				
12.8			93,200			147,600				
13.0			95,800			150,800				
13.2			98,400			154,000				
13.4			101,000			157,200				
13.6			103,600			160,400				
13.8			106,200			163,600				
14.0			108,800			166,800				
14.2			111,400			170,000				
14.4			114,000			173,200				
14.6			116,600			176,400				
14.8			119,200			179,600				
15.0			121,800			182,800				
15.2			124,400			186,000				
15.4			127,000			189,200				
15.6			129,600			192,400				
15.8			132,200			195,600				
16.0			134,800			198,800				
16.2			137,400			202,000				
16.4			140,000			205,200				
16.6			142,600			208,400				
16.8			145,200			211,600				
17.0			147,800			214,800				
17.2			150,400			218,000				
17.4			153,000			221,200				
17.6			155,600			224,400				
17.8			158,200							
18.0			160,800							
18.2			163,400							
18.4			166,000							
18.6			168,600							
18.8			171,200							
19.0			173,800							
19.2			176,400							
19.4			179,000							
19.6			181,600							
19.8			184,200							
20.0			186,800							
20.2			189,400							
20.4			192,000							
20.6			194,600							
20.8			197,200							
21.0			199,800							
21.2			202,400							
21.4			205,000							
21.6			207,600							
21.8			210,200							
22.0			212,800							
22.2			215,400							
22.4			218,000							
22.6			220,600							
22.8			223,200							
23.0			225,800							
23.2			228,400							
23.4			231,000							
23.6			233,600							
23.8			236,200							
24.0			238,800							

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.	221. 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						
0.8	183		82	85	21	100					7	24
0.9	208		104	100	30	170	507				9	36
1.0	235	80	134	125	40	240	893				12	36
1.1	265	84	169	155	50	310	1,316				24	49
1.2	295	90	209	200	62	380	1,777				38	65
1.3	330	98	246	245	80	450	2,275				53	86
1.4	365	110	286	290	100	525	2,811				68	115
1.5	400	124	323	350	120	600	3,385		889		83	145
1.6	440	140	365	410	140	680	3,997			622	98	175
1.7	480	160	406	475	160	760	4,647		1,149			205
1.8	525	183	447	550	185	850	5,335		1,495	713		234
1.9	570	208	504	630	210	940	6,061		1,845	984		264
2.0	620	235	558	720	240	1,030	6,824	600	2,619	1,557		294
2.2	725	295	657	960	300	1,230	8,465	1,049	2,215	1,270		323
2.4	845	365	752	1,240	370	1,480	10,257	1,646	2,619	2,275		383
2.6	980		856	1,530	450	1,760	12,200	2,391	3,427	3,138		442
2.8	1,135			1,820	540	2,070	14,295	3,285	4,235	4,001		501
3.0	1,305			2,110	660	2,400	16,541	4,327	5,197			561
3.2	1,480			2,400	810	2,780	18,939	5,517	6,317			621
3.4	1,680			2,690	1,000	3,240	21,489	6,855	7,497			680
3.6	1,880			2,980	1,200	3,790	24,189	8,342	8,557			740
3.8	2,080			3,270	1,405	4,555		9,977	9,851			800
4.0	2,280			3,560	1,611	5,445		11,760	11,330			860
4.2	2,480			3,850	1,817	6,335		13,691	14,606			
4.4	2,680			4,140	2,023	7,225		15,771	16,257			
4.6	2,880			4,430	2,229	8,115		17,894	17,894			
4.8					2,435	9,005		18,000				
5.0					2,641	9,895		20,375				
5.2					2,847	10,785		22,900				
5.4					3,053	11,760		25,573				
5.6					3,259	12,835		28,394				
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 Canon, 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.
0.0	a							0		
0.1	125				0			7		
0.2	146				1			14		
0.3	168				2			21		4
0.4	190				3			28		8
0.5	213				4			36		19
0.6	236				5			45		35
0.7	260				6			55		60
0.8	284				7		7	67		88
0.9	308				8		13	80		116
1.0	333				9		20	95		146
1.1	359				10		29	113		176
1.2	386				11		39	133		206
1.3	413				12		49	156		236
1.4	441				13	32	60	182		267
1.5	470				14	44	72	211		299
1.6	500				15	58	86	242		331
1.7	531				16	75	102	276		365
1.8	563				17	93	121	321		399
1.9	596				18	112	143	366		433
2.0	631			19	19	133	167	412		468
2.1	669		0	40	21	158	193	464		510
2.2	754		40	115	22	179	248	504		551
2.3	850		113	206	23	205	308	596		619
2.4	954		195	340	24	235	375	688		689
2.5	1,066		288	614	25	267	452	780		769
2.6	1,185		408	936	26	307	536		1,003	1,360
2.7	1,305		593	1,258	27	341			1,251	1,560
2.8	1,425		968	1,580	28	377			1,499	1,760
2.9	1,545		1,342	1,902	29	411			1,747	1,960
3.0	1,665		1,716	2,224	30	441				2,175
3.1	1,785		2,090	2,546	31	477				2,400
3.2	1,905		2,464	2,868	32	512				2,625
3.3	2,025		2,838	3,190	33	546				2,900
3.4	2,145		3,214	3,512	34					
3.5		52	3,590	3,834	35					
3.6		81	3,966	4,156	36					
3.7		121			37					
3.8		172			38					
3.9		232			39					
4.0		292			40					
4.1		352			41					
4.2		412			42					
4.3		472			43					
4.4		532			44					
4.5		592			45					
4.6		652			46					
4.7		712			47					
4.8		772			48					
4.9		832			49					
5.0		892			50					
5.1		952			51					
5.2		1,012			52					
5.3		1,072			53					
5.4		1,132			54					
5.5		1,192			55					
5.6		1,252			56					
5.7		1,312			57					
5.8		1,372			58					
5.9		1,432			59					
6.0		1,492			60					
6.1		1,552			61					
6.2		1,612			62					
6.3		1,672			63					
6.4		1,732			64					
6.5		1,792			65					
6.6		1,852			66					
6.7		1,912			67					
6.8		1,972			68					
6.9		2,032			69					
7.0		2,092			70					
7.1		2,152			71					
7.2		2,212			72					

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.
0.2					90					
0.3					140					
0.4					200					
0.5					270					
0.6			115	303	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				23	
1.4			396	639	1,580				56	
1.6			477	714					94	
1.8			562	789					135	
2.0			660	863					180	
2.2			820	938					230	1,850
2.4			1,010						280	2,070
2.6		1,676		1,013					335	2,320
2.8		2,324		1,088		115			390	2,580
3.0		3,100		1,162		205			450	2,860
3.2		4,000		1,240		295		40	520	3,150
3.4		5,000		1,339		395		60	610	3,460
3.6		6,050		1,462		500		70	710	3,780
3.8		7,400		1,610		615		80	830	4,120
4.0		9,200		1,781		735		95	960	4,480
4.2	898	11,300		1,977		870	30	110	1,000	5,000
4.4	1,241	13,450		2,197		1,020	45	125	1,100	5,240
4.6	1,620	16,400		2,441		1,180	62	140	1,250	5,640
4.8	2,040	19,700				1,360	81	156	1,400	6,060
5.0	2,500	23,700				1,570	100	173	1,550	6,500
5.2	2,995	28,400				1,780	120	190	1,700	6,950
5.4	3,530					2,030	142	205	1,850	7,420
5.6	4,101					2,320	165	220	2,000	7,930
5.8	4,712					2,610	190	236	2,150	8,470
6.0	5,358					2,910	215	254	2,300	9,030
6.2	6,040					3,230	242	270	2,460	9,600
6.4	7,910					4,080	319	315	2,865	11,200
6.6							400	360	3,290	13,000
6.8							490	405	3,715	14,900
7.0							600	457	4,160	16,800
7.2							713	514	4,650	
7.4							834	565	5,150	
7.6							959	627	5,660	
7.8							1,087	680	6,230	
8.0							1,217	737	6,835	
8.2							1,351	800	7,460	
8.4							1,487	862	8,170	
8.6							1,625	927	8,950	
8.8							1,770	997	9,810	
9.0							1,920	1,060	10,986	
9.2							2,070			
9.4							2,220			
9.6							2,380			
9.8							2,540			
10.0							2,700			
10.2							2,870			
10.4							3,040			
10.6							3,210			
10.8							3,380			
11.0							3,550			
11.2							3,720			
11.4							3,890			
11.6							4,060			
11.8							4,230			
12.0							4,400			
12.2							4,570			
12.4							4,740			
12.6							4,910			
12.8							5,080			
13.0							5,250			
13.2							5,420			
13.4							5,590			
13.6							5,760			
13.8							5,930			
14.0							6,100			
14.2							6,270			
14.4							6,440			
14.6							6,610			
14.8							6,780			
15.0							6,950			
15.2							7,120			
15.4							7,290			
15.6							7,460			
15.8							7,630			
16.0							7,800			
16.2							7,970			
16.4							8,140			
16.6							8,310			
16.8							8,480			
17.0							8,650			
17.2							8,820			
17.4							8,990			
17.6							9,160			
17.8							9,330			
18.0							9,500			
18.2							9,670			
18.4							9,840			
18.6							10,010			
18.8							10,180			
19.0							10,350			
19.2							10,520			
19.4							10,690			
19.6							10,860			
19.8							11,030			
20.0							11,200			

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

^bRating 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.]

Discharge in second-feet.												
Gage height in 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 Nepeseta, 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 Cencero, 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	0	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	3,262	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.]

Discharge in second-feet.												
Gage height in 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 Faircreek, 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				
2.2			2,700	970	2,020		1,221		1,061		25	
2.4			3,080	1,130	2,440		1,492		1,356		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		1,948	82	150	
3.0			4,710	1,780	3,700		2,473	5	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		3,267	33	2,847	412	340	
3.6	100		7,263	2,620	4,960	1,650	3,701	59	3,162	555	449	
3.8	120		8,189	2,900	5,380	1,740	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							
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 Feko, 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. <i>a</i>
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	1.0	161	70		167
1.6				105	60	80	2.5	1.0	182	78		191
1.7				121	81	110	5	1	204	87		217
1.8				139	102	140	8	7	227	96		245
1.9				158	123	170	11	14	251	105		275
2.0				179	144	200	14	22	276	114		308
2.1				200	165	230	18	32	301	124		343
2.2		36		223	186	260	23	43	327	134		381
2.3		49			207	290	29	56	354	145		422
2.4	25	67			228	330	35	70	382	156		466
2.5	38	89			249	370	42	86	410	168		512
2.6	52	124			270	410	50	104	439	180		561
2.7	68	180			291	460	59	123	469	193		613
2.8	88	236			312	520	69	144	499	206		668
2.9	111	292			333	590	80	166	529	220		725
3.0	138	349			354	680	92	190	559	235		785
3.2	200	463				960	122	240	619	266		914
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							1,388	1,449		1,093		
6.6							1,486	1,550		1,183		
6.8				163			1,584	1,655		1,281		
7.0				237			1,682	1,763		1,387		
7.2				315				1,873		1,501		
7.4				402				1,986		1,623		
7.6				504				2,101		1,753		
7.8				624				2,218		1,888		
8.0				786				2,339		2,026		
8.2				970						2,302		
8.4				1,160								
8.6				1,350								
8.8				1,540								
9.0				1,730								
9.2				1,920								
9.4				2,110								
9.6				2,300								

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.
0.9								0.1			
1.0								0.5			
1.1								1			10
1.2		790						1	5		867
1.3		870						2	6		25
1.4		950						2	6		986
1.5		1,050	320					2	7		1,105
1.6		1,150	375					4	7		1,224
1.7		1,260	445					6	8		1,343
1.8		1,370	520					8	9		1,462
1.9		1,485	595					10	10		1,581
2.0		1,600	675					12	12		1,700
2.1		1,720	766			4,400		12	12		1,819
2.2		1,840	857			4,500		14	14	1,060	1,938
2.3		1,965	948			4,600		18	18	1,120	2,057
2.4	200	2,090	1,039			4,700		22	30	1,200	2,177
2.5	230	2,215	1,130			4,800		26	45	1,300	2,296
2.6	255	2,340	1,221			4,900		30	65	1,400	2,415
2.7	280	2,465	1,312			5,000		34	85	1,500	2,534
2.8	310	2,590	1,403			5,150		38	105	1,600	2,653
2.9	345	2,715	1,494			5,300		43	130	1,700	2,772
3.0	380	2,840	1,585			5,450		49	155	1,800	2,891
3.1	420	2,970	1,676			5,600		55	180	1,900	3,010
3.2	465	3,100	1,767			5,800		61	210	2,000	3,129
3.3	515	3,230	1,858			6,000		67	245	2,100	3,248
3.4	570	3,360	1,949			6,200		74	280	2,200	3,367
3.5	630	3,495	2,040			6,400		81	325	2,300	3,486
3.6	695	3,630	2,131			6,600		88	370	2,400	3,605
3.7	765	3,765	2,222	128		6,800		95	420	2,500	3,724
3.8	845	3,900	2,313	146		7,000		102	470	2,600	3,843
3.9	935	4,040	2,404	167		7,250		109	525	2,700	3,962
4.0	1,020	4,180	2,495	190		7,500		116	580	2,800	4,081
4.2	1,202	4,460	2,677	216		7,750		124	640	2,900	4,200
4.4	1,384	4,750	2,859	287		8,300		140	780	3,000	4,319
4.6	1,566	5,040	3,041	390		8,900		156	920	3,100	4,438
4.8	1,748	5,340	3,223	510	330	9,550		173	1,060	3,200	4,557
5.0	1,930	5,650	3,405	652	370	10,250		194	1,210	3,300	4,676
5.2		5,970	3,587	812	437	10,950		219	1,370	3,400	4,795
5.4		6,300	3,769	972	533	11,650		247	1,530	3,500	4,914
5.6		6,640	3,951	1,132	690	12,400		275	1,690	3,600	5,033
5.8			4,133	1,292	850	13,200		303	1,850	3,700	5,152
6.0			4,315	1,454	1,010	14,000			2,030	3,800	5,271
6.2			4,497	1,616	1,170	14,820			2,210	3,900	5,390
6.4			4,679	1,780	1,330	15,720			2,390	4,000	5,509
6.6				1,950	1,490	16,660			2,575	4,100	5,628
6.8				2,120	1,650	17,600			2,766	4,200	5,747
7.0				2,290	1,810	18,540			2,958	4,300	5,866
7.2				2,460	1,970	19,480			3,150	4,400	5,985
7.4				2,630	2,130	20,420				4,500	6,104
7.6				2,800	2,290	21,360				4,600	6,223
7.8				2,970	2,450	22,300				4,700	6,342
8.0				3,140		23,240				4,800	6,461
8.2				3,310		24,180				4,900	6,580
8.4						25,120				5,000	6,699
8.6						26,060				5,100	6,818
8.8						27,000				5,200	6,937
9.0						28,000				5,300	7,056
9.2						29,000				5,400	7,175
9.4						30,000				5,500	7,294
9.6						31,000				5,600	7,413
9.8						32,000				5,700	7,532
10.0						33,000				5,800	7,651

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.]

Discharge in second-feet.												
Gage height in 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								233
1.1	310		1,000	1,170				1,341				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	4,540	208	1,800	3,570	6,059				1,714
3.8	2,690	446	4,900	4,900	295	2,000	3,890	6,523				1,884
4.0	2,940	525	5,400	5,400	385	2,240	4,230	7,000				2,061
4.2	3,200	620	5,904		490	2,500	4,600	7,489				2,245
4.4	3,460	735	6,408		623	2,800	5,000	7,990	1,000	600	566	2,435
4.6	3,720	866	6,912		777	3,100	5,440	8,503	1,230	800	917	2,633
4.8	3,980	998	7,416		931	3,500	5,910	9,028	1,480	1,480	1,074	2,839
5.0	4,240	1,130	7,920		1,085	3,900	6,400	9,565	1,730	1,730	1,705	3,052
5.2	4,500	1,262	8,424		1,239	4,400	6,930	10,114	2,000	2,000	1,962	3,272
5.4	4,760	1,394	8,928		1,393	4,900	7,500	10,673	2,300	2,300	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	4,700	4,556	
7.0		2,450	12,960			10,200	12,300	15,525	2,500	5,200	4,935	
7.5		3,780	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								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.]

Discharge in second-feet.												
Gage height in feet.	377. Deschutes River at Moro, Oregon.	380. Hood River at Tucker, Oregon.	381. White River at Bucklev, Washington.	383. Dungeness River at Dungeness, Wash- ington.	384. Elwha River at McDonald, Wash- ington.	386. Calowa River at Forks, Washing- ton.	386. Soulduck River at Quillayute, Wash- ington.	387. Sacramento River at Jellys Ferry, California.	391. Stanislaus River at Oakdale, Cali- fornia.	393. Tuolumne River at Lagrange, Cali- fornia.	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				538	260				
1.6	5,330	486	1,070			485	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				
2.4	6,800	830	2,300			840	892	560			60	
2.6	7,360	936	2,700	186	1,000	974	630	630			100	
2.8	7,920	1,050	3,100	197	1,165	1,062	700	700			170	
3.0	8,480	1,172	3,500	205	1,345	1,150	770	770			280	
3.2	9,040	1,302	3,900	220	1,535	1,254	850	850			445	
3.4	9,600	1,440	4,300	255	1,725	1,358	930	930			640	
3.6	10,160	1,586	4,700	310	1,920	1,472	1,010			0	850	
3.8	10,720	1,730	5,100	382	2,120	1,596	1,090			15	1,060	180
4.0	11,280	1,900	5,500	480	2,320	1,720	1,180	2,400		45	1,285	250
4.2	11,840	2,110	5,900	585	2,520	1,876	1,270	2,670	50	85	1,520	320
4.4	12,400	2,360	6,300	700	2,720	2,032	1,360	2,970	90	140	1,765	400
4.6	12,960	2,550	6,700	820	2,920	2,212	1,460	3,290	175	250	2,030	480
4.8	13,520	2,850	7,100	940	3,120	2,416	1,570	3,630	265	410	2,315	572
5.0	14,080	3,150	7,500	1,060	3,320	2,620	1,690	3,980	370	570	2,620	676
5.2		3,450	7,900	1,180	3,520	2,880	1,810	4,360	485	750	2,940	780
5.4		3,750	8,300	1,300	3,720	3,226	1,940	4,760	620	950	3,275	908
5.6		4,050	8,700	1,420	3,920	3,536	2,080	5,170	760	1,180	3,620	1,036
5.8		4,350	9,100	1,540	4,120	3,808	2,240	5,590	900	1,440	3,985	1,170
6.0		4,650	9,500	1,660	4,320	4,080	2,400	6,030	1,045	1,740	4,370	1,310
6.5		5,400		1,960	4,820	4,760	2,810	7,265	1,450	2,080	4,775	1,450
7.0		6,150		2,260	5,320	5,440	3,260	8,630	1,925	3,100	5,850	1,930
7.5		6,900		2,560	5,820	6,120	3,760	10,100	2,450	4,320	7,090	2,450
8.0		7,650		2,860	6,320	6,800	4,260	11,600	3,020	5,760	8,410	3,120
8.5		8,400		3,160	6,820	7,480	4,760	13,100	3,625	7,400	9,730	3,920
9.0		9,150		3,460	7,320	8,160	5,260	14,600	4,250	9,000	11,060	4,870
9.5		9,900			7,820	8,840	5,760	16,100	4,887	10,600	12,400	6,000
10.0		10,650			8,320	9,520	6,260	17,600	5,525	12,200	13,750	7,800
11.0		12,150				10,880	7,260	20,800	6,800	13,800	15,110	8,800
12.0							8,260	24,400	8,075	17,000		11,800
13.0							9,260	28,400	9,350	20,200		14,800
14.0								32,400	10,625	23,400		17,800
15.0								36,800	11,900			20,800
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:

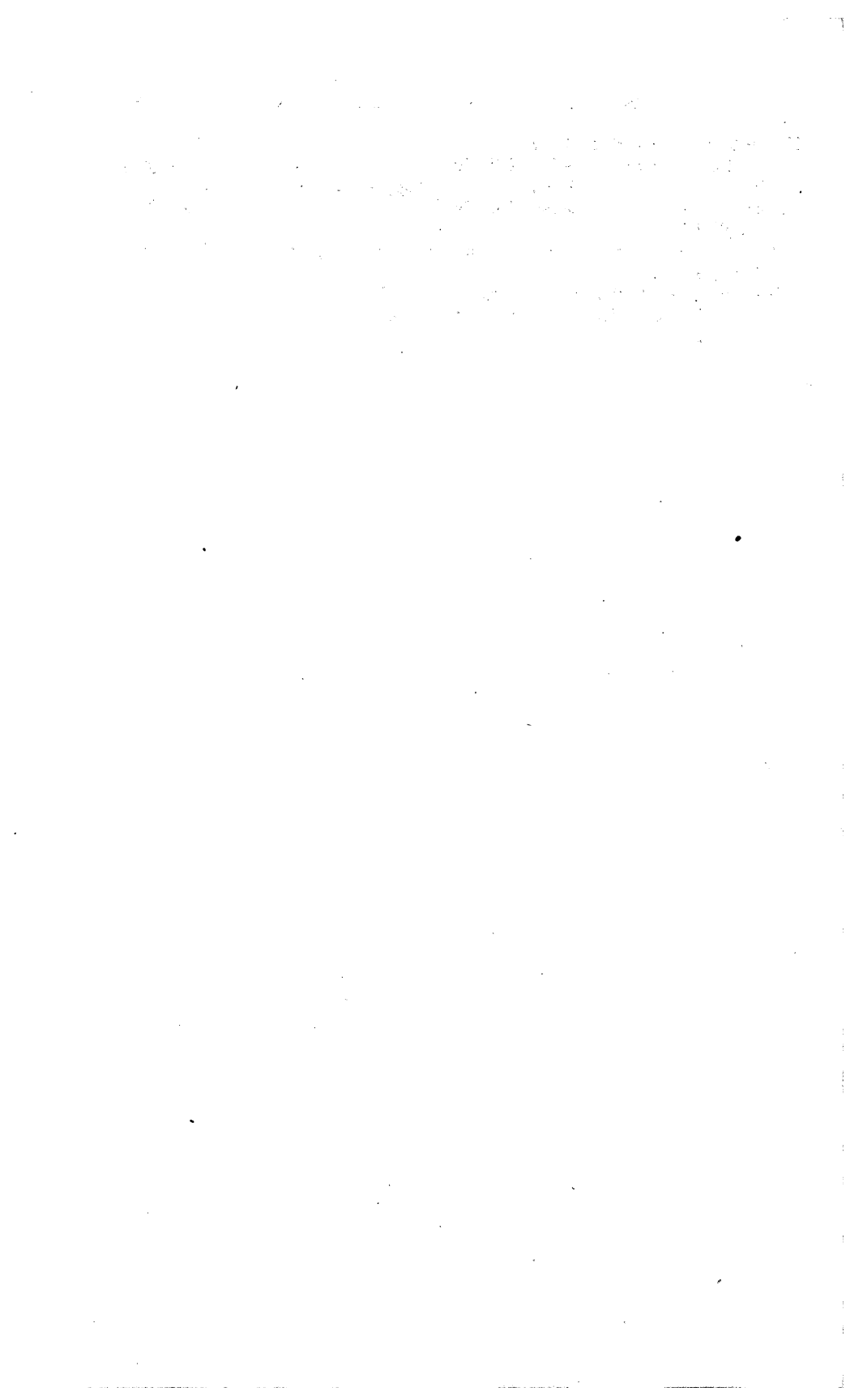
Page 165, the figures on the left of the hydrograph for Savannah River, except 0, should be moved up one division. Insert 5,000 opposite the first division.

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.]

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