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THE SURFACE WATER SUPPLY OF CALIFORNIA, 1906

WITH A SECTION ON GROUND WATER LEVELS
IN SOUTHERN CALIFORNIA

(GREAT BASIN AND PACIFIC OCEAN DRAINAGES
IN CALIFORNIA AND LOWER COLORADO
RIVER DRAINAGE)

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IN COOPERATION WITH CALIFORNIA STATE BOARD OF EXAMINERS



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SURFACE WATER SUPPLY OF CALIFORNIA 1906.^a

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INTRODUCTION.

SCOPE OF WORK.

The water supply of the United States is of more importance to the life and pursuits of the people than is any other natural resource. In the arid States the limit of agricultural development is determined by the amount of water available for irrigation; while in all parts of the country the increase in the population of cities and towns makes necessary additional water supplies for domestic and industrial uses, in procuring which both the quantity and the quality of the water that may be obtained must be considered. The location of manufacturing plants may depend largely on the water-power facilities and on the character of the water. The notable advances made in the electric transmission of power have led to the utilization of water powers for the operation of manufacturing establishments, railroads, and municipal lighting plants, many of which are at some distance from the places at which the power is developed.

The intelligent establishment and maintenance of enterprises or industries that depend on the use of water demands a thorough knowledge of the flow of the streams and an understanding of the conditions affecting that flow. This knowledge should be based on data showing both the total flow and the distribution of the flow throughout the year, in order that normal fluctuations may be provided for. As the flow of a stream is variable from year to year estimates of future flow can be made only from a study of observations covering several years. The rapid increase in the development

^a This report contains information similar to that published in previous years under the title "Report on Progress of Stream Measurements."

^b The data in this report have been collected under the direction of W. B. Clapp, assisted by W. F. Martin, R. S. Hawley, C. H. Lee, and W. C. Sawyer, and have been prepared for publication under the direction of John C. Hoyt, by R. H. Bolster, Robert Follansbee, F. F. Henshaw, J. E. Stewart, and H. D. Padgett.

of the water resources of the United States has caused a great demand by engineers for information in regard to the flow of streams, as it is now generally realized that the failure of many large power, irrigation, and other projects has been due to the fact that the plans were made without sufficient trustworthy information in respect to the water supply.

Owing to the broad scope of these hydrographic investigations and the length of time they should cover in order that the records may be of greatest value, it is, in general, impossible for private individuals to collect the necessary data, and as many of the streams traverse more than one State this work does not properly fall within the province of the State authorities. The United States Geological Survey has therefore, by means of specific appropriations by Congress, for several years systematically made records of stream flow with the view to ultimately determining all the important features governing the flow of the principal streams of the country. In carrying out this plan stations are established on the streams and maintained for a period long enough to show their regimen or general behavior. When a record that is sufficient for this purpose has been obtained for any stream, the work on that stream is discontinued. The order in which the streams are measured is determined by the degree of their importance.

During 1906 the regimen of flow was studied at about 700 stations distributed along the various rivers throughout the United States, as shown on Pl. I. In addition to these records, data in regard to precipitation, evaporation, water power, and river profiles were obtained in many sections of the country.

These data have been assembled by drainage areas and are published in a series of fourteen Water-Supply and Irrigation Papers, Nos. 201 to 214, inclusive, each of which pertains to the surface-water resources of a group of adjacent areas. In these papers are embodied not only the data collected in the field, but also the results of computations based on these data, and other information that has a direct bearing on the subject, such as descriptions of basins and the streams draining them, utility of the water resources, etc. The list follows:

Water-Supply and Irrigation Papers on Surface Water Supply, 1906.

201. Surface water supply of New England, 1906. (Atlantic coast of New England drainage.)
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river drainages, 1906.
203. Surface water supply of the Middle Atlantic States, 1906. (Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages.)
204. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1906. (Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages.)

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of the hydrographer, width and area of cross section, gage height, and discharge in second-feet.

The table of daily gage heights gives the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. At most stations the gage is read in the morning and in the evening.

The discharge measurements and gage heights are the base data from which the other tables are computed. In cases of extensive development it is expected that engineers will use these original data in making their calculations, as the computations made by the Survey are based on the data available at the time they are made and should be reviewed and, if necessary, revised when additional data are available.

The rating table gives the discharge in second-feet corresponding to various stages of the river as given by the gage heights. It is published to enable engineers to determine the daily discharge in case this information is desired.

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest, and it is the flow as given in the rating table for that mean gage height. As the gage height is the mean for the day, there might have been short periods when the water was higher and the corresponding discharge larger than given in this column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow for each second during the month. Upon this the computations for the remaining columns, which are defined on page 10, are based.

The values in the table of monthly discharge are intended to give only a general idea of the conditions of flow at the station, and it is not expected that they will be used for other than preliminary estimates.

In most work where data in regard to flow are used the regimen of flow is of primary importance. Therefore for the principal stations tables have been prepared showing the horsepower that can be developed at various rates of flow, and the length of time that these rates of flow and the corresponding horsepower are available. These tables have been prepared on a basis of 80 per cent efficiency on the turbines, and the horsepower per foot of fall is given in order that the reader can determine the horsepower for any fall.

In the computations, sufficient significant figures have been used so that the percentage of error in the tables will not in general exceed

1 per cent. Therefore, most of the values in the tables are given only three significant figures. In making the various computations Thatcher's slide rule, Crelle's tables, and computation machines have been generally used.

In order to give engineers an idea of the relative value of the various data, notes in regard to accuracy are given as far as possible. The accuracy depends on the general local conditions at the gaging stations and the amount of data collected. Every effort possible is made to so locate the stations that the data collected will give a high degree of accuracy. This is not always possible, but it is considered better to publish rough values with explanatory notes rather than no data at all.

In the accuracy notes the following terms have been used, indicating the probable accuracy, in per cent, of the mean monthly flow. These values are mean values, the error in the value for the flow of an individual day may be much larger.

Excellent indicates that the mean monthly flow is probably accurate to within 5 per cent; good, to within 10 per cent; fair, to within 15 per cent; approximate, to within 25 per cent.

CONVENIENT EQUIVALENTS.

Following is a table of convenient equivalents for use in hydraulic computations:

- 1 second-foot equals 40 California miner's inches (law of March 23, 1901).
- 1 second-foot equals 38.4 Colorado miner's inches.
- 1 second-foot equals 40 Arizona miner's inches.
- 1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
- 1 second-foot equals 6.23 British imperial gallons per second.
- 1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
- 1 second-foot for one year equals 31,536,000 cubic feet.
- 1 second-foot equals about 1 acre-inch per hour.
- 1 second-foot for one day covers 1 square mile 0.03719 inch deep.
- 1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
- 1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
- 1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
- 1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
- 1 second-foot for one day equals 1.983 acre-feet.
- 1 second-foot for one 28-day month equals 55.54 acre-feet.
- 1 second-foot for one 29-day month equals 57.52 acre-feet.
- 1 second-foot for one 30-day month equals 59.50 acre-feet.
- 1 second-foot for one 31-day month equals 61.49 acre-feet.
- 100 California miner's inches equal 18.7 United States gallons per second.
- 100 California miner's inches equal 96.0 Colorado miner's inches.
- 100 California miner's inches for one day equal 4.96 acre-feet.
- 100 Colorado miner's inches equal 2.60 second-feet.
- 100 Colorado miner's inches equal 19.5 United States gallons per second.
- 100 Colorado miner's inches equal 104 California miner's inches.
- 100 Colorado miner's inches for one day equal 5.17 acre-feet.
- 100 United States gallons per minute equal 0.223 second-foot.

100 United States gallons per minute for one day equal 0.442 acre-foot.

1,000,000 United States gallons per day equal 1.55 second-feet.

1,000,000 United States gallons equal 3.07 acre-feet.

1,000,000 cubic feet equal 22.95 acre-feet.

1 acre-foot equals 325,850 gallons.

1 inch deep on 1 square mile equals 2,323,200 cubic feet.

1 inch deep on 1 square mile equals 0.0737 second-foot per year.

1 foot equals 0.3048 meter.

1 mile equals 1.60935 kilometers.

1 mile equals 5,280 feet.

1 acre equals 0.4047 hectare.

1 acre equals 43,560 square feet.

1 acre equals 209 feet square, nearly.

1 square mile equals 2.59 square kilometers.

1 cubic foot equals 0.0283 cubic meter.

1 cubic foot equals 7.48 gallons.

1 cubic foot of water weighs 62.5 pounds.

1 cubic meter per minute equals 0.5886 second-foot.

1 horsepower equals 550 foot-pounds per second.

1 horsepower equals 76.0 kilogram-meters per second.

1 horsepower equals 746 watts.

1 horsepower equals 1 second-foot falling 8.80 feet.

$1\frac{1}{2}$ horsepower equal about 1 kilowatt.

To calculate water power quickly:
$$\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11} = \text{net horsepower on water wheel, realizing 80 per cent of theoretical power.}$$

FIELD METHODS OF MEASURING STREAM FLOW.

The methods used in collecting these data and in preparing them for publication are given in detail in Water-Supply Papers No. 94 (Hydrographic Manual, U. S. Geological Survey) and No. 95 (Accuracy of Stream Measurements). In order that persons using this report may readily become acquainted with the general methods employed, the following brief descriptions are given:

Streams may be divided, with respect to their physical conditions, into three classes: (1) Those with permanent beds; (2) those with beds which change only during extreme low or high water; (3) those with constantly shifting beds. In determining the daily flow special methods are necessary for each class. The data upon which the determinations are based and the methods of collecting them are, however, in general the same.

There are three distinct methods of determining the flow of open-channel streams: (1) By measurements of slope and cross section and the use of Chezy's and Kutter's formulas; (2) by means of a weir; (3) by measurements of the velocity of the current and of the area of the cross section. The method chosen for any case depends upon the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

205. Surface water supply of the Ohio and lower eastern Mississippi river drainages, 1906.
206. Surface water supply of the Great Lakes and St. Lawrence River drainages, 1906.
207. Surface water supply of the upper Mississippi River and Hudson Bay drainages, 1906.
208. Surface water supply of the Missouri River drainage, 1906.
209. Surface water supply of the lower western Mississippi River drainage, 1906.
210. Surface water supply of the western Gulf of Mexico and Rio Grande drainages, 1906.
211. Surface water supply of the Colorado River drainage above Yuma, 1906.
212. Surface water supply of the Great Basin drainage, 1906.
213. Surface water supply of California, 1906. (The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage below Yuma.)
214. Surface water supply of the North Pacific Coast drainage, 1906.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing such records up to and including 1903 has been published in Water-Supply Paper No. 119. The following table gives, by years and primary drainage basins, the numbers of the papers on surface water supply, published from 1901 to 1906.

Numbers of Water-Supply Papers containing results of stream measurements, 1901-1906.^a

| | 1901. | 1902. | 1903. | 1904. | 1905. | 1906. |
|---|----------|----------|-----------|------------|-------|-------|
| | No. | No. | No. | No. | No. | No. |
| Atlantic Coast of New England drainage..... | 65 75 | 82 | 97 | 124 | 165 | 201 |
| Hudson, Passaic, Raritan, and Delaware river drainages..... | 65 75 | 82 | 97 | 125 | 166 | 202 |
| Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages..... | 65 75 | 82 83 | 97 98 | 126 | 167 | 203 |
| Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages..... | 65 75 | 83 | 98 | 127 | 168 | 204 |
| Ohio and lower eastern Mississippi river drainages..... | 65 75 | 83 | 98 | 128 | 169 | 205 |
| Great Lakes and St. Lawrence River drainages..... | 65 75 | 83 | 97 | 129 | 170 | 206 |
| Hudson Bay and upper eastern and western Mississippi River drainages..... | 66 75 | 84 85 | 98 100 | 128 130 | 171 | 207 |
| Missouri River drainage..... | 66 75 | 84 | 99 | 130 131 | 172 | 208 |
| Meramec, Arkansas, Red, and lower western Mississippi river drainages..... | 66 75 | 84 | 99 | 131 | 173 | 209 |
| Western Gulf of Mexico and Rio Grande drainages..... | 66 75 | 84 | 99 | 132 | 174 | 210 |
| Colorado River drainage above Yuma..... | 66 75 | 85 | 100 | 133 | 175 | 211 |
| The Great Basin drainage..... | 66 75 | 85 | 100 | 133 | 176 | 212 |
| The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage below Yuma..... | 66 75 | 85 | 100 | 134 | 177 | 213 |
| North Pacific Coast drainage..... | 66 75 | 85 | 100 | 135 | 178 | 214 |

^a Reports containing data for years prior to 1901 are noted in the series list at the end of this paper.

DEFINITIONS.

The volume of water flowing in a stream—the “run-off” or “discharge”—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner’s inches, and run-off in second-feet per

square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and represents the quantity of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

The "miner's inch" is the quantity of water that passes through an orifice 1 inch square under a head which varies locally. It has been commonly used by miners and irrigators throughout the West and is defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used in comparing run-off with rainfall, which is usually expressed in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work. There is a convenient relation between the second-foot and the acre-foot: a second-foot flowing for twenty-four hours will deliver 86,400 cubic feet, or approximately 2 acre-feet.

EXPLANATION AND USE OF TABLES.

For each regular gaging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of monthly and yearly discharges and run-off.
6. Tables showing discharge and horsepower and the number of days during the year when the same are available.

The descriptions of stations give such general information as to the locality and equipment as would enable the reader to find and use the station, and they also give, as far as possible, a complete history of all the changes that have occurred since the establishment of the station that would be factors in using the data collected.

section into strips. For each strip or pair of strips the mean velocity, area, and discharge are determined independently, so that conditions existing in one part of the stream may not be extended to parts where they do not apply.

Three classes of methods of measuring velocity with current meters are in general use—multiple-point, single-point, and integration.

The three principal multiple-point methods in general use are the vertical velocity-curve; 0.2 and 0.8 depth; and top, bottom, and mid-depth.

In the vertical velocity-curve method a series of velocity determinations are made in each vertical at regular intervals, usually from 0.5 to 1 foot apart. By plotting these velocities as abscissas and their depths as ordinates, and drawing a smooth curve among the resulting points, the vertical velocity-curve is developed. This curve shows graphically the magnitude and changes in velocity from the surface to the bottom of the stream. The mean velocity in the ver-

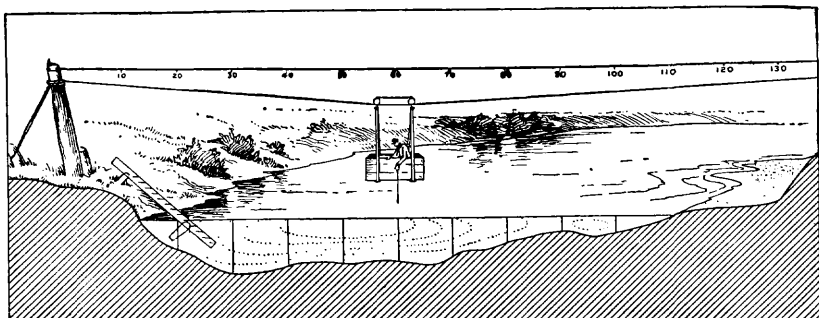


FIG. 1.—Cable station, showing section of river, car, gage, etc.

tical is then obtained by dividing the area bounded by this velocity curve and its axis by the depth. On account of the length of time required to make a complete measurement by this method, its use is limited to the determination of coefficients for purposes of comparison and to measurements under ice.

In the second multiple-point method the meter is held successively at 0.2 and 0.8 of the depth, and the mean of the velocities at these two points is taken as the mean velocity for that vertical. On the assumption that the vertical velocity-curve is a common parabola with horizontal axis, the mean of the velocities at 0.22 and 0.79 of the depth will give (closely) the mean velocity in the vertical. Actual observations under a wide range of conditions show that this second multiple-point method gives the mean velocity very closely for open-water conditions, and, moreover, the indications are that it holds nearly as well for ice-covered rivers.

In the third multiple-point method the meter is held at mid depth,

at 0.5 foot below the surface, and at 0.5 foot above the bottom, and the mean velocity is determined by dividing by 6 the sum of the top velocity, four times the mid-depth velocity, and the bottom velocity. This method may be modified by observing at 0.2, 0.6, and 0.8 depth.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity, or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined.

Extensive experiments by vertical velocity-curves show that the thread of mean velocity generally occurs at from 0.5 to 0.7 of the total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, at which point the meter is held in the majority of measurements. A large number of vertical velocity-curve measurements, taken on many streams and under varying conditions, show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean velocity is practically unity.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of wind or other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be from 0.85 to 0.95, depending on the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is especially adapted for flood measurements or when the velocity is so great that the meter can not be kept at 0.6 depth.

The vertical integration method consists in moving the meter at a slow, uniform speed from the surface to the bottom and back again to the surface, and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point of the vertical is measured twice. It is useful as a check on the point methods.

The area, which is the other factor in the velocity method of determining the discharge of a stream, depends on the stage of the river which is observed on the gage, and on the general contour of the bed of the stream, which is determined by soundings. The soundings are usually taken at each measuring point at the time of the discharge measurement, either by using the meter and cable, or by a special sounding line or rod. For streams with permanent beds standard cross sections are usually taken during low water. These sections serve to check the soundings which are taken at the time of the measurements, and from them any change which may have taken place in the bed of the stream can be detected. They are also of value in obtaining the area for use in computations of high-water measurements, as accurate soundings are hard to obtain at high stages.

In computing the discharge measurements from the observed velocities and depths at various points of measurement the measuring section is divided into elementary strips, as shown in fig. 1, and the mean velocity, area, and discharge are determined separately for either a single or a double strip. The total discharge and the area are the sums of those for the various strips, and the mean velocity is obtained by dividing the total discharge by the total area.

The determination of the flow of an ice-covered stream is difficult, owing to diversity and instability of conditions during the winter period and also to the lack of definite information in regard to the laws of flow of water under ice. The method now employed is to make frequent discharge measurements during the frozen periods by the 0.2 and 0.8, and vertical velocity-curve methods, and to keep an accurate record of the conditions, such as the gage height to the surface of the water as it rises in a hole cut in the ice, the thickness and character of the ice, etc.

From these data an approximate estimate of the daily flow can be made by constructing a rating curve (really a series of curves) similar to that used for open channels, but considering, in addition to gage heights and discharge, the varying thickness of ice.

For information in regard to flow under ice cover see Water-Supply Paper No. 187.

OFFICE METHODS OF COMPUTING RUN-OFF.

There are two principal methods of determining run-off, depending on whether or not the bed of the stream is permanent.

For stations on streams with permanent beds the first step in computing the run-off is the construction of the rating table, which shows the discharge corresponding to any stage of the stream. This rating table is applied to the record of stage to determine the amount of water flowing. The construction of the rating table depends on the method used in measuring flow.

For a station at a weir or dam the basis for the rating table is some standard weir formula. The coefficients to be used in its application depend on the type of dam and other conditions near its crest. After inserting in the weir formula the measured length of crest and assumed coefficient, the discharge is computed for various heads and the rating table constructed.

The data necessary for the construction of a rating table for a velocity-area station are the results of the discharge measurements, which include the record of stage of the river at the time of measurement, the area of the cross section, the mean velocity of the current, and the quantity of water flowing. A thorough knowledge of the conditions at and in the vicinity of the station is also necessary.

The construction of the rating table depends on the following law of flow for open, permanent channels: (1) The discharge will remain constant so long as the conditions at or near the gaging station remain constant; (2) the discharge will be the same whenever the stream at a given stage if the change of slope due to the rise and fall of the stream be neglected; (3) the discharge is a function of and increases gradually with the stage.

The plotting of the results of the various discharge measurements using gage heights as ordinates, and discharge, mean velocity, and area as abscissas, will define curves which show the discharge, mean velocity, and area corresponding to any gage height. For the development of these curves there should be, therefore, a sufficient number of discharge measurements to cover the range of the stage of the stream. Fig. 2 shows a typical rating curve, with its corresponding mean-velocity and area curves.

As the discharge is the product of two factors, the area and the mean velocity, any change in either factor will produce a corresponding change in the discharge. Their curves are therefore constructed in order to study each independently of the other.

The area curve can be definitely determined from accurate soundings extending to the limits of high water. It is always concave toward the horizontal axis or on a straight line, unless the banks of the stream are overhanging.

The form of the mean-velocity curve depends chiefly upon the surface slope, the roughness of the bed, and the cross section of the stream. Of these the slope is the principal factor. In accordance with the relative change of these factors the curve may be either a straight line, convex or concave toward either axis, or a combination of the three. From a careful study of the conditions at a gaging station the form which the vertical velocity-curve will take can be predicted, and it may be extended with reasonable certainty to stages beyond the limits of actual measurements. Its principal use is in connection with the area curve in locating errors in discharge measurements and in constructing the rating table.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. The curve may, however, best be located between and beyond the measurements by means of curves of area and mean velocity. This curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

In the preparation of the rating table the discharge for each tenth or half tenth on the gage is taken from the curve. The difference between successive discharges are then taken and adjusted according to the law that they shall either be constant or increasing.

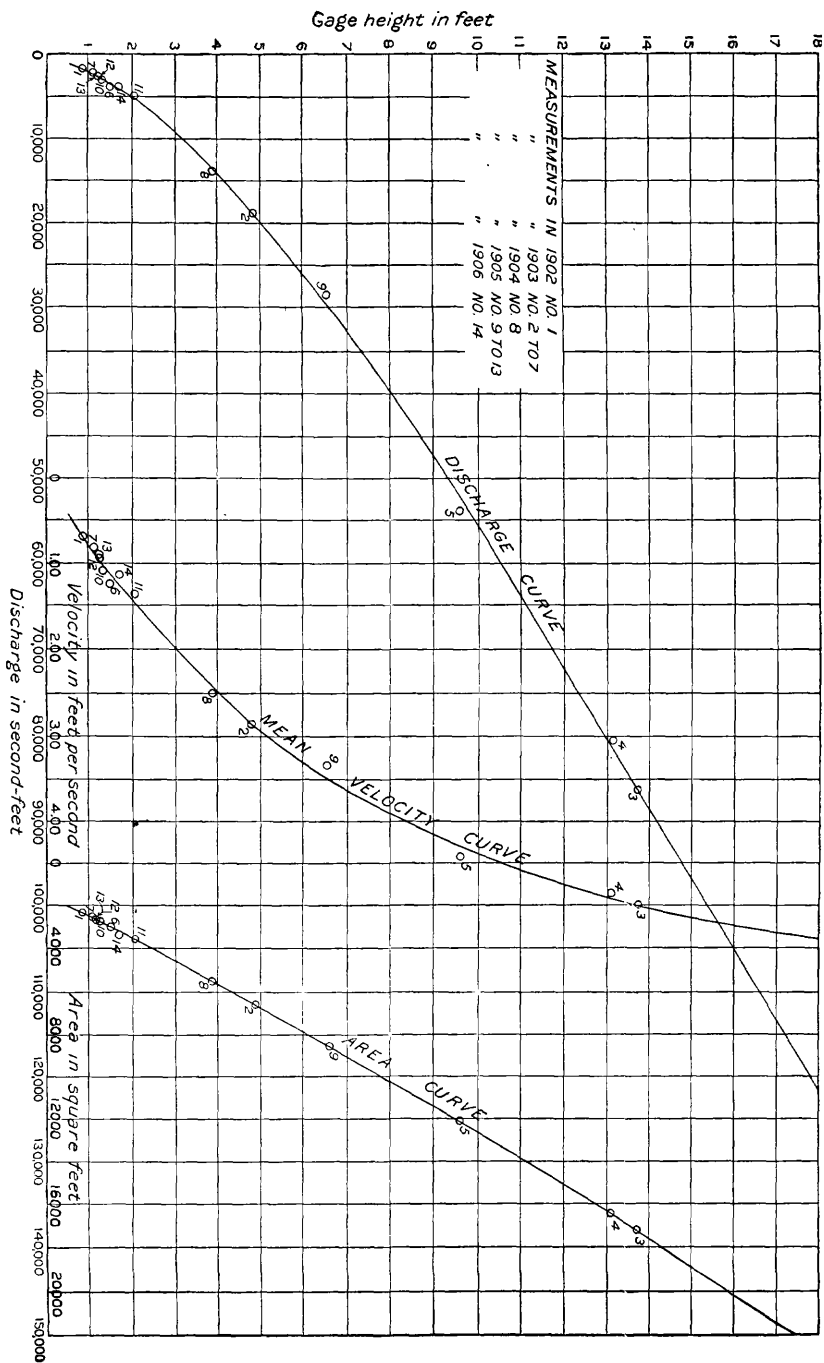


FIG. 2.—Discharge, area, and mean-velocity curves of Potomac River at Point of Rocks, Md.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available a condition which seldom exists on streams of this class, the discharge can be determined by its use. In case of velocity-area stations frequent discharge measurements must be made if the determinations of flow are to be other than rough approximations. For stations with beds which shift slowly, or are materially changed only during flood rating tables can be prepared for periods between such changes and satisfactory results obtained with a limited number of measurements provided that some of them are taken soon after the change occurs. For streams with continually shifting beds, such as the Colorado and Rio Grande, discharge measurements should be made every two or three days and the discharges for intervening days obtained either by interpolation modified by gage height or by Professor Stout's method, which has been described in full in the Nineteenth Annual Report United States Geological Survey, Part IV, page 323, and in the Engineering News of April 21, 1904. This method, or a graphical application of it, is also much used in determining the flow at stations where the bed shifts but slowly.

COOPERATION AND ACKNOWLEDGMENTS.

The hydrographic work of the United States Geological Survey in California is being carried on in cooperation with the State in accordance with acts of the State legislature approved March 1, 1903, and March 20, 1905.

The act of March 16, 1903, which covered the period from July 1, 1903, to June 30, 1905, is in substance as follows:

The State board of examiners are hereby empowered to enter into contracts with the Director of the United States Geological Survey for the purpose of making topographic maps to the extent of twenty thousand dollars; also for the purpose of gaging streams, surveying reservoir sites and canal locations, for the conservation and utilization of the flood or storm waters of the State, to the extent of fifteen thousand dollars [etc.].

The act of March 20, 1905, is in substance the same as previous acts, the appropriations being increased to \$30,000 for topography and \$20,000 for hydrography, and covering the two fiscal years July 1, 1905, to June 30, 1907.

Assistance has been rendered or records furnished by the following, to whom acknowledgment is due: California State board of examiners, composed of the following members: George C. Pardee, governor; C. F. Curry, secretary of state; U. S. Webb, attorney general. Acknowledgment is also due to Mr. Lovelace, of Lemoore, Cal., for gage readings on Tulare Lake; to the Kern County Land Company, through A. K. Warren, engineer in charge of water measurements, for the record of Kern River; to the city of Santa Barbara

for cooperation in gaging Santa Ynez River; to the Bay Cities Water Company, through Edwin Duryea, jr., chief engineer, for precipitation and run-off data; to the Great Western Power Company, through Mr. M. A. Viele, chief engineer, for gage heights and stream measurements on Feather River and tributaries and for rainfall and evaporation records near Prattville, Cal.; to the Southern Pacific Company, through its chief engineer, William Hood, for river-stage records of San Joaquin River at Herndon, Cal., and for transportation furnished; and to the officials of the Santa Fe Railway for transportation furnished.

LOWER COLORADO RIVER DRAINAGE BASIN.^a

COLORADO RIVER AT HARDYVILLE, ARIZ.

This station was established May 11, 1905. It is located one-fourth mile above the deserted town of Hardyville, and 7 miles above Fort Mohave, Ariz. The conditions at this station and the bench marks are described in Water-Supply Paper No. 175, page 128.

Discharge measurements of Colorado River at Hardyville, Ariz., in 1905-6.

| Date. | Hydrographer. | Gage height. | Dis-charge. | Date. | Hydrographer. | Gage height. | Dis-charge. |
|-------------------|-------------------|--------------|-----------------|-------------------|-------------------|--------------|-----------------|
| 1905. | | <i>Feet.</i> | <i>Sec.-ft.</i> | 1906. | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| May 17..... | O. W. Peterson.. | 6.65 | 33,140 | April 8..... | C. W. Jenkins... | 6.90 | 21,500 |
| May 20..... | do..... | 6.95 | 33,910 | April 15..... | do..... | 7.30 | 24,100 |
| May 27..... | C. W. Jenkins.... | 11.20 | 69,010 | April 22..... | do..... | 8.10 | 32,200 |
| June 4..... | do..... | 10.50 | 64,750 | April 24..... | Murphy and Lee.. | 8.84 | 37,500 |
| June 10..... | do..... | 14.50 | 107,700 | May 3..... | Lee and Jenkins.. | 9.00 | 40,800 |
| June 18..... | do..... | 12.80 | 81,030 | May 6..... | C. W. Jenkins.... | 8.70 | 33,100 |
| June 25..... | do..... | 10.15 | 52,810 | May 13..... | do..... | 11.20 | 67,200 |
| July 9..... | do..... | 6.70 | 30,650 | May 20..... | C. H. Lee..... | 11.90 | 63,700 |
| July 16..... | do..... | 5.70 | 22,400 | May 27..... | C. W. Jenkins.... | 14.60 | 92,800 |
| July 23..... | do..... | 5.10 | 17,120 | June 3..... | do..... | 14.05 | 96,200 |
| July 30..... | do..... | 4.00 | 14,580 | June 9..... | do..... | 13.10 | 92,000 |
| August 6..... | do..... | 5.00 | 17,040 | June 16..... | do..... | 14.40 | 109,000 |
| August 13..... | do..... | 4.20 | 12,270 | July 1..... | F. T. Cavin..... | 10.35 | 63,700 |
| August 27..... | do..... | 4.00 | 11,650 | July 8..... | Lee and Cavin.... | 19.30 | 47,500 |
| September 2..... | do..... | 3.20 | 5,934 | July 15..... | F. T. Cavin..... | 8.50 | 34,600 |
| September 17..... | do..... | 3.40 | 7,323 | July 22..... | do..... | 8.56 | 38,100 |
| October 1..... | do..... | 3.00 | 4,657 | July 29..... | do..... | 7.55 | 27,400 |
| October 15..... | do..... | 3.90 | 6,579 | August 5..... | do..... | 7.35 | 24,600 |
| October 29..... | do..... | 3.60 | 6,574 | August 11..... | do..... | 7.00 | 19,500 |
| November 4..... | Jenkins and Lee.. | 3.48 | 5,949 | August 18..... | do..... | 6.45 | 16,200 |
| November 12..... | C. W. Jenkins.... | 3.85 | 6,504 | August 25..... | do..... | 6.20 | 14,200 |
| November 19..... | do..... | 3.70 | 5,979 | September 1..... | do..... | 6.50 | 15,500 |
| November 25..... | do..... | 3.60 | 5,757 | September 8..... | do..... | 6.63 | 12,700 |
| December 3..... | do..... | 6.00 | 17,850 | September 15..... | do..... | 6.50 | 11,400 |
| 1906. | | | | September 22..... | C. J. Brunk..... | 6.73 | 12,100 |
| January 1..... | C. W. Jenkins.... | 3.70 | 3,430 | September 29..... | do..... | 7.38 | 16,900 |
| January 7..... | do..... | 3.50 | 3,440 | October 6..... | do..... | 7.63 | 16,000 |
| January 14..... | do..... | 3.30 | 3,360 | October 13..... | do..... | 7.00 | 12,000 |
| January 21..... | do..... | 4.15 | 5,900 | October 20..... | do..... | 6.75 | 9,840 |
| January 28..... | do..... | 4.50 | 7,850 | October 28..... | do..... | 6.60 | 8,400 |
| February 5..... | do..... | 4.10 | 5,110 | November 4..... | do..... | 6.80 | 9,470 |
| February 12..... | do..... | 4.40 | 6,390 | November 10..... | do..... | 7.30 | 12,800 |
| February 25..... | do..... | 4.30 | 6,350 | November 17..... | do..... | 7.15 | 10,300 |
| March 4..... | do..... | 4.10 | 5,710 | November 24..... | do..... | 6.85 | 9,430 |
| March 11..... | do..... | 4.20 | 1,520 | December 1..... | do..... | 6.70 | 7,720 |
| March 18..... | do..... | 6.40 | 19,400 | December 8..... | do..... | 8.48 | 23,300 |
| March 25..... | do..... | 5.80 | 12,800 | December 15..... | do..... | 7.25 | 11,300 |
| April 1..... | do..... | 7.50 | 30,000 | December 22..... | do..... | 6.89 | 9,230 |
| | | | | December 29..... | do..... | 6.50 | 7,160 |

^a A description of the general features of Colorado River drainage will be found in Water-Supply Paper No. 211.

Daily gage height, in feet, of Colorado River at Hardyville, Ariz., for 1905-6.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | D |
|---------|------------------|------------------|------------------|------------------|-------------------|-------------------|------------------|-------------------------------|------------------|-------------------|-------------------|----------------|
| 1905. | | | | | | | | | | | | |
| 1..... | | | | | | ^a 11.8 | 8.55 | 4.5 | 3.4 | 3.75 | 3.45 | 7 |
| 2..... | | | | | | ^a 11.5 | 8.4 | 4.5 | 3.4 | 4.05 | 3.45 | 7 |
| 3..... | | | | | | ^a 11.1 | 8.3 | ^a 4.6 ¹ | 3.2 | 4.7 | 3.5 | 6 |
| 4..... | | | | | | 10.7 | 8.0 | 4.8 | 3.2 | 4.35 | 3.45 | 5 |
| 5..... | | | | | | 10.8 | 7.9 | 3.2 | 3.45 | 3.1 | 3.5 | 4 |
| 6..... | | | | | | 11.85 | 7.55 | 5.0 | 3.55 | 4.8 | 3.5 | 4 |
| 7..... | | | | | | 12.5 | 7.3 | 4.7 | 3.5 | 4.8 | 3.6 | 4 |
| 8..... | | | | | | 13.1 | 7.0 | 4.7 | 3.6 | 4.7 | 4.0 | ^a 4 |
| 9..... | | | | | | 13.7 | 6.7 | 4.85 | 3.5 | 4.7 | 3.85 | 4 |
| 10..... | | | | | | 14.4 | 6.7 | 4.6 | 3.6 | 4.45 | 3.85 | 3 |
| 11..... | | | | | 6.85 | 14.3 | 6.5 | 4.5 | 4.0 | 4.25 | 3.75 | 3 |
| 12..... | | | | | 6.9 | 14.0 | 6.15 | 4.3 | 3.7 | 4.1 | 3.85 | 3 |
| 13..... | | | | | 6.95 | 14.3 | ^a 6.0 | 4.25 | 3.5 | ^a 4.0 | 3.8 | 3 |
| 14..... | | | | | 7.15 | 14.45 | 5.85 | ^a 4.15 | 3.5 | 3.95 | 3.65 | 3 |
| 15..... | | | | | 7.15 | 14.5 | 5.2 | 4.0 | 3.45 | 3.85 | 3.85 | 3 |
| 16..... | | | | | 6.95 | 13.8 | 5.85 | 4.0 | 3.45 | 3.8 | 3.75 | 3 |
| 17..... | | | | | 6.7 | 13.3 | 5.5 | 3.9 | 3.4 | 3.7 | 3.7 | 3 |
| 18..... | | | | | 6.8 | 12.8 | 5.3 | 3.8 | 3.3 | 3.7 | 3.7 | 3 |
| 19..... | | | | | 6.95 | 12.5 | 5.25 | 3.8 | 3.2 | 3.7 | 3.7 | 3 |
| 20..... | | | | | 7.0 | 12.2 | ^a 5.2 | 3.8 | 3.2 | 3.6 | 3.7 | 3 |
| 21..... | | | | | 7.35 | 11.85 | 5.1 | 3.75 | 3.05 | 3.55 | 3.6 | ^a 5 |
| 22..... | | | | | 8.1 | 11.35 | 5.1 | 3.75 | 3.05 | 3.5 | 3.6 | 3 |
| 23..... | | | | | 8.8 | 10.8 | 5.1 | 3.6 | 3.0 | 3.5 | 3.6 | 3 |
| 24..... | | | | | 9.5 | 10.5 | 4.95 | 3.6 | 3.05 | ^a 3.5 | 3.7 | 3 |
| 25..... | | | | | 9.9 | 10.15 | 4.85 | 3.6 | 2.95 | 3.45 | 3.6 | 3 |
| 26..... | | | | | 10.6 | 10.0 | 4.7 | 4.75 | 2.95 | 3.5 | 5.4 | 3 |
| 27..... | | | | | 11.1 | 9.5 | 4.7 | 3.7 | 2.95 | 3.45 | 5.4 | 3 |
| 28..... | | | | | 11.5 | 9.1 | 4.7 | 3.4 | 2.95 | 3.5 | 5.1 | 3 |
| 29..... | | | | | 12.7 | 9.2 | 4.7 | 3.3 | 3.95 | 3.55 | 5.0 | 3 |
| 30..... | | | | | ^a 12.4 | 9.6 | 4.65 | 3.4 | 3.95 | 3.5 | 5.1 | 3 |
| 31..... | | | | | ^a 12.1 | | 4.6 | 3.4 | | 3.5 | | ^a 3 |
| 1906. | | | | | | | | | | | | |
| 1..... | ^a 3.7 | ^a 4.2 | 4.4 | 7.85 | 9.5 | 13.2 | 10.25 | 7.4 | 6.5 | ^a 7.55 | 6.65 | 6 |
| 2..... | 3.5 | 4.1 | 4.2 | 8.25 | 9.2 | 13.8 | 10.0 | 7.4 | 6.35 | 7.5 | 6.6 | 6 |
| 3..... | 3.5 | 4.05 | 4.2 | 7.9 | 9.1 | 14.0 | ^c 9.7 | 7.6 | 6.35 | 7.7 | ^a 6.7 | 6 |
| 4..... | 3.4 | 4.1 | 4.1 | 7.4 | 9.2 | 13.8 | 9.4 | 7.5 | 6.5 | 7.7 | 6.8 | 6 |
| 5..... | 3.35 | 4.1 | 4.1 | 7.45 | 8.9 | 13.75 | 9.4 | 7.35 | 6.5 | 7.7 | 6.75 | 6 |
| 6..... | 3.4 | 4.1 | 4.1 | 7.1 | 8.8 | 13.8 | 9.2 | 7.2 | 6.55 | 7.6 | ^a 6.8 | 6 |
| 7..... | 3.5 | 4.2 | 4.1 | 6.85 | 8.7 | 13.6 | 9.35 | 7.0 | 6.55 | 7.4 | 6.9 | 6 |
| 8..... | 3.35 | 4.2 | 4.2 | 6.9 | 8.1 | 13.3 | 9.25 | 7.1 | 6.7 | 7.3 | 6.9 | 6 |
| 9..... | 3.3 | 4.3 | 4.2 | 6.9 | 8.7 | 13.0 | 9.35 | 7.0 | 6.7 | 7.2 | 7.0 | 6 |
| 10..... | 3.45 | 4.4 | 4.2 | 6.9 | 9.3 | 13.1 | 9.1 | 7.0 | 6.7 | 7.1 | 7.3 | 7 |
| 11..... | 3.3 | ^a 4.4 | 4.25 | 7.1 | 10.1 | 13.25 | 8.9 | 7.05 | 6.55 | 7.1 | 7.3 | ^a 7 |
| 12..... | 3.35 | 4.4 | 4.2 | 7.1 | 10.5 | 13.5 | 8.8 | 6.85 | 6.6 | 7.1 | ^a 7.3 | 7 |
| 13..... | 3.3 | 4.4 | 4.35 | 7.6 | 11.05 | 13.1 | 8.8 | 6.8 | 6.55 | 7.0 | 7.3 | 7 |
| 14..... | 3.4 | 4.4 | 4.5 | 7.5 | 11.85 | 13.95 | 8.45 | 6.7 | 6.55 | 7.0 | 7.2 | 7 |
| 15..... | 3.35 | 4.3 | 5.1 | 7.35 | 11.9 | ^a 14.0 | 8.5 | 6.65 | 6.55 | 6.95 | 7.15 | 7 |
| 16..... | 3.4 | 4.3 | ^a 5.8 | 7.4 | 12.5 | 14.1 | 8.35 | 6.6 | 6.55 | 6.9 | 7.15 | 7 |
| 17..... | 3.7 | 4.3 | 6.4 | 7.45 | 12.75 | 14.6 | 8.55 | 6.55 | 6.5 | 6.85 | 7.15 | 6 |
| 18..... | 3.8 | 4.25 | 6.35 | 7.6 | 12.6 | 14.8 | 8.5 | 6.45 | 6.6 | 6.8 | 7.1 | 6 |
| 19..... | 3.9 | 4.2 | 5.9 | 7.6 | 12.1 | 15.2 | 8.55 | 6.45 | 6.9 | 6.8 | 7.0 | 6 |
| 20..... | 4.2 | 4.1 | 5.8 | 7.6 | 11.9 | 15.4 | 8.65 | 6.25 | 6.7 | 6.75 | 6.9 | 6 |
| 21..... | 4.15 | 4.2 | 5.9 | 7.9 | 12.3 | 15.0 | 8.75 | 6.2 | 6.6 | 6.7 | 6.85 | 6 |
| 22..... | 4.5 | ^a 4.2 | 5.9 | 8.1 | 12.75 | 15.0 | 8.6 | 6.1 | 6.75 | 6.7 | 6.85 | 6 |
| 23..... | 4.4 | 4.2 | 5.8 | ^a 8.4 | 13.4 | 14.35 | 8.55 | 6.3 | 7.2 | 6.7 | 6.9 | 6 |
| 24..... | 4.3 | 4.2 | 5.8 | 8.8 | 13.7 | 13.8 | 8.35 | 6.6 | 7.0 | 6.65 | 6.85 | 6 |
| 25..... | 4.4 | 4.3 | 5.8 | 8.9 | 14.2 | 13.1 | 8.15 | 6.2 | 6.9 | 6.6 | 6.85 | 6 |
| 26..... | 4.5 | 4.3 | 6.5 | 9.2 | 14.2 | 12.4 | 8.05 | 6.2 | 7.0 | 6.6 | ^a 6.85 | 6 |
| 27..... | 4.4 | 4.3 | 6.4 | 9.8 | 14.55 | 11.85 | 7.85 | ^a 6.25 | 7.0 | 6.55 | 6.85 | 6 |
| 28..... | 4.45 | 4.4 | 6.3 | 10.4 | 14.5 | 11.6 | 7.65 | 6.35 | ^a 7.2 | 6.6 | 6.9 | 6 |
| 29..... | 4.4 | | 6.55 | 10.3 | ^a 14.2 | 11.2 | 7.55 | 6.45 | 7.4 | 6.75 | 6.9 | 6 |
| 30..... | 4.4 | | 7.3 | 10.0 | 13.9 | 10.6 | 7.55 | 6.5 | 7.6 | ^a 6.75 | 6.8 | 6 |
| 31..... | 4.3 | | 7.75 | | 13.4 | | ^a 7.5 | ^a 6.5 | | 6.75 | | 6 |

^a Estimated.

LOWER COLORADO RIVER BASIN.

25

Daily discharge, in second-feet, of Colorado River at Hardyville, Ariz., for 1905-6.

| Day. | Jan | Feb. | Mar | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-------|-------|-------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|
| 1905. | | | | | | | | | | | | |
| 1. | | | | | | 73,460 | 45,260 | 14,080 | 7,160 | 9,290 | 5,650 | 29,500 |
| 2. | | | | | | 70,700 | 44,020 | 14,080 | 7,160 | 11,600 | 5,000 | 26,500 |
| 3. | | | | | | 67,090 | 43,230 | 15,090 | 5,970 | 15,930 | 6,030 | 18,200 |
| 4. | | | | | | 63,550 | 40,750 | 16,110 | 5,970 | 13,100 | 5,750 | 14,300 |
| 5. | | | | | | 64,430 | 39,940 | 18,950 | 7,460 | 18,230 | 5,800 | 11,500 |
| 6. | | | | | | 73,920 | 37,120 | 17,500 | 8,065 | 15,630 | 5,500 | 10,400 |
| 7. | | | | | | 81,000 | 35,120 | 15,430 | 7,760 | 15,300 | 6,000 | 10,200 |
| 8. | | | | | | 85,780 | 32,750 | 15,430 | 8,370 | 14,300 | 8,500 | 9,500 |
| 9. | | | | | | 91,700 | 30,410 | 16,460 | 7,760 | 14,030 | 7,200 | 8,800 |
| 10. | | | | | | 98,780 | 30,410 | 14,750 | 8,300 | 12,000 | 7,000 | 7,400 |
| 11. | | | | | 31,580 | 97,760 | 28,850 | 14,080 | 10,850 | 10,300 | 6,000 | 6,300 |
| 12. | | | | | 31,970 | 94,700 | 26,160 | 12,770 | 8,980 | 8,930 | 6,500 | 6,300 |
| 13. | | | | | 32,330 | 97,760 | 25,000 | 12,440 | 7,760 | 7,900 | 6,200 | 6,700 |
| 14. | | | | | 33,940 | 99,290 | 23,840 | 11,800 | 7,760 | 7,200 | 5,200 | 6,700 |
| 15. | | | | | 33,940 | 99,800 | 18,950 | 10,850 | 7,460 | 6,200 | 6,700 | 6,000 |
| 16. | | | | | 32,330 | 92,700 | 23,840 | 10,850 | 7,460 | 6,000 | 6,100 | 6,000 |
| 17. | | | | | 33,410 | 87,740 | 21,180 | 10,220 | 7,160 | 5,300 | 5,800 | 6,000 |
| 18. | | | | | 31,190 | 82,880 | 19,690 | 9,630 | 6,560 | 5,600 | 5,900 | 6,000 |
| 19. | | | | | 32,330 | 80,000 | 19,320 | 9,600 | 5,970 | 5,600 | 5,980 | 5,300 |
| 20. | | | | | 32,750 | 77,180 | 18,950 | 9,600 | 5,970 | 5,200 | 6,000 | 5,300 |
| 21. | | | | | 35,520 | 73,920 | 18,220 | 9,290 | 5,090 | 4,850 | 5,400 | 5,600 |
| 22. | | | | | 41,560 | 69,340 | 18,220 | 9,290 | 5,090 | 4,800 | 5,500 | 6,000 |
| 23. | | | | | 47,330 | 64,430 | 18,220 | 8,370 | 4,800 | 4,800 | 5,600 | 6,700 |
| 24. | | | | | 53,230 | 61,810 | 17,150 | 8,370 | 5,090 | 5,050 | 6,350 | 6,700 |
| 25. | | | | | 56,640 | 58,790 | 16,460 | 8,370 | 4,515 | 4,700 | 5,760 | 6,700 |
| 26. | | | | | 62,680 | 57,500 | 15,430 | 15,770 | 4,515 | 5,400 | 17,800 | 7,800 |
| 27. | | | | | 67,090 | 53,230 | 15,430 | 8,980 | 4,515 | 5,050 | 17,300 | 7,400 |
| 28. | | | | | 70,700 | 49,840 | 15,430 | 7,160 | 4,515 | 5,700 | 14,500 | 7,400 |
| 29. | | | | | 81,920 | 50,680 | 15,430 | 6,560 | 10,540 | 6,050 | 13,200 | 7,400 |
| 30. | | | | | 79,060 | 54,080 | 15,090 | 7,160 | 10,540 | 5,900 | 13,300 | 6,700 |
| 31. | | | | | 76,240 | | 14,750 | 7,160 | | 5,900 | | 6,700 |
| 1906. | | | | | | | | | | | | |
| 1. | 3,430 | 6,100 | 6,700 | 33,630 | 45,900 | 83,500 | 62,600 | 25,000 | 15,500 | 17,800 | 8,300 | 7,720 |
| 2. | 3,000 | 5,630 | 6,000 | 36,930 | 42,900 | 91,700 | 59,000 | 25,000 | 13,200 | 16,000 | 8,030 | 6,800 |
| 3. | 3,100 | 5,200 | 6,030 | 32,800 | 41,800 | 95,500 | 55,000 | 29,000 | 12,500 | 17,500 | 8,600 | 6,700 |
| 4. | 2,900 | 5,250 | 5,700 | 27,300 | 41,300 | 94,300 | 51,030 | 27,000 | 13,500 | 16,800 | 9,470 | 6,000 |
| 5. | 2,850 | 5,110 | 5,700 | 27,100 | 36,400 | 95,000 | 50,500 | 24,400 | 13,030 | 16,600 | 8,900 | 5,500 |
| 6. | 3,100 | 5,030 | 5,650 | 23,600 | 34,030 | 96,500 | 47,500 | 21,500 | 13,000 | 15,800 | 9,200 | 6,000 |
| 7. | 3,440 | 5,300 | 5,630 | 21,100 | 34,000 | 94,500 | 48,700 | 18,500 | 12,200 | 13,500 | 9,500 | 10,100 |
| 8. | 3,150 | 5,300 | 5,700 | 21,500 | 28,500 | 93,200 | 47,030 | 20,700 | 13,600 | 12,800 | 9,530 | 23,100 |
| 9. | 3,050 | 5,700 | 5,650 | 21,300 | 35,600 | 91,200 | 47,500 | 18,800 | 13,630 | 12,100 | 10,030 | 14,500 |
| 10. | 3,330 | 6,100 | 5,600 | 22,100 | 42,500 | 92,000 | 44,100 | 19,100 | 13,600 | 11,700 | 12,800 | 13,000 |
| 11. | 3,270 | 6,200 | 5,700 | 22,800 | 52,700 | 93,200 | 41,000 | 20,500 | 12,000 | 12,000 | 12,700 | 12,600 |
| 12. | 3,250 | 6,400 | 5,800 | 22,900 | 58,500 | 95,800 | 39,630 | 17,800 | 12,630 | 12,300 | 12,500 | 12,400 |
| 13. | 3,200 | 6,200 | 6,700 | 27,000 | 65,800 | 91,000 | 39,030 | 18,000 | 12,100 | 12,000 | 12,200 | 11,700 |
| 14. | 3,500 | 6,200 | 7,500 | 26,100 | 72,800 | 100,000 | 34,500 | 17,500 | 12,100 | 12,030 | 11,300 | 11,300 |
| 15. | 3,450 | 6,030 | 10,600 | 24,600 | 71,500 | 100,000 | 34,600 | 17,200 | 12,100 | 11,700 | 10,700 | 11,300 |
| 16. | 3,700 | 6,050 | 15,030 | 25,200 | 77,100 | 101,000 | 33,500 | 17,300 | 11,700 | 11,100 | 10,600 | 10,100 |
| 17. | 4,530 | 6,100 | 19,300 | 25,700 | 78,030 | 105,000 | 36,030 | 17,600 | 11,300 | 10,800 | 10,330 | 9,100 |
| 18. | 4,800 | 5,900 | 19,030 | 27,200 | 72,300 | 110,000 | 35,700 | 16,200 | 12,000 | 10,300 | 10,200 | 9,100 |
| 19. | 5,200 | 5,800 | 15,400 | 27,200 | 68,000 | 115,000 | 36,500 | 16,500 | 15,000 | 10,200 | 9,600 | 9,000 |
| 20. | 5,700 | 5,600 | 14,300 | 27,300 | 63,700 | 116,000 | 37,200 | 14,030 | 12,500 | 9,840 | 9,200 | 9,000 |
| 21. | 5,900 | 5,850 | 14,900 | 30,200 | 68,500 | 113,000 | 39,700 | 13,500 | 10,800 | 9,800 | 9,000 | 9,000 |
| 22. | 7,300 | 5,900 | 14,300 | 32,200 | 73,500 | 113,000 | 38,500 | 12,500 | 11,800 | 9,300 | 9,200 | 8,900 |
| 23. | 7,000 | 6,030 | 13,500 | 34,100 | 81,000 | 108,030 | 38,030 | 15,030 | 16,500 | 9,200 | 9,400 | 8,300 |
| 24. | 6,700 | 6,050 | 13,200 | 37,100 | 83,000 | 100,000 | 35,700 | 20,300 | 14,000 | 8,900 | 9,430 | 7,600 |
| 25. | 7,200 | 6,350 | 12,800 | 38,300 | 89,500 | 93,000 | 33,600 | 14,200 | 12,500 | 8,500 | 9,200 | 7,000 |
| 26. | 7,700 | 6,300 | 18,030 | 41,700 | 89,500 | 85,030 | 32,600 | 14,030 | 13,000 | 8,450 | 9,200 | 6,700 |
| 27. | 7,330 | 6,300 | 17,600 | 48,600 | 92,200 | 79,700 | 30,500 | 14,100 | 13,000 | 8,200 | 9,200 | 6,400 |
| 28. | 7,700 | 6,700 | 17,200 | 55,600 | 93,000 | 76,700 | 28,500 | 15,000 | 15,000 | 8,430 | 9,500 | 6,400 |
| 29. | 7,200 | | 22,300 | 54,500 | 91,000 | 72,500 | 27,600 | 16,500 | 17,400 | 9,400 | 9,500 | 7,160 |
| 30. | 7,100 | | 26,800 | 51,200 | 89,000 | 66,030 | 27,500 | 16,500 | 19,500 | 9,400 | 8,800 | 7,400 |
| 31. | 6,700 | | 31,830 | | 84,500 | | 27,500 | 16,500 | | 9,400 | | 7,700 |

NOTE.—These discharges were obtained by the indirect method for shifting channels, except from May 11 to October 1, 1905, when a rating table was used.

Estimated monthly discharge of Colorado River at Hardyville, Ariz., for 1905-6.

| Month. | Discharge in second-feet. | | | Total acre-fe |
|---------------------|---------------------------|----------|--------|------------------|
| | Maximum. | Minimum. | Mean. | |
| 1905. | | | | |
| May (11 to 31)..... | 81,920 | 30,410 | 47,370 | 1,973 |
| June..... | 99,800 | 49,840 | 75,760 | 4,508 |
| July..... | 45,200 | 14,750 | 25,310 | 1,556 |
| August..... | 18,950 | 6,560 | 11,810 | 726 |
| September..... | 10,850 | 4,515 | 6,972 | 414 |
| October..... | 18,200 | 4,700 | 8,571 | 527 |
| November..... | 17,800 | 5,200 | 7,606 | 452 |
| December..... | 29,500 | 5,300 | 9,097 | 559 |
| The period..... | | | | 10,720 |
| 1906. | | | | |
| January..... | 7,700 | 2,850 | 4,830 | 297 |
| February..... | 6,700 | 5,000 | 5,880 | 327 |
| March..... | 31,800 | 5,600 | 12,300 | 756 |
| April..... | 55,600 | 21,100 | 31,600 | 1,880 |
| May..... | 93,000 | 28,500 | 64,500 | 3,970 |
| June..... | 116,000 | 66,000 | 95,300 | 5,670 |
| July..... | 62,600 | 27,500 | 40,000 | 2,460 |
| August..... | 29,000 | 12,500 | 18,400 | 1,130 |
| September..... | 19,500 | 10,800 | 13,400 | 797 |
| October..... | 17,800 | 8,200 | 11,700 | 719 |
| November..... | 12,800 | 8,000 | 9,870 | 587 |
| December..... | 23,100 | 5,500 | 9,260 | 569 |
| The year..... | 116,000 | 2,850 | 26,400 | 19,200 |

NOTE.—Values are rated as follows: October to December, 1905, fair; remainder of 1905 and 1906, gage.

COLORADO RIVER AT YUMA, ARIZ.

This station is located in the town of Yuma, Ariz., $1\frac{1}{2}$ miles below the mouth of Gila River and 10 miles, by river, above the Mexican boundary. Records of river height have been kept by the Southern Pacific Company since April 1, 1878, on the gage which was established by Arthur Brown, superintendent of the company's bridge and building department, during the summer of 1876. The conditions at the station and the bench marks are described in Water Supply Paper No. 177, page 13, where are given also references to publications that contain data for previous years.

Discharge measurements of Colorado River at Yuma, Ariz., in 1906.

[BY W. D. SMITH AND OTHERS.]

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|------------------|--------------|-----------------|-----------------------------|--------------|-------------|
| | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sec.</i> |
| January 3..... | 17.70 | 5,730 | February 21..... | 19.40 | 10 |
| January 5..... | 17.55 | 5,580 | February 24..... | 19.30 | 10 |
| January 9..... | 17.45 | 5,090 | March 6..... | 18.90 | 8 |
| January 13..... | 17.40 | 4,550 | March 9..... | 18.90 | 7 |
| January 19..... | 17.40 | 4,260 | March 12..... | 18.85 | 6 |
| January 23..... | 19.50 | 16,100 | March 15..... | 26.35 | 54 |
| January 25..... | 19.60 | 13,800 | March 16..... | 27.55 | 66 |
| January 27..... | 18.80 | 10,000 | March 17..... | 24.75 | 42 |
| January 30..... | 18.70 | 9,740 | March 19..... | 22.75 | 33 |
| February 2..... | 18.55 | 9,110 | March 21..... | 22.05 | 24 |
| February 5..... | 18.20 | 7,280 | March 24..... | 21.50 | 22 |
| February 9..... | 18.20 | 6,360 | March 27..... | 24.00 | 43 |
| February 12..... | 18.55 | 8,220 | March 28 ^a | 26.50 | 65 |
| February 15..... | 18.90 | 9,640 | March 29 ^a | 28.10 | 75 |
| February 16..... | 19.95 | 14,600 | March 31 ^a | 23.70 | 34 |
| February 19..... | 19.60 | 12,200 | April 3..... | 23.80 | 37 |

^a Measured by J. N. Johannson.

LOWER COLORADO RIVER BASIN.

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Discharge measurements of Colorado River at Yuma, Ariz., in 1936—Continued.

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|----------------------------|--------------|-----------------|--------------------------------|--------------|-----------------|
| | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| April 5..... | 23.40 | 37,800 | August 27..... | 19.10 | 15,200 |
| April 9..... | 22.30 | 27,200 | August 29..... | 19.50 | 16,400 |
| April 11..... | 22.70 | 29,800 | August 31..... | 18.90 | 13,400 |
| April 14..... | 22.45 | 27,800 | September 3..... | 19.20 | 14,500 |
| April 16..... | 22.70 | 29,500 | September 5..... | 18.85 | 12,500 |
| April 18..... | 22.40 | 27,200 | September 7..... | 18.70 | 12,000 |
| April 20..... | 22.45 | 26,100 | September 10..... | 18.75 | 11,800 |
| April 23..... | 22.65 | 29,000 | September 13..... | 18.80 | 11,800 |
| April 25..... | 23.10 | 31,700 | September 15..... | 18.70 | 10,700 |
| April 27..... | 23.55 | 36,700 | September 17..... | 16.65 | 10,700 |
| April 30..... | 24.50 | 44,100 | September 19..... | 18.40 | 9,920 |
| May 2..... | 25.10 | 50,800 | September 21..... | 18.40 | 10,200 |
| May 5..... | 24.55 | 40,600 | September 24..... | 18.40 | 10,300 |
| May 8..... | 24.30 | 36,800 | September 26..... | 19.10 | 13,200 |
| May 10..... | 23.70 | 35,100 | September 28..... | 18.70 | 11,700 |
| May 12..... | 24.25 | 42,100 | October 1..... | 19.55 | 15,900 |
| May 15..... | 24.90 | 46,500 | October 3..... | 19.40 | 14,700 |
| May 18..... | 26.20 | 52,800 | October 6..... | 19.35 | 15,800 |
| May 21..... | 27.10 | 64,200 | October 8..... | 19.10 | 14,900 |
| May 24..... | 27.20 | 68,900 | October 10..... | 18.80 | 14,300 |
| May 28..... | 27.60 | 71,100 | October 11..... | 18.60 | 13,300 |
| June 1..... | 28.60 | 81,800 | October 16..... | 18.10 | 10,700 |
| June 5..... | 28.30 | 92,400 | October 18..... | 18.10 | 10,800 |
| June 8..... | 27.40 | 89,000 | October 22..... | 18.00 | 9,950 |
| June 11..... | 27.30 | 82,100 | October 24..... | 18.00 | 9,800 |
| June 13..... | 26.90 | 65,800 | October 27..... | 18.00 | 8,980 |
| June 16..... | 26.95 | 80,600 | October 29..... | 18.05 | 8,610 |
| June 18..... | 26.90 | 80,800 | November 1..... | 18.35 | 8,630 |
| June 21..... | 26.75 | 79,800 | November 3..... | 18.50 | 9,150 |
| June 23..... | 27.30 | 83,000 | November 6..... | 18.65 | 8,430 |
| June 25..... | 27.80 | 96,600 | November 8..... | 18.75 | 9,420 |
| June 28 ^a | 28.05 | 96,900 | November 9..... | 18.75 | 9,430 |
| June 30..... | 27.30 | 80,300 | November 10..... | 18.80 | 9,650 |
| July 3..... | 24.35 | 60,400 | November 12..... | 19.20 | 11,600 |
| July 5..... | 22.85 | 48,100 | November 14..... | 19.10 | 11,500 |
| July 9..... | 21.85 | 40,400 | November 16..... | 19.00 | 10,800 |
| July 11..... | 21.80 | 38,600 | November 20..... | 18.95 | 10,000 |
| July 13..... | 21.40 | 38,100 | November 22..... | 18.75 | 9,280 |
| July 16..... | 20.95 | 35,400 | November 24..... | 18.80 | 9,230 |
| July 18..... | 21.15 | 32,900 | November 26..... | 18.80 | 8,670 |
| July 20..... | 21.30 | 32,400 | November 28..... | 18.80 | 9,210 |
| July 23..... | 21.60 | 31,600 | December 1 ^b | 18.70 | 9,080 |
| July 25..... | 21.40 | 33,000 | December 3..... | 18.65 | 9,080 |
| July 28..... | 21.10 | 29,100 | December 5..... | 18.50 | 8,470 |
| July 30..... | 20.70 | 29,100 | December 6..... | 21.10 | 26,000 |
| August 1..... | 20.35 | 25,600 | December 8..... | 23.90 | 47,000 |
| August 4..... | 20.00 | 24,500 | December 10..... | 21.90 | 37,000 |
| August 7..... | 19.70 | 21,900 | December 11..... | 21.00 | 28,200 |
| August 9..... | 19.30 | 22,000 | December 12..... | 20.30 | 23,400 |
| August 11..... | 19.55 | 20,500 | December 15..... | 19.60 | 19,300 |
| August 13..... | 19.40 | 19,500 | December 17 ^c | 19.30 | 15,800 |
| August 15..... | 19.20 | 16,900 | December 19..... | 19.10 | 13,900 |
| August 18..... | 19.10 | 16,500 | December 21..... | 18.90 | 12,800 |
| August 20..... | 19.25 | 16,400 | December 24..... | 18.80 | 11,800 |
| August 21..... | 19.90 | 18,500 | December 26..... | 18.60 | 10,600 |
| August 24..... | 19.20 | 15,500 | December 28..... | 18.50 | 8,870 |
| August 25..... | 19.80 | 17,900 | December 29..... | 18.50 | 8,940 |

^a Measurements June 28 to July 25 by F. R. S. Buttemer.^b Measurements December 1 to 15 by J. M. Brown.^c Measurements December 17 to 29 by L. C. Robertson.*Daily gage height, in feet, of Colorado River at Yuma, Ariz., for 1903.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1..... | 17.75 | 18.6 | 19.0 | 24.2 | 24.75 | 28.6 | 26.5 | 20.35 | 18.8 | 19.55 | 18.35 | 18.7 |
| 2..... | 17.7 | 18.55 | 19.0 | 23.9 | 25.1 | 28.6 | 25.55 | 20.3 | 19.0 | 19.4 | 18.5 | 18.8 |
| 3..... | 17.7 | 18.55 | 19.0 | 23.8 | 25.0 | 28.8 | 24.35 | 20.2 | 19.2 | 19.4 | 18.5 | 18.65 |
| 4..... | 17.6 | 18.45 | 19.0 | 24.0 | 24.7 | 28.6 | 23.35 | 20.0 | 19.1 | 19.45 | 18.6 | 18.6 |
| 5..... | 17.55 | 18.2 | 18.95 | 23.4 | 24.55 | 28.3 | 22.85 | 20.15 | 18.85 | 19.45 | 18.6 | 18.5 |
| 6..... | 17.4 | 18.3 | 18.9 | 23.2 | 24.55 | 27.95 | 22.4 | 20.0 | 18.7 | 19.35 | 18.65 | 20.3 |
| 7..... | 17.4 | 18.2 | 18.95 | 22.95 | 24.4 | 27.6 | 22.0 | 19.7 | 18.7 | 19.15 | 18.7 | 25.3 |
| 8..... | 17.5 | 18.2 | 18.95 | ..... | 24.2 | 27.4 | 21.9 | 19.4 | 18.7 | 19.1 | 18.75 | 23.55 |
| 9..... | 17.45 | 18.2 | 18.9 | 22.45 | 23.95 | 27.4 | 21.85 | 19.3 | 18.65 | 18.9 | 18.8 | 21.2 |
| 10..... | 17.5 | 18.2 | 18.85 | 22.9 | 23.8 | 27.45 | 21.85 | 19.2 | 18.75 | 18.8 | 18.8 | 22.1 |

Daily gage height, in feet, of Colorado River at Yuma, Ariz., for 1906—Continued

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | D. |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| 11. | 17.5 | 18.7 | 18.85 | 22.7 | 23.8 | 27.3 | 21.8 | 19.55 | 18.8 | 18.6 | 18.85 | 20 |
| 12. | 17.5 | 18.55 | 18.85 | 22.15 | 24.25 | 27.1 | 21.55 | 19.4 | 18.85 | 18.4 | 19.2 | 20 |
| 13. | 17.4 | 18.7 | 18.9 | 22.6 | 24.3 | 23.9 | 21.4 | 19.4 | 18.8 | 18.25 | 19.3 | 20 |
| 14. | 17.4 | 18.8 | 20.2 | 22.45 | 24.5 | 23.7 | 21.3 | 19.4 | 18.8 | 18.25 | 19.1 | 19 |
| 15. | 17.4 | 18.9 | 21.2 | 22.9 | 24.9 | 23.75 | 21.1 | 19.2 | 18.7 | 18.2 | 19.1 | 19 |
| 16. | 17.4 | 19.95 | 27.55 | 22.7 | 25.4 | 26.95 | 20.95 | 19.2 | 18.7 | 18.1 | 19.0 | 19 |
| 17. | 17.4 | 20.0 | 25.5 | 22.4 | 25.85 | 26.95 | 20.95 | 19.1 | 18.65 | 18.1 | 18.95 | 19 |
| 18. | 17.4 | 19.8 | 23.2 | 22.4 | 24.2 | 26.9 | 21.25 | 19.1 | 18.6 | 18.1 | 18.9 | 19 |
| 19. | 17.4 | 19.6 | 22.15 | 22.55 | 26.45 | 26.8 | 21.5 | 19.5 | 18.4 | 18.1 | 18.9 | 19 |
| 20. | 17.45 | 19.4 | 22.85 | 22.45 | 26.8 | 26.7 | 21.2 | 19.25 | 18.35 | 18.0 | 18.9 | 19 |
| 21. | 17.4 | 19.4 | 22.05 | 22.4 | 27.1 | 26.75 | 21.35 | 19.9 | 18.45 | 18.0 | 18.9 | 19 |
| 22. | 17.5 | 19.4 | 21.7 | 22.4 | 27.2 | 23.85 | 21.5 | 19.3 | 18.6 | 18.0 | 18.8 | 19 |
| 23. | 19.5 | 19.3 | 21.6 | 22.7 | 27.3 | 27.3 | 21.6 | 19.25 | 18.6 | 18.0 | 18.8 | 19 |
| 24. | 19.4 | 19.3 | 21.5 | 22.9 | 27.2 | 27.6 | 21.5 | 19.2 | 18.4 | 18.0 | 18.8 | 19 |
| 25. | 19.6 | 19.2 | 21.35 | 23.1 | 27.2 | 27.8 | 21.4 | 19.8 | 18.7 | 17.95 | 18.8 | 19 |
| 26. | 19.0 | 19.1 | 21.2 | 23.5 | 27.3 | 27.85 | 21.4 | 19.45 | 19.1 | 17.95 | 18.8 | 19 |
| 27. | 18.8 | 19.0 | 23.1 | 23.55 | 27.5 | 28.10 | 21.2 | 19.15 | 18.8 | 18.0 | 18.75 | 19 |
| 28. | 18.75 | 19.0 | 21.0 | 23.8 | 27.6 | 28.05 | 21.1 | 18.9 | 18.7 | 18.0 | 18.8 | 19 |
| 29. | 18.75 | | 27.95 | 24.2 | 27.8 | 27.85 | 20.9 | 19.5 | 18.8 | 18.05 | 18.75 | 19 |
| 30. | 18.7 | | 25.0 | 24.5 | 28.2 | 27.3 | 20.7 | 19.2 | 19.0 | 18.1 | 18.5 | 19 |
| 31. | 18.7 | | 23.8 | | 28.4 | | 20.5 | 18.9 | | 18.15 | | 2 |

Daily discharge, in second-feet, of Colorado River at Yuma, Ariz., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | D. |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----|
| 1. | 5,800 | 9,280 | 9,350 | 39,600 | 46,900 | 81,800 | 74,200 | 25,600 | 12,700 | 15,900 | 8,630 | 9 |
| 2. | 5,800 | 9,100 | 9,210 | 37,600 | 50,800 | 84,000 | 68,000 | 25,500 | 13,300 | 15,000 | 9,300 | 9 |
| 3. | 5,730 | 9,000 | 9,000 | 37,500 | 48,600 | 84,200 | 60,400 | 25,200 | 14,500 | 14,700 | 9,150 | 9 |
| 4. | 5,640 | 8,500 | 8,900 | 38,000 | 43,400 | 87,200 | 52,200 | 24,500 | 13,800 | 15,100 | 9,270 | 9 |
| 5. | 5,580 | 7,280 | 8,750 | 37,800 | 40,600 | 92,400 | 48,100 | 24,900 | 12,500 | 15,200 | 8,700 | 8 |
| 6. | 5,400 | 7,500 | 8,600 | 35,900 | 41,000 | 91,100 | 44,600 | 24,400 | 12,100 | 15,800 | 8,430 | 17 |
| 7. | 5,280 | 6,800 | 8,350 | 33,400 | 38,500 | 89,800 | 41,900 | 21,900 | 12,000 | 15,000 | 9,000 | 60 |
| 8. | 5,230 | 6,600 | 8,000 | 31,000 | 33,800 | 80,000 | 41,100 | 21,900 | 11,900 | 14,900 | 9,420 | 43 |
| 9. | 5,090 | 6,360 | 7,730 | 27,200 | 31,000 | 83,700 | 40,400 | 22,000 | 11,900 | 14,500 | 9,700 | 27 |
| 10. | 4,950 | 6,450 | 7,300 | 32,200 | 35,100 | 85,300 | 39,500 | 21,900 | 11,800 | 14,300 | 9,650 | 38 |
| 11. | 4,830 | 8,830 | 6,900 | 29,800 | 36,700 | 82,100 | 38,600 | 20,500 | 11,800 | 13,300 | 9,800 | 27 |
| 12. | 4,700 | 8,220 | 6,740 | 29,200 | 42,100 | 74,000 | 40,600 | 19,700 | 11,900 | 11,800 | 11,000 | 23 |
| 13. | 4,550 | 8,840 | 7,000 | 29,000 | 42,800 | 65,800 | 37,100 | 19,500 | 11,800 | 10,900 | 12,500 | 21 |
| 14. | 4,500 | 9,250 | 15,600 | 27,800 | 44,000 | 65,000 | 37,400 | 19,200 | 11,750 | 10,800 | 11,500 | 19 |
| 15. | 4,450 | 9,640 | 54,300 | 31,200 | 46,500 | 70,000 | 36,300 | 16,900 | 10,700 | 10,500 | 11,500 | 17 |
| 16. | 4,400 | 14,600 | 66,700 | 29,500 | 48,900 | 80,600 | 35,400 | 16,800 | 10,700 | 10,700 | 11,400 | 15 |
| 17. | 4,350 | 14,800 | 42,300 | 27,200 | 51,100 | 80,600 | 34,600 | 16,100 | 10,700 | 10,800 | 10,500 | 15 |
| 18. | 4,300 | 13,500 | 31,000 | 27,200 | 52,800 | 80,800 | 32,900 | 16,500 | 10,500 | 10,800 | 10,200 | 14 |
| 19. | 4,200 | 12,200 | 33,200 | 28,200 | 55,900 | 80,400 | 32,600 | 17,500 | 9,900 | 10,700 | 9,900 | 13 |
| 20. | 4,600 | 11,000 | 33,500 | 26,100 | 60,200 | 80,100 | 32,400 | 16,400 | 9,600 | 10,300 | 9,750 | 13 |
| 21. | 4,400 | 10,800 | 24,600 | 25,800 | 64,200 | 79,800 | 32,200 | 18,500 | 10,200 | 10,100 | 9,850 | 12 |
| 22. | 5,000 | 10,700 | 23,300 | 25,500 | 66,000 | 80,400 | 31,800 | 18,100 | 10,900 | 10,000 | 9,300 | 12 |
| 23. | 11,100 | 10,300 | 22,800 | 29,000 | 67,700 | 83,000 | 31,000 | 15,800 | 11,000 | 9,800 | 9,330 | 12 |
| 24. | 14,000 | 10,200 | 22,400 | 39,600 | 68,900 | 91,000 | 32,300 | 15,500 | 10,300 | 9,800 | 9,250 | 11 |
| 25. | 13,800 | 9,880 | 21,200 | 31,700 | 69,200 | 95,600 | 33,000 | 17,900 | 11,500 | 9,500 | 8,900 | 11 |
| 26. | 11,000 | 9,550 | 19,000 | 36,200 | 69,700 | 95,400 | 32,400 | 16,400 | 13,200 | 9,200 | 8,670 | 10 |
| 27. | 10,000 | 9,250 | 43,800 | 36,700 | 70,600 | 99,200 | 30,800 | 15,200 | 12,100 | 9,000 | 8,700 | 9 |
| 28. | 9,940 | 9,190 | 65,600 | 38,000 | 71,200 | 97,100 | 29,100 | 14,300 | 11,700 | 8,800 | 9,210 | 8 |
| 29. | 9,830 | | 75,000 | 41,800 | 73,500 | 92,000 | 29,100 | 16,400 | 12,200 | 8,600 | 9,000 | 8 |
| 30. | 9,740 | | 47,500 | 44,100 | 77,300 | 79,300 | 29,100 | 15,000 | 13,300 | 8,600 | 9,080 | 6 |
| 31. | 9,600 | | 34,700 | | 79,800 | | 27,000 | 13,400 | | 8,600 | | 48 |

NOTE.—These discharges were obtained by the indirect method for shifting channels.

Monthly discharge of Colorado River at Yuma, Ariz., for 1906.

[Drainage area, 225,000 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|--------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 16,100 | 4,260 | 6,870 | 422,000 | 0.050 | 0.03 |
| February..... | 14,800 | 6,360 | 9,560 | 531,000 | 0.042 | .04 |
| March..... | 75,000 | 6,740 | 25,400 | 1,560,000 | 0.113 | .13 |
| April..... | 44,100 | 25,500 | 32,500 | 1,930,000 | 0.144 | .16 |
| May..... | 79,800 | 35,100 | 54,100 | 3,330,000 | 0.240 | .28 |
| June..... | 99,200 | 65,000 | 84,200 | 5,010,000 | 0.374 | .42 |
| July..... | 74,200 | 27,000 | 39,000 | 2,400,000 | 0.173 | .20 |
| August..... | 25,000 | 13,400 | 19,200 | 1,180,000 | 0.085 | .10 |
| September..... | 14,500 | 9,600 | 11,700 | 696,000 | 0.052 | .06 |
| October..... | 15,900 | 8,600 | 11,700 | 719,000 | 0.052 | .06 |
| November..... | 12,500 | 8,450 | 9,710 | 578,000 | 0.043 | .05 |
| December..... | 60,000 | 6,800 | 18,300 | 1,130,000 | 0.081 | .09 |
| The year..... | 99,200 | 4,260 | 26,900 | 19,490,000 | 0.119 | 1.62 |

NOTE.—These values are good.

MISCELLANEOUS MEASUREMENTS IN COLORADO RIVER DRAINAGE BASIN.

The following miscellaneous measurements were made in Colorado River drainage basin below Hardyville in 1906:

Colorado River below heading No. 3 of Imperial canal.—Measurements at this point show the discharge in the old channel of Colorado River below the intake of the Imperial canal, where most of the flow was diverted into Salton Sea.

There was practically no discharge in the old channel from early in July until the closure of the break, in November, 1906. The conditions at this point are described in Water-Supply Paper No. 177, page 17.

Discharge measurements of Colorado River below heading No. 3 of Imperial canal in 1906.

| Date. | Hydrographer. | Gage height. | Dis-charge. | Date. | Hydrographer. | Gage height. | Dis-charge. |
|--------------|------------------|--------------|-----------------|-------------|----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| April 10.... | W. D. Smith..... | 4.90 | 1,760 | June 7.... | W. D. Smith..... | 7.00 | 3,210 |
| April 24.... | do..... | 4.60 | 974 | June 19.... | do..... | 6.30 | 398 |
| May 4..... | do..... | 5.60 | 2,040 | June 27.... | Smith and Buttemer. | 7.10 | 1,220 |
| May 14.... | do..... | 5.10 | 1,040 | July 4.... | F. R. S. Buttemer... | 4.50 | 34 |
| May 22.... | do..... | 6.70 | 3,840 | July 11.... | do..... | 3.80 | 0 |
| May 29.... | do..... | 6.80 | 3,440 | | | | |

a Second channel estimated.

Farmer's canal near Yuma, Ariz.—This canal diverts water from Colorado River about 1 mile below Yuma. Measurements were made at the heading. The canal was dry after July 4.

June 7: Area, 82 square feet; discharge, 58 second-feet.

June 19: Area, 78 square feet; discharge, 48 second-feet.

Ludy canal near Yuma, Ariz.—This canal diverts water from Colorado River about 3 miles below Yuma. Measurements were made at the heading. The canal was dry after July 4.

June 7: Area, 109 square feet; discharge, 76 second-feet.

June 19: Area, 116 square feet; discharge, 93 second-feet.

SALTON SEA NEAR SALTON, CAL.

What is now generally known as Salton Sea was until recently an old dry lake or playa, marked on maps as Salton Sink. There is some uncertainty as to the elevation of the lowest point of this sink, and it is now believed that the depth below sea level has been overestimated in the past. From the record of the depth of the water as it filled the lowest portion of the basin, as kept by the New Liverpool Salt Company, it appears that the maximum depth of water was 17 feet on October 4, 1905 (according to the gage and as checked by soundings later), when on the same date the water surface just covered the United States Geological Survey bench mark a few feet from the old Salton railway station. As this bench mark is 256 feet below mean sea level, it would appear that the lowest point of the sink is 273.5 feet below mean sea level instead of 287 feet, which has been accepted heretofore.

Salton Sink originally formed a part of the Colorado Desert, which has an area of nearly 2,000 square miles and extends in a northwesterly direction almost 100 miles from the California-Mexico boundary line. It comprises two fertile valleys, that to the northwest of the sink, in Riverside County, being known as the Coahuila Valley, and the one to the southeast of the sink, in San Diego County, being called the Imperial Valley. Salton Sea, which now partly fills the sink, separates the two valleys and is partly in Riverside County and partly in San Diego County. The longest diameter of the sea has a northwest-southeast direction. On December 31, 1906, its surface was 201 feet below mean sea level and it had a length of nearly 50 miles, a maximum width of about 16 miles, a minimum width of 10 miles, a maximum depth of 72.5 feet, and a superficial area of about 4 square miles. It is about 160 miles southeast of Los Angeles, 100 miles northwest of Yuma, and 50 miles north of Calexico.

A few thousand years ago, according to geologic evidence, what is now Salton Sea was a part of the Gulf of California, which then extended about 200 miles further northwest than at present, reaching possibly to the base of San Jacinto and San Geronimo mountains and certainly some distance beyond the present town of Indio. Colorado River then emptied into the Gulf about 125 miles below its head in the vicinity of Yuma, 75 miles above the present mouth. The river, then as now, was heavily laden with silt, at present estimated to amount to about 53 mile-feet annually, or sufficient to cover 3 square miles 1 foot deep each year. The checking of the velocity near the river's mouth owing to the practically still water of the Gulf, resulted in a deposition of this vast volume of silt, and in the course of hundreds of years built up a broad delta that extended westward as a wide bar or dam until it eventually reached the Colorado Mountains in Mexico, the western wall of the valley, forming a

inland salt, or brackish, sea. During the next few hundred years the Colorado delivered all, or a part, of its silt-laden waters into this newly formed sea, raising the level of its waters coincidently with elevating, broadening, and strengthening by the silt-depositing process the barrier dam which effected its complete and permanent isolation. In the course of many years the dam and the level of the inland sea reached a height of about 30 feet above mean sea level, whereupon the river took a course of less resistance and found an outlet to the Gulf below the recently completed dam.

Whether the river maintained its outlet to the Gulf continuously until the inland sea was completely dissipated through the medium of evaporation is not known. The probability is that the river followed the course of all rivers with growing deltas, and changed its channel from time to time with more or less caprice, alternately discharging into the Gulf and the inland sea. At any rate it is definitely known from the shells found on the desert that the water which ultimately filled the inland sea was fresh, while the originally isolated Gulf water was salt. The conversion from salt to fresh water may have come about through the alternate partial evaporation of the salt water and the refilling with fresh water from the river, or it may have been effected gradually by means of dilution and substitution from a continuous fresh-water inflow covering a long period of time.

As to the date when this inland sea finally disappeared there is no definite information. The Indians now living in the desert are said to have a tradition that the sea was full as late as 400 or 500 years ago at most, and that the water disappeared "poco a' poco"—little by little—until the sea became dry. The geologic evidence at hand neither confirms nor disproves the Indian legend, but simply indicates that the dissipation of the sea occurred at a time which, if not historic, is at least one of the most recent of geologic dates. With climatic conditions as they are at present the sea when full would probably have evaporated in 50 years if not checked by inflow. It is highly probable that the sink has been partly refilled many times in the recent past, the water soon evaporating. During the summer of 1891 the high water in the Colorado overflowed into the sink to such an extent as to endanger the Southern Pacific's railway at its lowest point. In the summer of 1905, after a succession of winter and spring floods in Gila River, followed by an exceptionally heavy summer flow in the Colorado, there was a repetition of flood conditions in the sink on a much larger scale.

The gravity of the situation on this latter date, however, was greatly augmented by the interference of man. For several years preceding a small quantity of water had been diverted from the Colorado below Yuma, Ariz., to be used by the settlers of the Imperial Valley for irrigation and domestic purposes. The first water

was diverted in the United States and conveyed to the Imperial Valley, after passing through Mexican territory, by means of an old river channel which had been one of the Colorado's distributaries during the formation of its delta, and is now known as Alamo River. The increased demand for water and the silting up of the original canal heading above the boundary line necessitated the cutting of an additional channel from the river below the boundary to connect with the canal. It likewise silted up, so that in order to supply the urgent need for water a canal was cut 4 miles below the original heading to connect Colorado and Alamo rivers. This canal was not provided with protective headworks and had a gradient much greater than that of the river, so that with the unusual and prolonged summer flood in 1905, it began cutting, until in July it was carrying 10 per cent of the total flow of the river. This large quantity of water flooded several hundred square miles about Calexico in the southern part of the Imperial Valley, and caused serious loss both in the United States and in Mexico. These waters ultimately reached the Salton Sea but in doing so they deepened and widened Alamo River into a great gorge and developed another drainage channel to the west through Imperial Valley in a second gorge now called New River. Notwithstanding all attempts to control it the Colorado continued to pour its waters through Alamo and New rivers into Salt Lake Sea until the early fall of 1906 when it was finally shut off by the Southern Pacific Company. It broke again, however, on December 7, but was closed about two months later.

The rise of Salton Sea began in November, 1904, and continued throughout 1905 and 1906. In the summer of 1905 it endangered the Southern Pacific tracks to such an extent as to require frequent shifting to higher ground by means of "shoo-fly" or spur tracks which served temporarily until the latter part of the year when a high line about 40 miles in length was completed on the 200-foot contour below sea level. This line is still in use, though during the latter part of 1906 the lowest portion of it was seriously damaged by the action of waves. For use in the future, if required, another line has been located and graded on the 150-foot contour below sea level. In addition to the damage done to the railroad the sea has completely submerged the plant of the New Liverpool Salt Company below Mecca, and also a few ranches in the vicinity of Mecca.

The gage record from November, 1904, to February 26, 1906, was kept by the New Liverpool Salt Company. Their datum is the lowest portion of the sink, or at least that portion which first fills with water, so that the gage record shows the actual depth of the water from time to time. On February 23, 1906, the government put in a gage on the same datum about one-half mile west of Salt Lake railway station, which is 3 miles southeast of the old Salton station. This gage consisted of a series of 5 posts, 6 inches by 6 inches by

feet, set in the ground about 3 feet deep, and so placed that when the water covered one it would just reach the next one farther back. It was not a great while, however, until the waves completely destroyed this gage. In the meantime the Southern Pacific Company had graduated a bent on the trestle bridge across Salt Creek, about 2½ miles east of Salton, using the company's datum, and arrangements were made to have the Southern Pacific agent at Salton furnish the record from this gage, corrections being made to reduce to the original datum. The zero of the gage is 273.5 feet below mean sea level as determined from United States Geological Survey bench marks, or at an elevation of -280.3 according to the Southern Pacific Company.

Daily gage height, in feet, of Salton Sea near Salton, Cal., for 1904-1906.

| Day. | Nov. | Dec. | Day. | Nov. | Dec. | Day. | Nov. | Dec. |
|---------|------|------|---------|------|------|----------------------------|------|------|
| 1904. | | | 1904. | | | 1904. | | |
| 1..... | 0.0 | 0.6 | 13..... | 0.0 | 0.7 | 25..... | 0.4 | 0.6 |
| 2..... | .0 | .6 | 14..... | .0 | .7 | 26..... | .4 | .1 |
| 3..... | .0 | .6 | 15..... | .2 | .7 | 27..... | .5 | .0 |
| 4..... | .0 | .6 | 16..... | .2 | .7 | 28..... | .5 | .8 |
| 5..... | .0 | .2 | 17..... | .3 | .7 | 29..... | .6 | .8 |
| 6..... | .0 | .0 | 18..... | .3 | .7 | 30..... | .6 | .8 |
| 7..... | .0 | .3 | 19..... | .3 | .7 | 31..... | | .8 |
| 8..... | .0 | .7 | 20..... | .4 | .7 | Total monthly rise..... | | |
| 9..... | .0 | .7 | 21..... | .5 | .7 | | | |
| 10..... | .0 | .7 | 22..... | .5 | .7 | | .6 | .2 |
| 11..... | .0 | .7 | 23..... | .4 | .7 | | | |
| 12..... | .0 | .7 | 24..... | .4 | .6 | | | |

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|----------------------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1905. | | | | | | | | | | | | |
| 1..... | 0.8 | 2.2 | 3.8 | 4.8 | 5.7 | 7.0 | 9.1 | 13.5 | 15.7 | 16.8 | 18.3 | 19.8 |
| 2..... | .7 | 2.2 | 3.9 | 4.8 | 5.8 | 7.1 | 9.2 | 13.8 | 15.7 | 16.9 | 18.3 | 19.8 |
| 3..... | .6 | 2.3 | 4.0 | 4.8 | 5.9 | 7.0 | 9.4 | 13.8 | 15.7 | 16.9 | 18.4 | 19.9 |
| 4..... | .6 | 2.4 | 4.2 | 4.9 | 6.0 | 7.1 | 9.6 | 13.8 | 15.7 | 17.0 | 18.5 | 19.9 |
| 5..... | .6 | 2.4 | 4.4 | 5.0 | 5.8 | 7.2 | 9.7 | 13.8 | 15.7 | 17.0 | 18.5 | 20.0 |
| 6..... | .7 | 2.4 | 4.4 | 5.2 | 5.8 | 7.3 | 9.8 | 13.8 | 15.8 | 17.1 | 18.6 | 20.1 |
| 7..... | .7 | 2.5 | 4.4 | 5.3 | 6.2 | 7.6 | 10.1 | 14.0 | 15.8 | 17.1 | 18.7 | 20.2 |
| 8..... | .8 | 2.6 | 4.4 | 5.2 | 6.1 | 7.2 | 10.2 | 14.1 | 15.8 | 17.1 | 18.8 | 20.3 |
| 9..... | .8 | 2.7 | 4.4 | 5.4 | 6.0 | 7.3 | 10.3 | 14.2 | 15.8 | 17.1 | 18.8 | 20.5 |
| 10..... | .9 | 2.8 | 4.3 | 5.2 | 5.8 | 7.6 | 10.3 | 14.2 | 15.9 | 17.2 | 18.8 | 20.7 |
| 11..... | 1.0 | 2.8 | 4.3 | 5.2 | 6.2 | 7.5 | 10.7 | 14.2 | 15.9 | 17.2 | 18.8 | 20.8 |
| 12..... | 1.0 | 2.8 | 4.3 | 5.3 | 6.2 | 7.7 | 10.8 | 14.4 | 16.0 | 17.2 | 18.9 | 21.0 |
| 13..... | 1.1 | 2.9 | 4.3 | 5.4 | 6.2 | 7.7 | 10.9 | 14.3 | 16.0 | 17.2 | 19.0 | 21.2 |
| 14..... | 1.1 | 3.0 | 4.2 | 5.5 | 6.3 | 7.7 | 10.9 | 14.4 | 16.1 | 11.2 | 19.0 | 21.3 |
| 15..... | 1.1 | 3.2 | 4.2 | 5.4 | 6.3 | 7.8 | 11.1 | 14.5 | 16.1 | 17.3 | 19.1 | 21.5 |
| 16..... | 1.7 | 3.2 | 4.2 | 5.5 | 6.4 | 7.8 | 11.2 | 14.6 | 16.2 | 17.3 | 19.2 | 21.7 |
| 17..... | 1.8 | 3.2 | 4.6 | 5.3 | 6.4 | 7.8 | 11.4 | 14.7 | 16.2 | 17.4 | 19.2 | 21.8 |
| 18..... | 1.8 | 3.2 | 4.6 | 5.5 | 6.4 | 7.8 | 11.7 | 14.8 | 16.2 | 17.5 | 19.2 | 21.9 |
| 19..... | 1.8 | 3.3 | 4.6 | 5.2 | 6.5 | 8.0 | 11.9 | 14.8 | 16.2 | 18.0 | 19.2 | 22.0 |
| 20..... | 1.8 | 3.3 | 4.5 | 5.5 | 6.6 | 8.0 | 11.9 | 14.9 | 16.3 | 17.7 | 19.3 | 22.1 |
| 21..... | 1.8 | 3.4 | 4.5 | 5.4 | 6.5 | 8.2 | 12.1 | 15.0 | 16.3 | 17.8 | 19.3 | 22.2 |
| 22..... | 1.8 | 3.4 | 4.5 | 5.7 | 6.7 | 8.2 | 12.2 | 15.0 | 16.4 | 17.8 | 19.4 | 22.2 |
| 23..... | 1.8 | 3.4 | 4.6 | 5.7 | 6.5 | 8.3 | 12.4 | 15.1 | 16.4 | 17.9 | 19.4 | 22.3 |
| 24..... | 1.9 | 3.4 | 4.6 | 5.7 | 6.8 | 8.4 | 12.5 | 15.2 | 16.5 | 17.9 | 19.5 | 22.3 |
| 25..... | 2.0 | 3.5 | 4.6 | 5.5 | 6.6 | 8.5 | 12.7 | 15.2 | 16.5 | 18.0 | 19.5 | 22.4 |
| 26..... | 2.0 | 3.6 | 4.6 | 5.6 | 6.6 | 8.5 | 12.8 | 15.3 | 16.6 | 18.0 | 19.6 | 22.4 |
| 27..... | 2.0 | 3.7 | 4.6 | 5.7 | 6.6 | 8.7 | 13.0 | 15.4 | 16.7 | 18.1 | 19.7 | 22.5 |
| 28..... | 2.0 | 3.8 | 4.7 | 5.8 | 6.8 | 8.8 | 13.1 | 15.5 | 16.8 | 18.2 | 19.7 | 22.6 |
| 29..... | 2.1 | | 4.6 | 5.8 | 6.8 | 8.8 | 13.2 | 15.5 | 16.8 | 18.2 | 19.8 | 22.6 |
| 30..... | 2.1 | | 4.6 | 5.8 | 7.0 | 9.0 | 13.2 | 15.6 | 16.8 | 18.2 | 19.8 | 22.7 |
| 31..... | 2.2 | | 4.6 | | 6.8 | | 13.4 | 15.6 | | 18.2 | | 22.7 |
| Total monthly rise.. | 1.4 | 1.6 | .8 | 1.2 | 1.0 | 2.2 | 4.4 | 2.2 | 1.2 | 1.4 | 1.6 | 2.9 |

Daily gage height, in feet, of Salton sea near Salton, Cal., for 1904-1906—Continued

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|----------------------|------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|
| 1906. | | | | | | | | | | | |
| 1..... | 22.8 | 23.9 | ..... | 28.3 | 34.1 | 42.7 | 59.1 | 66.7 | 69.5 | 70.3 | 71.5 |
| 2..... | 22.8 | 24.0 | 25.6 | ..... | ..... | 43.3 | 59.4 | 66.9 | 69.5 | 70.3 | 71.5 |
| 3..... | 22.8 | 24.0 | ..... | 28.7 | 34.4 | 43.8 | 60.1 | 67.0 | 69.6 | 70.3 | 71.5 |
| 4..... | 22.8 | 24.2 | ..... | ..... | 34.5 | 44.4 | 60.3 | 67.0 | 69.6 | 70.4 | 71.5 |
| 5..... | 22.9 | 24.2 | 25.8 | 29.1 | ..... | 44.7 | 60.5 | 67.1 | 69.7 | 70.4 | 71.6 |
| 6..... | 22.9 | 24.3 | ..... | ..... | ..... | ..... | 61.0 | 67.2 | 69.8 | 70.4 | 71.6 |
| 7..... | 23.0 | 24.4 | 25.9 | 29.5 | ..... | ..... | 61.4 | 67.3 | 69.9 | 70.4 | 71.6 |
| 8..... | 23.0 | 24.4 | 26.0 | 29.7 | ..... | ..... | 61.7 | 67.4 | 69.9 | 70.6 | 71.6 |
| 9..... | 23.1 | 24.5 | ..... | ..... | ..... | ..... | 62.1 | 67.5 | 69.9 | 70.6 | 71.6 |
| 10..... | 23.1 | 24.5 | 26.0 | 30.2 | ..... | 47.9 | 62.3 | 67.6 | 69.9 | 70.8 | 71.6 |
| 11..... | 23.2 | 24.7 | ..... | ..... | ..... | 48.4 | 62.6 | 67.7 | 69.9 | 70.9 | 71.6 |
| 12..... | 23.2 | 24.8 | 26.0 | 30.5 | 36.4 | 48.6 | 62.8 | 67.8 | 70.0 | 71.1 | 71.6 |
| 13..... | 23.2 | 24.8 | 26.2 | 30.9 | ..... | 49.5 | 63.3 | 67.9 | 70.0 | 71.3 | 71.6 |
| 14..... | 23.2 | 24.9 | ..... | 31.1 | 36.9 | 50.0 | 63.3 | 68.1 | 70.0 | 71.3 | 71.6 |
| 15..... | 23.3 | 25.0 | ..... | 31.3 | 37.2 | ..... | 63.5 | 68.2 | 70.1 | 71.3 | 71.6 |
| 16..... | 23.3 | 25.0 | ..... | ..... | ..... | 51.3 | 63.8 | 68.3 | 70.1 | 71.3 | 71.5 |
| 17..... | 23.3 | 25.1 | 26.3 | 31.7 | 37.5 | ..... | 64.1 | 68.4 | 70.1 | 71.3 | 71.5 |
| 18..... | 23.3 | 25.1 | 26.4 | ..... | 37.8 | 52.3 | 64.3 | 68.5 | 70.1 | 71.3 | 71.5 |
| 19..... | 23.4 | 25.2 | 26.4 | 32.0 | 38.0 | ..... | 64.4 | 68.6 | 70.1 | 71.3 | 71.5 |
| 20..... | 23.4 | 25.2 | ..... | 32.2 | 38.4 | 52.8 | 64.6 | 68.7 | 70.1 | 71.3 | 71.5 |
| 21..... | 23.4 | 25.2 | 26.5 | 32.3 | ..... | ..... | 64.8 | 68.8 | 70.1 | 71.4 | 71.5 |
| 22..... | 23.5 | 25.3 | ..... | ..... | 38.9 | ..... | 65.0 | 68.9 | 70.1 | 71.4 | 71.5 |
| 23..... | 23.6 | 25.4 | 26.8 | ..... | ..... | ..... | 65.3 | 69.0 | 70.1 | 71.4 | 71.5 |
| 24..... | 23.5 | 25.5 | 27.0 | ..... | 39.5 | ..... | 65.3 | 69.0 | 70.1 | 71.4 | 71.5 |
| 25..... | 23.6 | 25.6 | 27.1 | 33.0 | 39.8 | 55.3 | 65.5 | 69.1 | 70.1 | 71.4 | 71.4 |
| 26..... | 23.6 | 25.7 | ..... | ..... | 40.0 | 55.7 | 65.7 | 69.2 | 70.2 | 71.4 | 71.4 |
| 27..... | 23.6 | ..... | 27.6 | 33.3 | 40.7 | 56.2 | 65.9 | 69.3 | 70.2 | 71.4 | 71.4 |
| 28..... | 23.7 | ..... | 27.7 | ..... | 41.3 | 56.7 | 66.1 | 69.4 | 70.2 | 71.5 | 71.4 |
| 29..... | 23.7 | ..... | ..... | 33.6 | 41.5 | 57.3 | 66.2 | 69.4 | 70.2 | 71.5 | 71.3 |
| 30..... | 23.8 | ..... | 28.2 | ..... | 41.8 | 57.9 | 66.3 | 69.4 | 70.3 | 71.5 | 71.3 |
| 31..... | 23.8 | ..... | ..... | ..... | 42.5 | ..... | 66.5 | 69.4 | ..... | 71.5 | ..... |
| Total monthly rise.. | 1.1 | 1.8 | 2.7 | 5.6 | 8.7 | 15.4 | 8.6 | 2.9 | .9 | 1.2 | —2 |

THE GREAT BASIN DRAINAGE.

GENERAL FEATURES.

The Great Basin drainage in California is comprised within subdrainages Sierra Nevada and Minor Great Basin. Within Sierra Nevada drainage is a limited area of arid country lying on eastern slope of the Sierra Nevada. This area includes the Su and Owens River drainage basins. Within the Minor Great Basin drainage lies the Mohave River drainage basin. Having no outlet to the sea, the entire drainage of these basins is lost mainly through evaporation from the lakes and sinks in which the waters of the rivers collect.

OWENS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Owens River has its source in the Sierra Nevada in eastern California and flows southeast parallel with this range, finally discharging its waters into Owens Lake. This basin has a length from north to south of approximately 150 miles with a width of from 20 to 30 miles. It lies between the Sierra Nevada on the west and the W.

Mountains on the east. Practically the entire flow of this river is derived from the Sierra Nevada, as it drains the entire eastern slope of this range from Mount Lyell on the north to a point some distance below Mount Whitney on the south. The White Mountains furnish no water for this stream except in times of exceptionally heavy rain storms, which seldom occur on this range. There are numerous tributaries entering Owens River from the west which have their source in the high elevations of the Sierra Nevada, extending from the northern to the southern limits of this basin. The topography of the portion of the Sierra Nevada drained by this stream is extremely rough and precipitous, the mountains rising abruptly from Owens Valley to elevations of 13,000 to 14,000 feet. The formation is of granite, with very little soil covering and sparse timber growth. Numerous lakes and marshes are found in the upper reaches of this portion of the drainage basin.

Owens River, a short distance below its source, enters a flat, swampy country known as Long Valley, where a considerable quantity of its flow is used for the irrigation of meadow lands for stock raising. This water returns to the river channel at the lower end of this valley, at which point the stream enters a deep, narrow gorge with heavy grade. As the river breaks from this canyon it enters Owens Valley, through which it flows for a distance of about 80 miles, finally discharging into Owens Lake. The gaging station at Round Valley is located at the lower end of this canyon. Below this point numerous diversions are made for the irrigation of land in Owens Valley, where the soil is extensively cultivated and large areas are used for the raising of hay and grain. This country is particularly adapted to stock raising, which is carried on extensively throughout the valley. Numerous opportunities for the construction of storage reservoirs occur, both on the main stream and also on the upper reaches of its tributaries, although none have been taken advantage of as yet. The precipitation is extremely light except on the high elevations of the Sierra Nevada, where there is a heavy fall of snow. The melting of this in the spring and summer months feeds the numerous tributaries of this river, insuring a continued flow throughout the year.

OWENS RIVER NEAR ROUND VALLEY, CAL.

This station was established August 3, 1903, by J. C. Clausen. It is located at the footbridge, 700 feet above the junction of Owens River and Rock Creek. The conditions at this station and the bench marks^a are described in Water-Supply Paper No. 177, page 50, where are given also references to publications that contain data for previous years.

^a The elevation of the bench mark is 8.05 feet above the datum of the gage.

Discharge measurements of Owens River near Round Valley, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|------------------------|--------------|------------------|--------------|-------------|
| | | <i>Fect.</i> | <i>Sec. ft.</i> | <i>Fect.</i> | <i>Sec.</i> |
| January 8..... | F. R. S. Buttemer..... | 34 | 73 | 1.75 | 715 |
| January 14..... | do..... | 34 | 77 | 1.92 | 750 |
| January 14..... | do..... | 34 | 79 | 1.93 | 785 |
| August 23..... | Hawley and Shuey..... | 34 | 111 | 2.85 | 821 |
| November 3..... | G. R. Shuey..... | 34 | 85 | 2.14 | 715 |
| November 30..... | do..... | 34 | 79 | 2.00 | 680 |

Daily gage height, in feet, of Owens River near Round Valley, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|
| 1..... | 1.8 | 1.85 | 1.95 | 2.45 | 2.25 | 2.4 | 3.5 | 3.5 | 2.6 | 2.3 | 2.15 |
| 2..... | 1.8 | 1.9 | 1.95 | 2.4 | 2.3 | 2.45 | 3.55 | 3.5 | 2.6 | 2.3 | 2.15 |
| 3..... | 1.8 | 1.9 | 1.95 | 2.4 | 2.35 | 2.4 | 3.5 | 3.45 | 2.6 | 2.3 | 2.15 |
| 4..... | 1.8 | 1.9 | 1.95 | 2.4 | 2.3 | 2.45 | 3.45 | 3.45 | 2.6 | 2.35 | 2.15 |
| 5..... | 1.8 | 1.9 | 1.95 | 2.25 | 2.3 | 2.5 | (a) | 3.4 | 2.6 | 2.35 | 2.15 |
| 6..... | 1.8 | 1.9 | 1.95 | 2.1 | 2.25 | 2.6 | | 3.3 | 2.55 | 2.35 | 2.15 |
| 7..... | 1.75 | 1.9 | 2.0 | 2.15 | 2.2 | 2.7 | | 3.3 | 2.5 | 2.3 | 2.15 |
| 8..... | 1.75 | 1.9 | 2.0 | 2.3 | 2.25 | 2.9 | | 3.3 | 2.5 | 2.3 | 2.1 |
| 9..... | 1.75 | 1.95 | 2.0 | 2.5 | 2.2 | 3.9 | | 3.25 | 2.45 | 2.3 | 2.1 |
| 10..... | 1.75 | 1.95 | 2.0 | 2.6 | 2.25 | 3.95 | | 3.25 | 2.45 | 2.3 | 2.1 |
| 11..... | 1.8 | 1.95 | 2.1 | 2.7 | 2.35 | 3.0 | | 3.2 | 2.45 | 2.25 | 2.1 |
| 12..... | 1.8 | 1.95 | 2.3 | 2.7 | 2.5 | 3.25 | | 3.1 | 2.45 | 2.2 | 2.1 |
| 13..... | 1.9 | 1.95 | 2.25 | 2.75 | 2.45 | 3.3 | | 3.1 | 2.45 | 2.2 | 2.1 |
| 14..... | 1.9 | 1.95 | 2.2 | 2.7 | 2.4 | 3.4 | | 3.1 | 2.4 | 2.2 | 2.1 |
| 15..... | 1.9 | 1.95 | 2.2 | 2.65 | 2.4 | 3.4 | | 3.05 | 2.4 | 2.2 | 2.05 |
| 16..... | 1.9 | 1.95 | 2.25 | 2.7 | 2.4 | 3.45 | | 3.0 | 2.4 | 2.2 | 2.05 |
| 17..... | 1.95 | 1.95 | 2.25 | 2.7 | 2.4 | 3.45 | | 2.95 | 2.4 | 2.2 | 2.0 |
| 18..... | 2.15 | 1.95 | 2.25 | 2.7 | 2.45 | 3.5 | | 2.95 | 2.4 | 2.2 | 2.0 |
| 19..... | 2.1 | 1.95 | 2.3 | 2.7 | 2.6 | 3.55 | | 3.1 | 2.35 | 2.2 | 2.0 |
| 20..... | 2.0 | 1.95 | 2.3 | 2.7 | 2.65 | 3.6 | | 3.2 | 2.35 | 2.15 | 2.0 |
| 21..... | 2.0 | 2.0 | 2.35 | 2.6 | 2.6 | 3.7 | | 3.2 | 2.3 | 2.15 | 2.0 |
| 22..... | 2.1 | 2.0 | 2.35 | 2.6 | 2.55 | 3.75 | | 3.1 | 2.3 | 2.15 | 2.0 |
| 23..... | 2.1 | 2.0 | 2.35 | 2.5 | 2.5 | 3.85 | | 2.85 | 2.25 | 2.1 | 2.0 |
| 24..... | 2.1 | 2.0 | 2.4 | 2.35 | 2.5 | 3.9 | | 2.85 | 2.25 | 2.1 | 2.0 |
| 25..... | 2.1 | 2.0 | 2.35 | 2.25 | 2.5 | 3.9 | | 2.85 | 2.25 | 2.1 | 2.05 |
| 26..... | 2.05 | 2.0 | 2.4 | 2.2 | 2.5 | 3.9 | | 2.7 | 2.3 | 2.1 | 2.1 |
| 27..... | 2.0 | 1.95 | 2.35 | 2.15 | 2.5 | 3.7 | | 2.6 | 2.3 | 2.1 | 2.1 |
| 28..... | 2.0 | 1.95 | 2.3 | 2.15 | 2.45 | 3.65 | | 2.6 | 2.3 | 2.1 | 2.1 |
| 29..... | 1.95 | | 2.3 | 2.2 | 2.4 | 3.5 | 3.65 | 2.6 | 2.3 | 2.1 | 2.1 |
| 30..... | 1.9 | | 2.35 | 2.2 | 2.45 | 3.6 | 3.6 | 2.6 | 2.3 | 2.15 | 2.1 |
| 31..... | 1.9 | | 2.5 | | 2.4 | | 3.6 | 2.6 | | 2.15 | |

^a Station discontinued; operations resumed July 29.

Rating table for Owens River near Round Valley, Cal., for 1906.

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> |
| 1.60 | 132 | 2.10 | 244 | 2.60 | 385 | 3.10 | 545 | 3.60 | 715 |
| 1.70 | 152 | 2.20 | 270 | 2.70 | 416 | 3.20 | 578 | 3.70 | 750 |
| 1.80 | 172 | 2.30 | 297 | 2.80 | 448 | 3.30 | 612 | 3.80 | 785 |
| 1.90 | 194 | 2.40 | 326 | 2.90 | 480 | 3.40 | 646 | 3.90 | 821 |
| 2.00 | 218 | 2.50 | 355 | 3.00 | 512 | 3.50 | 680 | | |

NOTE.—This table is based on discharge measurements made during 1903-6 and is well defined by gage heights 1.7 feet and 2.8 feet.

Monthly discharge of Owens River near Round Valley, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|-------------------------|---------------------------|----------|-------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 257 | 162 | 199 | 12,200 |
| February..... | 218 | 183 | 205 | 11,400 |
| March..... | 355 | 206 | 270 | 16,600 |
| April..... | 432 | 244 | 345 | 20,500 |
| May..... | 400 | 270 | 328 | 20,200 |
| June..... | 839 | 326 | 624 | 37,100 |
| July ^a | 732 | 663 | 696 | 42,800 |
| August..... | 680 | 385 | 535 | 32,900 |
| September..... | 385 | 284 | 330 | 19,600 |
| October..... | 312 | 244 | 273 | 16,800 |
| November..... | 257 | 218 | 239 | 14,200 |
| December..... | 270 | 218 | 256 | 15,700 |
| The year..... | 839 | 162 | 358 | 260,000 |

^a Discharge interpolated July 5 to 28.

NOTE.—Values are rated as follows: June and July, good; remainder of 1906, excellent.

OWENS RIVER NEAR TINEMAHA, CAL.

This station was established September 20, 1906, but measurements were made prior to this date by the city of Los Angeles, Cal. It is located about 7 miles south of Tinemaha at a basaltic knoll in the floor of the valley known as "Charles Butte." It was described in Water-Supply Paper No. 177 as near Independence.

The channel is straight for 300 feet above and 200 feet below the station. The right bank is high and rocky with a growth of willows along the bank; the left is low and liable to overflow at high stages of the river. The channel has a carrying capacity of about 1,800 second-feet before it overflows. The bed of the stream is composed of sand and gravel and is subject to some change between high and low stages of the river.

Discharge measurements are made from a cable and car. The initial point for soundings is a spike in post on right bank.

The gage, which is read by Ray Bowers, is a vertical rod fastened to a post on left bank of the stream. The bench mark is a nail in the south side of the post that supports the cable on the left bank; elevation, 8.36 feet above the zero of the gage.

During high water this station is inaccessible, and measurements are made at the county bridge near Citrus, about 12 miles below. The conditions at this station are described in Water-Supply Paper No. 177, p. 74, where are given, also, references to publications that contain data for previous years.

Discharge measurements of Owens River near Tinemaha, Cal., by G. R. Shuey, in 19

| Date. | Gage height. | Dis-charge. | Date. | Gage height. | Dis-charge. |
|------------------|--------------|-----------------|------------------|--------------|-------------|
| | <i>Fect.</i> | <i>Sec.-ft.</i> | | <i>Fect.</i> | <i>Sec.</i> |
| January 3..... | 1.60 | 284 | April 12..... | 2.72 | |
| January 10..... | 1.80 | 319 | April 25..... | | |
| January 18..... | 2.65 | 467 | May 3..... | 1.10 | |
| January 24..... | | 555 | May 8..... | .90 | |
| February 6..... | 2.11 | 377 | May 24..... | 1.16 | |
| February 14..... | 2.04 | 347 | June 5..... | 1.30 | |
| February 21..... | 1.93 | 350 | June 18..... | 3.93 | |
| February 26..... | 1.80 | 314 | October 8..... | 1.40 | |
| March 8..... | 1.70 | 277 | October 18..... | 1.57 | |
| March 20..... | 2.92 | 523 | November 1..... | 1.80 | |
| March 27..... | 2.67 | 478 | December 8..... | 2.62 | |
| April 6..... | 2.37 | 462 | December 17..... | 2.60 | |

Daily gage height, in feet, of Owens River near Tinemaha, Cal., for 1906.

| Day. | Sept. | Oct. | Nov. | Dec. | Day. | Sept. | Oct. | Nov. | Dec. |
|---------|-------|------|------|------|---------|-------|------|------|------|
| 1..... | | 1.45 | 1.80 | 2.15 | 17..... | 1.55 | 2.05 | | |
| 2..... | | 1.52 | 1.85 | 2.20 | 18..... | 1.57 | 2.05 | | |
| 3..... | | 1.45 | 1.90 | 2.30 | 19..... | 1.58 | 2.05 | | |
| 4..... | | 1.40 | 1.90 | 2.45 | 20..... | 1.85 | 1.60 | 2.00 | |
| 5..... | | 1.40 | 1.95 | 2.60 | 21..... | 1.82 | 1.55 | 2.00 | |
| 6..... | | 1.38 | 2.00 | 2.70 | 22..... | 1.80 | 1.57 | 2.00 | |
| 7..... | | 1.40 | 2.00 | 2.65 | 23..... | 1.75 | 1.60 | 2.00 | |
| 8..... | | 1.40 | 2.05 | 2.60 | 24..... | 1.72 | 1.70 | 2.00 | |
| 9..... | | 1.38 | 2.05 | 2.55 | 25..... | 1.60 | 1.82 | 2.10 | |
| 10..... | | 1.36 | 2.05 | 2.50 | 26..... | 1.50 | 1.85 | 2.05 | |
| 11..... | | 1.35 | 2.00 | 2.45 | 27..... | 1.45 | 1.87 | 2.10 | |
| 12..... | | 1.35 | 2.00 | 2.50 | 28..... | 1.40 | 1.85 | 2.20 | |
| 13..... | | 1.30 | 2.00 | 2.70 | 29..... | 1.35 | 1.90 | 2.30 | |
| 14..... | | 1.35 | 2.00 | 2.80 | 30..... | 1.38 | 1.80 | 2.20 | |
| 15..... | | 1.38 | 2.05 | 2.70 | 31..... | 1.80 | | | |
| 16..... | | 1.45 | 2.10 | 2.70 | | | | | |

Rating table for Owens River near Tinemaha, Cal., from October 19, 1906, to December 31, 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> |
| 1.00 | 278 | 1.50 | 342 | 1.90 | 402 | 2.30 | 470 | 2.70 | 542 |
| 1.10 | 290 | 1.60 | 357 | 2.00 | 418 | 2.40 | 488 | 2.80 | 560 |
| 1.20 | 302 | 1.70 | 372 | 2.10 | 434 | 2.50 | 506 | 2.90 | 580 |
| 1.30 | 314 | 1.80 | 387 | 2.20 | 452 | 2.60 | 524 | 3.00 | 600 |
| 1.40 | 327 | | | | | | | | |

NOTE.—This table is based on 5 discharge measurements made during 1906 and is fairly well defined.

Discharge measurements of Owens River near Citrus, Cal., by Buttemer and Shuey in 19

| Date. | Discharge. | Date. | Discharge. |
|-----------------|-----------------|-------------------|-----------------|
| | <i>Sec.-ft.</i> | | <i>Sec.-ft.</i> |
| January 3..... | 283 | July 13..... | 2..... |
| January 19..... | 440 | July 21..... | 2..... |
| January 21..... | 585 | July 29..... | 2..... |
| June 4..... | 214 | August 9..... | 1..... |
| June 16..... | 586 | August 17..... | 1..... |
| June 26..... | 1,370 | September 10..... | |
| July 1..... | 1,520 | October 7..... | |
| July 8..... | 2,080 | | |

Monthly discharge of Owens River near Tinemaha, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|-------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 635 | 270 | 436 | 26,800 |
| February..... | 443 | 308 | 358 | 19,900 |
| March..... | 680 | 277 | 438 | 26,900 |
| April..... | 530 | 213 | 388 | 23,100 |
| May..... | 285 | 162 | 200 | 12,300 |
| June..... | 1,540 | 224 | 729 | 43,400 |
| July..... | 2,610 | 1,520 | 2,230 | 137,000 |
| August..... | 2,220 | 730 | 1,210 | 74,400 |
| September..... | 700 | 332 | 448 | 26,700 |
| October..... | 401 | 270 | 339 | 20,800 |
| November..... | 470 | 387 | 423 | 25,200 |
| December..... | 560 | 443 | 510 | 31,400 |
| The year..... | 2,610 | 162 | 642 | 468,000 |

NOTE.—From January 1 to June 30 the daily discharge was interpolated between measurements at the regular station. During July, August, and September the regular station was inaccessible on account of floods and the daily discharge has been interpolated between measurements made at Citrus. The values for these months are probably too small, as the Eastside and Stevens canals divert water above. After September the discharge was obtained from the rating table. Values for the year are approximate.

ROCK CREEK NEAR ROUND VALLEY, CAL.

This station was established August 3, 1903, by J. C. Clausen. It is located at the wagon bridge on the road from Long Valley to Bishop, 3,500 feet above the mouth of the creek. The conditions and the bench marks are described in Water Supply Paper No. 177, page 52, where are given also references to publications that contain data for previous years.

Discharge measurements of Rock Creek near Round Valley, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|-----------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| January 8..... | F. R. S. Buttner..... | 13.5 | 17 | 1.58 | 23 |
| January 14..... | do..... | 14.6 | 21 | 1.93 | 41 |
| August 27..... | R. S. Hawley..... | 14 | 21 | 1.75 | 51 |
| November 3..... | G. R. Shuey..... | 13 | 16 | 1.55 | 37 |
| November 30..... | do..... | 13 | 19 | 1.70 | 47 |

Daily gage height, in feet, of Rock Creek near Round Valley, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1..... | 1.5 | 1.55 | 1.35 | 1.5 | 1.2 | 1.8 | 3.15 | 2.75 | 1.9 | 1.55 | 1.6 | 1.7 |
| 2..... | 1.45 | 1.35 | 1.35 | 1.5 | 1.2 | 1.75 | 3.25 | 2.75 | 1.9 | 1.55 | 1.6 | 1.7 |
| 3..... | 1.5 | 1.55 | 1.35 | 1.55 | 1.2 | 1.8 | 3.2 | 2.75 | 1.9 | 1.55 | 1.6 | 1.75 |
| 4..... | 1.5 | 1.5 | 1.35 | 1.5 | 1.25 | 1.8 | 3.2 | 2.75 | 1.95 | 1.55 | 1.6 | 1.75 |
| 5..... | 1.6 | 1.5 | 1.35 | 1.5 | 1.25 | 1.8 | (a) | 2.7 | 1.9 | 1.55 | 1.65 | 1.8 |
| 6..... | 1.7 | 1.45 | 1.35 | 1.45 | 1.25 | 1.85 | ..... | 2.7 | 1.9 | 1.55 | 1.65 | 1.8 |
| 7..... | 1.65 | 1.4 | 1.3 | 1.5 | 1.3 | 1.9 | ..... | 2.65 | 1.85 | 1.55 | 1.65 | 1.8 |
| 8..... | 1.6 | 1.4 | 1.3 | 1.4 | 1.3 | 2.15 | ..... | 2.6 | 1.8 | 1.55 | 1.65 | 1.8 |
| 9..... | 1.6 | 1.45 | 1.3 | 1.3 | 1.3 | 2.35 | ..... | 2.6 | 1.75 | 1.55 | 1.65 | 1.8 |
| 10..... | 1.65 | 1.45 | 1.35 | 1.3 | 1.35 | 2.5 | ..... | 2.65 | 1.75 | 1.55 | 1.65 | 1.75 |
| 11..... | 1.75 | 1.45 | 1.4 | 1.4 | 1.45 | 2.8 | ..... | 2.7 | 1.75 | 1.5 | 1.65 | 1.7 |
| 12..... | 1.8 | 1.45 | 1.8 | 1.4 | 1.75 | 2.95 | ..... | 2.65 | 1.75 | 1.5 | 1.65 | 1.65 |
| 13..... | 1.9 | 1.45 | 2.0 | 1.45 | 1.8 | 3.2 | ..... | 2.7 | 1.75 | 1.5 | 1.65 | 1.6 |
| 14..... | 1.9 | 1.45 | 2.2 | 1.4 | 1.95 | 3.35 | ..... | 2.7 | 1.7 | 1.55 | 1.65 | 1.55 |
| 15..... | 2.0 | 1.4 | 2.4 | 1.3 | 1.95 | 3.4 | ..... | 2.65 | 1.7 | 1.55 | 1.65 | 1.5 |

^a Station discontinued; operations resumed July 29.

Daily gage height, in feet, of Rock Creek near Round Valley, Cal., for 1906—Continued

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|------|-------|------|
| 16..... | 2.1 | 1.4 | 2.3 | 1.3 | 1.9 | 3.4 | ..... | 2.6 | 1.7 | 1.55 | 1.65 | 1.65 |
| 17..... | 2.1 | 1.4 | 2.2 | 1.3 | 1.9 | 3.4 | ..... | 2.55 | 1.7 | 1.55 | 1.65 | 1.65 |
| 18..... | 2.1 | 1.4 | 2.2 | 1.25 | 2.2 | 3.45 | ..... | 2.55 | 1.7 | 1.55 | 1.65 | 1.65 |
| 19..... | 4.2 | 1.4 | 2.1 | 1.25 | 2.3 | 3.5 | ..... | 2.6 | 1.65 | 1.55 | 1.65 | 1.65 |
| 20..... | 1.4 | 1.4 | 2.1 | 1.2 | 2.4 | 3.5 | ..... | 2.65 | 1.65 | 1.6 | 1.65 | 1.65 |
| 21..... | 1.5 | 1.4 | 1.95 | 1.2 | 2.4 | 3.55 | ..... | 2.6 | 1.6 | 1.6 | 1.6 | 1.6 |
| 22..... | 1.6 | 1.4 | 1.8 | 1.2 | 2.3 | 3.6 | ..... | 2.5 | 1.55 | 1.6 | 1.5 | 1.5 |
| 23..... | 1.7 | 1.4 | 1.7 | 1.2 | 2.3 | 3.7 | ..... | 2.45 | 1.5 | 1.55 | 1.45 | 1.45 |
| 24..... | 1.7 | 1.4 | 1.6 | 1.2 | 2.25 | 3.7 | ..... | 2.45 | 1.5 | 1.5 | 1.45 | 1.45 |
| 25..... | 1.6 | 1.35 | 1.55 | 1.15 | 2.1 | 3.8 | ..... | 2.45 | 1.5 | 1.5 | 1.5 | 1.5 |
| 26..... | 1.55 | 1.35 | 1.6 | 1.15 | 2.15 | 3.8 | ..... | 2.0 | 1.55 | 1.45 | 1.6 | 1.6 |
| 27..... | 1.5 | 1.35 | 1.5 | 1.15 | 2.0 | 3.6 | ..... | 2.0 | 1.55 | 1.45 | 1.7 | 1.7 |
| 28..... | 1.5 | 1.35 | 1.4 | 1.15 | 1.85 | 3.55 | ..... | 1.95 | 1.6 | 1.45 | 1.75 | 1.75 |
| 29..... | 1.55 | ..... | 1.4 | 1.2 | 1.8 | 3.4 | 2.85 | 1.9 | 1.6 | 1.45 | 1.8 | 1.8 |
| 30..... | 1.55 | ..... | 1.4 | 1.2 | 1.8 | 3.5 | 2.85 | 1.9 | 1.55 | 1.5 | 1.8 | 1.8 |
| 31..... | 1.55 | ..... | 1.5 | ..... | 1.8 | ..... | 2.8 | 1.9 | ..... | 1.55 | ..... | 1.55 |

Rating table for Rock Creek near Round Valley, Cal., from January 20, 1906, to December 31, 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1.00 | 12 | 1.60 | 40 | 2.20 | 83 | 2.80 | 131 | 3.40 | 179 |
| 1.10 | 15 | 1.70 | 47 | 2.30 | 91 | 2.90 | 133 | 3.50 | 188 |
| 1.20 | 19 | 1.80 | 54 | 2.40 | 99 | 3.00 | 147 | 3.60 | 197 |
| 1.30 | 23 | 1.90 | 61 | 2.50 | 107 | 3.10 | 155 | 3.70 | 206 |
| 1.40 | 28 | 2.00 | 68 | 2.60 | 115 | 3.20 | 163 | 3.80 | 215 |
| 1.50 | 34 | 2.10 | 75 | 2.70 | 123 | 3.30 | 171 | ..... | ..... |

NOTE.—This table is based on 3 discharge measurements made during 1906 and is not well defined. The table used January 1 to 19 gives a much smaller discharge at the same gage height.

Monthly discharge of Rock Creek near Round Valley, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|------------------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 200 | 17 | 38.8 | 2. |
| February..... | 37 | 25 | 29.7 | 1. |
| March..... | 99 | 23 | 45.7 | 2. |
| April..... | 37 | 17 | 24.6 | 1. |
| May..... | 99 | 19 | 54.2 | 3. |
| June..... | 215 | 50 | 145 | 8. |
| July..... | 167 | 131 | ^a 150 | 9. |
| August..... | 127 | 61 | 107 | 6. |
| September..... | 64 | 34 | 47.4 | 2. |
| October..... | 40 | 31 | 35.9 | 2. |
| November..... | 54 | 31 | 42.6 | 2. |
| December..... | 54 | 34 | 43.5 | 2. |
| The year..... | 215 | 17 | 63.7 | 46. |

^a Mean for seven days taken as mean for the month.

NOTE.—These values are fair.

PINE CREEK NEAR ROUND VALLEY, CAL.

This station was established August 3, 1903, by J. C. Clausen. It is located 150 feet below the wagon bridge on the road from Bishop to Long Valley and 100 feet above the mouth of the creek. The conditions and the bench marks are described in Water-Supply Paper

No. 177, page 55, where are given also references to publications that contain data for previous years.

On June 15, 1906, the gage was washed out. On August 23 a new gage was placed at the wagon bridge on the Long Valley road about 150 feet above the old gage. It consists of a $\frac{1}{4}$ by $1\frac{1}{2}$ inch steel rod fastened to the downstream side of the bridge, near the right bank, and is graduated to 0.05 of a foot. No reference was made to any bench mark.

This section at the bridge is very rough and rocky, but not subject to much change. During very high stages gagings can be made from the bridge, while at ordinary stages a wading section below the bridge is more satisfactory.

Discharge measurements of Pine Creek near Round Valley, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|------------------------|--------------|------------------|--------------|-----------------|
| | | <i>Fect.</i> | <i>Sq. ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> |
| January 8..... | F. R. S. Buttemer..... | 19 | 18 | 1.80 | 7.0 |
| January 14..... | do..... | 20 | 25 | 2.13 | 22 |
| August 23..... | Shuey and Hawley..... | 12 | 33 | 3.85 | 90 |
| August 27..... | R. S. Hawley..... | 24 | 26 | 3.75 | 92 |
| November 3..... | G. R. Shuey..... | 12 | 22 | 2.95 | 9.0 |
| November 30..... | do..... | 12 | 21 | 3.00 | 9.2 |

Daily gage height, in feet, of Pine Creek River near Round Valley, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|-------|------|-------|------|
| 1..... | 1.8 | 1.85 | 1.8 | 1.85 | 1.8 | 2.05 | ..... | 3.65 | 3.25 | 3.0 | 3.0 |
| 2..... | 1.8 | 1.85 | 1.8 | 1.8 | 1.8 | 2.0 | ..... | 3.67 | 3.25 | 3.0 | 3.0 |
| 3..... | 1.8 | 1.85 | 1.8 | 1.8 | 1.8 | 2.0 | ..... | 3.6 | 3.25 | 3.0 | 3.0 |
| 4..... | 1.8 | 1.85 | 1.8 | 1.8 | 1.85 | 2.0 | ..... | 3.6 | 3.25 | 3.0 | 3.0 |
| 5..... | 1.8 | 1.8 | 1.8 | 1.8 | 1.85 | 2.2 | ..... | 3.6 | 3.25 | 3.0 | 3.0 |
| 6..... | 1.8 | 1.8 | 1.8 | 1.9 | 1.8 | 2.4 | ..... | 3.6 | 3.2 | 3.0 | 3.0 |
| 7..... | 1.8 | 1.8 | 1.75 | 1.9 | 1.8 | 2.55 | ..... | 3.6 | 3.2 | 3.0 | 3.0 |
| 8..... | 1.8 | 1.8 | 1.75 | 1.8 | 1.8 | 2.6 | ..... | 3.6 | 3.15 | 2.9 | 3.0 |
| 9..... | 1.8 | 1.8 | 1.75 | 1.85 | 1.8 | 2.75 | ..... | 3.6 | 3.15 | 2.9 | 3.0 |
| 10..... | 1.85 | 1.8 | 1.75 | 1.8 | 1.8 | 2.9 | ..... | 3.6 | 3.15 | 2.9 | 3.0 |
| 11..... | 1.9 | 1.8 | 1.8 | 1.8 | 1.85 | 3.2 | ..... | 3.55 | 3.1 | 2.9 | 2.95 |
| 12..... | 1.9 | 1.85 | 2.0 | 1.85 | 1.85 | 3.25 | ..... | 3.55 | 3.05 | 2.9 | 2.95 |
| 13..... | 2.0 | 1.85 | 2.1 | 1.8 | 1.85 | 3.15 | ..... | 3.5 | 3.05 | 2.9 | 2.9 |
| 14..... | 2.25 | 1.85 | 2.2 | 1.8 | 1.85 | 3.5 | ..... | 3.45 | 3.05 | 2.9 | 2.9 |
| 15..... | 2.25 | 1.85 | 2.3 | 1.85 | 1.85 | ..... | ..... | 3.4 | 3.05 | 2.9 | 2.9 |
| 16..... | 2.25 | 1.85 | 2.2 | 1.85 | 1.85 | ..... | ..... | 3.4 | 3.05 | 2.9 | 2.9 |
| 17..... | 2.15 | 1.8 | 2.1 | 1.8 | 1.9 | ..... | ..... | 3.35 | 3.0 | 2.9 | 2.9 |
| 18..... | 2.1 | 1.8 | 2.1 | 1.8 | 1.95 | ..... | ..... | 3.35 | 3.0 | 2.9 | 2.9 |
| 19..... | 2.0 | 1.8 | 2.1 | 1.8 | 2.2 | ..... | ..... | 3.35 | 3.0 | 2.9 | 2.9 |
| 20..... | 1.95 | 1.8 | 2.1 | 1.8 | 2.1 | ..... | ..... | 3.35 | 3.0 | 2.9 | 2.95 |
| 21..... | 1.95 | 1.8 | 2.0 | 1.8 | 1.85 | ..... | ..... | 3.3 | 3.0 | 2.9 | 2.95 |
| 22..... | 1.95 | 1.8 | 1.95 | 1.8 | 1.85 | ..... | ..... | 3.25 | 3.0 | 2.95 | 2.95 |
| 23..... | 1.9 | 1.8 | 1.95 | 1.8 | 2.15 | ..... | 3.85 | 3.25 | 3.0 | 3.0 | 2.95 |
| 24..... | 1.9 | 1.8 | 1.9 | 1.8 | 2.3 | ..... | 3.85 | 3.25 | 3.0 | 3.0 | 2.95 |
| 25..... | 1.9 | 1.8 | 2.0 | 1.8 | 2.3 | ..... | 3.8 | 3.25 | 3.0 | 3.0 | 2.95 |
| 26..... | 1.85 | 1.8 | 1.95 | 1.8 | 2.3 | ..... | 3.8 | 3.25 | 3.0 | 3.0 | 2.95 |
| 27..... | 1.85 | 1.8 | 1.9 | 1.8 | 2.2 | ..... | 3.8 | 3.25 | 3.0 | 3.0 | 2.95 |
| 28..... | 1.85 | 1.8 | 1.85 | 1.8 | 2.2 | ..... | 3.8 | 3.25 | 3.0 | 3.0 | 2.95 |
| 29..... | 1.85 | ..... | 1.8 | 1.8 | 2.15 | ..... | 3.8 | 3.25 | 3.0 | 3.0 | 2.95 |
| 30..... | 1.85 | ..... | 1.8 | 1.85 | 2.15 | ..... | 3.75 | 3.25 | 3.0 | 3.0 | 2.95 |
| 31..... | 1.85 | ..... | 1.9 | ..... | 2.1 | ..... | 3.7 | ..... | 3.0 | ..... | 2.95 |

*Rating tables for Pine Creek near Round Valley, Cal.*JANUARY 1 TO JUNE 14, 1906.^a

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> |
| 1.70 | 4 | 2.10 | 23 | 2.50 | 45 | 2.90 | 75 | 3.30 | 119 |
| 1.80 | 8 | 2.20 | 28 | 2.60 | 52 | 3.00 | 85 | 3.40 | 133 |
| 1.90 | 13 | 2.30 | 33 | 2.70 | 59 | 3.10 | 95 | 3.50 | 149 |
| 2.00 | 18 | 2.40 | 39 | 2.80 | 67 | 3.20 | 106 | | |

AUGUST 24 TO DECEMBER 31, 1906.^b

| | | | | | | | | | |
|------|----|------|----|------|----|------|----|------|-----|
| 2.90 | 5 | 3.20 | 24 | 3.40 | 42 | 3.60 | 64 | 3.80 | 89 |
| 3.00 | 10 | 3.30 | 33 | 3.50 | 53 | 3.70 | 76 | 3.90 | 103 |
| 3.10 | 16 | | | | | | | | |

^a This table is based on discharge measurements made during 1903-1906 and is well defined by gage height 3 feet.^b This table is based on 4 discharge measurements made during 1906 and is not well defined.*Monthly discharge of Pine Creek near Round Valley, Cal., for 1906.*

| Month. | Discharge in second-feet. | | | Total acre-ft. |
|----------------|---------------------------|----------|-------|----------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 30 | 8 | 13.7 | |
| February..... | 10 | 8 | 8.6 | |
| March..... | 33 | 6 | 14.5 | |
| April..... | 13 | 8 | 8.7 | |
| May..... | 33 | 8 | 16.0 | |
| June..... | | | 130 | |
| July..... | | | 160 | |
| August..... | | | 105 | |
| September..... | 70 | 28 | 46.2 | |
| October..... | 28 | 10 | 15.5 | |
| November..... | 10 | 5 | 7.6 | |
| December..... | 10 | 5 | 7.5 | |
| The year..... | | 5 | 44.4 | 3 |

NOTE.—Monthly means for June, July, and August estimated, and are only approximate; value remainder of 1906 fair.

BISHOP CREEK NEAR BISHOP, CAL.

This station was established August 10, 1903, at the wagon bridge on the Bishop road, about $4\frac{1}{4}$ miles from Bishop and about 2 miles from the point where the creek leaves the canyon. The conditions and the bench marks are described in Water-Supply Paper No. 1, page 62, where are given also references to publications that contain data for previous years.

Discharge measurements of Bishop Creek near Bishop, Cal., for 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Dis-charge. |
|-----------------------------|-----------------------|--------------|------------------|--------------|-------------|
| | | <i>Fect.</i> | <i>Sq. ft.</i> | <i>Fect.</i> | <i>Sec.</i> |
| January 1 ^a | F. R. S. Buttmer..... | 16 | 28 | 1.95 | |
| January 16.... |do..... | 16 | 24 | 1.76 | |
| January 24.... |do..... | 16 | 27 | 1.83 | |
| August 24.... | Shuey and Hawley..... | 16 | 41 | 3.10 | |
| November 5.... | G. R. Shuey..... | 16 | 24 | 1.71 | |
| December 3.... |do..... | 16 | 26 | 1.90 | |

^a Channel obstructed by rocks at time of measurement.

Daily gage height, in feet, of Bishop Creek near Bishop, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1..... | 1.95 | 1.6 | 1.6 | 1.8 | 2.5 | 2.45 | 4.75 | 4.0 | 2.8 | 2.2 | 1.5 | 1.85 |
| 2..... | 1.85 | 1.65 | 1.65 | 1.7 | 2.4 | 2.4 | 4.9 | 3.9 | 2.75 | 2.2 | 1.45 | 1.85 |
| 3..... | 1.85 | 1.6 | 1.6 | 1.8 | 2.45 | 2.45 | 5.2 | 3.8 | 2.7 | 2.15 | 1.35 | 1.9 |
| 4..... | 1.6 | 1.65 | 1.65 | 1.8 | 2.5 | 2.5 | 5.5 | 3.7 | 2.7 | 2.2 | 1.4 | 1.95 |
| 5..... | 1.6 | 1.6 | 1.6 | 1.8 | 2.55 | 2.55 | 5.3 | 3.75 | 2.65 | 2.2 | 1.4 | 1.95 |
| 6..... | 1.6 | 1.65 | 1.65 | 1.9 | 2.6 | 2.5 | 5.6 | 3.75 | 2.6 | 2.1 | 1.45 | 1.9 |
| 7..... | 1.5 | 1.6 | 1.65 | 1.95 | 2.65 | 2.6 | (a) | 3.8 | 2.65 | 2.15 | 1.45 | 1.85 |
| 8..... | 1.5 | 1.6 | 1.7 | 1.9 | 2.75 | 2.75 | | 3.7 | 2.65 | 2.2 | 1.4 | 1.9 |
| 9..... | 1.5 | 1.6 | 1.7 | 1.9 | 2.9 | 2.9 | | 3.65 | 2.6 | 2.1 | 1.45 | 1.85 |
| 10..... | 1.55 | 1.55 | 1.7 | 1.9 | 2.95 | 3.7 | | 3.75 | 2.65 | 2.0 | 1.4 | 1.9 |
| 11..... | 1.65 | 1.6 | 1.7 | 1.75 | 2.85 | 3.9 | | 3.8 | 2.6 | 2.0 | 1.5 | 2.0 |
| 12..... | 1.6 | 1.55 | 1.8 | 1.75 | 2.75 | 3.75 | | 3.7 | 2.6 | 1.95 | 1.65 | 1.95 |
| 13..... | 1.5 | 1.6 | 1.5 | 1.7 | 2.9 | 3.65 | | 3.65 | 2.5 | 1.9 | 1.65 | 2.0 |
| 14..... | 1.5 | 1.6 | 2.0 | 1.6 | 2.85 | 3.6 | | 3.65 | 2.5 | 1.9 | 1.7 | 2.0 |
| 15..... | 1.75 | 1.6 | 2.0 | 1.7 | 2.8 | 3.7 | 5.45 | 3.7 | 2.4 | 1.8 | 1.7 | 1.95 |
| 16..... | 1.8 | 1.6 | 2.2 | 1.8 | 2.8 | 3.85 | 5.4 | 3.7 | 2.45 | 1.75 | 1.65 | 2.0 |
| 17..... | 1.9 | 1.6 | 2.2 | 1.8 | 2.85 | 3.8 | 5.5 | 3.75 | 2.4 | 1.75 | 1.65 | 1.95 |
| 18..... | 2.0 | 1.6 | 2.2 | 1.85 | 2.9 | 3.9 | 5.4 | 3.7 | 2.4 | 1.7 | 1.65 | 2.0 |
| 19..... | 2.1 | 1.6 | 2.1 | 1.85 | 2.95 | 3.9 | 5.3 | 3.7 | 2.35 | 1.7 | 1.7 | 1.9 |
| 20..... | 2.1 | 1.6 | 2.1 | 1.9 | 3.0 | 4.2 | 5.1 | 3.65 | 2.4 | 1.75 | 1.65 | 1.95 |
| 21..... | 2.3 | 1.65 | 2.0 | 1.95 | 2.95 | 4.5 | 5.0 | 3.6 | 2.3 | 1.75 | 1.65 | 1.9 |
| 22..... | 2.15 | 1.7 | 2.0 | 2.0 | 2.8 | 4.7 | 5.0 | 3.7 | 2.25 | 1.75 | 1.6 | 1.95 |
| 23..... | 2.0 | 1.6 | 2.0 | 2.0 | 2.85 | 4.75 | 5.3 | 3.65 | 2.2 | 1.75 | 1.6 | 1.9 |
| 24..... | 1.9 | 1.65 | 1.9 | 1.9 | 2.75 | 4.8 | 5.0 | 3.65 | 2.3 | 1.8 | 1.65 | 1.9 |
| 25..... | 1.85 | 1.85 | 1.9 | 2.0 | 2.8 | 4.9 | 5.4 | 3.6 | 2.2 | 1.75 | 1.65 | 1.9 |
| 26..... | 1.8 | 1.6 | 1.95 | 1.95 | 2.75 | 4.95 | 5.1 | 3.55 | 2.2 | 1.7 | 1.7 | 1.95 |
| 27..... | 1.7 | 1.65 | 1.9 | 2.55 | 2.7 | 4.5 | 5.1 | 3.4 | 2.2 | 1.7 | 1.85 | 2.0 |
| 28..... | 1.75 | 1.65 | 1.9 | 2.55 | 2.65 | 4.35 | 5.3 | 3.35 | 2.25 | 1.65 | 1.8 | 2.0 |
| 29..... | 1.65 | | 1.85 | 2.55 | 2.6 | 4.2 | 4.4 | 2.8 | 2.2 | 1.6 | 1.8 | 1.95 |
| 30..... | 1.6 | | 1.9 | 2.5 | 2.5 | 4.4 | 4.4 | 2.85 | 2.2 | 1.55 | 1.8 | 1.95 |
| 31..... | 1.65 | | 1.85 | | 2.6 | | 4.3 | 2.85 | | 1.55 | | 2.0 |

^a Station discontinued; operation resumed July 15.

Rating table for Bishop Creek near Bishop, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1.40 | 7 | 2.20 | 84 | 3.00 | 220 | 3.80 | 393 | 4.60 | 582 |
| 1.50 | 10 | 2.30 | 98 | 3.10 | 240 | 3.90 | 416 | 4.70 | 606 |
| 1.60 | 14 | 2.40 | 114 | 3.20 | 261 | 4.00 | 439 | 4.80 | 630 |
| 1.70 | 24 | 2.50 | 130 | 3.30 | 282 | 4.10 | 462 | 4.90 | 654 |
| 1.80 | 35 | 2.60 | 147 | 3.40 | 303 | 4.20 | 486 | 5.00 | 678 |
| 1.90 | 46 | 2.70 | 164 | 3.50 | 325 | 4.30 | 510 | 5.20 | 726 |
| 2.00 | 58 | 2.80 | 182 | 3.60 | 347 | 4.40 | 534 | 5.40 | 774 |
| 2.10 | 70 | 2.90 | 201 | 3.70 | 370 | 4.50 | 558 | 5.60 | 822 |

NOTE. - This table is based on 6 discharge measurements made during 1906, and is not well defined.

Monthly discharge of Bishop Creek near Bishop, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|------------------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 98 | 10 | 33.4 | 2,050 |
| February..... | 40 | 12 | 16.4 | 911 |
| March..... | 84 | 10 | 42.0 | 2,580 |
| April..... | 138 | 14 | 52.8 | 3,140 |
| May..... | 220 | 114 | 172 | 10,600 |
| June..... | 666 | 114 | 382 | 22,700 |
| July..... | 822 | 510 | ^a 706 | 43,400 |
| August..... | 439 | 182 | 350 | 21,500 |
| September..... | 182 | 84 | 124 | 7,380 |
| October..... | 84 | 12 | 45.3 | 2,780 |
| November..... | 40 | 6 | 17.5 | 1,040 |
| December..... | 58 | 35 | 50.0 | 3,070 |
| The year..... | 822 | 6 | 166 | 121,000 |

^a Mean of 23 days taken as the mean for the month.

NOTE. - These values are fair.

BIG PINE CREEK NEAR BIG PINE, CAL.

This station was established December 5, 1903, by R. S. Hawley. It is located 3 miles southwest of Big Pine, Cal., at a point where the creek leaves the foothills. The conditions and the bench mark are described in Water-Supply Paper No. 177, page 78, where are given also references to publications that contain data for previous years. No gage-height record was kept during 1906.

Discharge measurements of Big Pine Creek near Big Pine, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|------------------------|--------------|------------------|--------------|---------------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec. cu. ft.</i> |
| January 2..... | F. R. S. Buttemer..... | 14 | 14 | 2.25 | |
| January 17..... | do..... | 14 | 14 | 2.32 | |
| January 24..... | do..... | 14 | 10 | 1.98 | |
| August 24..... | Hawley and Shuey..... | 14 | 26 | (a) | |
| November 1..... | G. R. Shuey..... | 8 | 12 | (a) | |
| December 6..... | do..... | 9 | 13 | (a) | |
| December 16..... | do..... | 8 | 13 | (a) | |

a Gage out.

BIRCH CREEK NEAR TINEMAHA, CAL.

This station, originally established June 14, 1905, was reestablished on December 7, 1906. It is located about 8 miles south of Big Pine and 1 mile west of Fish Springs schoolhouse and about 500 feet west of Peterson's ranch house. The conditions at this station are described in Water-Supply Paper No. 177, page 80. The gage is a vertical staff nailed to a post, and is graduated to feet and tenths. The bench mark is two large spikes driven in the base of a 4-inch birch tree about 50 feet northeast of the rod; elevation 0.52 feet above the zero of the gage.

Discharge measurements of Birch Creek near Tinemaha, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-----------------|------------------|--------------|------------------|--------------|---------------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec. cu. ft.</i> |
| January 11..... | G. R. Shuey..... | | | 0.52 | |
| January 29..... | do..... | | | | |
| March 8..... | do..... | | | | |
| December 7..... | do..... | 5 | 4.2 | 0.35 | |

a By new gage.

Daily gage height, in feet, of Birch Creek near Tinemaha, Cal., for 1906.

| Day. | Dec. | Day. | Dec. | Day. | Dec. | Day. | Dec. |
|---------|------|---------|------|---------|------|---------|------|
| 7..... | 0.35 | 14..... | 0.4 | 21..... | 0.3 | 28..... | |
| 8..... | .35 | 15..... | .35 | 22..... | .3 | 29..... | |
| 9..... | .3 | 16..... | .3 | 23..... | .3 | 30..... | |
| 10..... | .4 | 17..... | .3 | 24..... | .3 | 31..... | |
| 11..... | .4 | 18..... | .3 | 25..... | .35 | | |
| 12..... | .4 | 19..... | .3 | 26..... | .45 | | |
| 13..... | .4 | 20..... | .3 | 27..... | .4 | | |

TINEMAHA CREEK NEAR TINEMAHA, CAL.

Tinemaha Creek is tributary to Owens River from the eastern slope of the Sierra Nevada.

The station was established December 7, 1906. It is located about 500 feet south of the Peterson ranch house, about 8 miles south of Big Pine, and about 1 mile west of Fish Springs schoolhouse.

The channel is straight for about 40 feet above and for 30 feet below the measuring section, and the velocity is moderate at ordinary stages. Both banks are steep, about 5 or 6 feet high, and covered with a scrubby growth. The bottom is composed of clean gravel and is not likely to shift. There is one channel at all stages, and at low water the width is about 10 feet and the depth 0.5 feet. The section is good and gagings are made by wading.

The gage is a vertical staff, graduated to feet and tenths, and nailed to a post.

The following measurement was made December 7, 1906:

Width, 7 feet; area, 4 square feet; gage height, 0.50 foot; discharge, 5.9 second-feet.

Daily gage height, in feet, of Tinemaha Creek near Tinemaha, Cal., for 1906.

| Day. | Dec. | Day. | Dec. | Day. | Dec. | Day. | Dec. |
|---------|------|---------|------|---------|------|---------|------|
| 7..... | 0.5 | 14..... | 0.5 | 21..... | 0.4 | 28..... | 0.5 |
| 8..... | .5 | 15..... | .5 | 22..... | .5 | 29..... | .5 |
| 9..... | .5 | 16..... | .45 | 23..... | .5 | 30..... | .5 |
| 10..... | .5 | 17..... | .45 | 24..... | .5 | 31..... | .5 |
| 11..... | .5 | 18..... | .4 | 25..... | .5 | | |
| 12..... | .5 | 19..... | .4 | 26..... | .55 | | |
| 13..... | .5 | 20..... | .4 | 27..... | .5 | | |

TABOOSE CREEK NEAR TIBBETTS, CAL.

Taboose Creek is tributary to Owens River from the eastern slope of Sierra Nevada.

The station was not established regularly until August 20, 1906, though discharge measurements were made throughout the year. It is located about 15 miles north of Independence, 2 miles northwest of Tibbetts railway station, and about one-half mile west of the crossing on the lower main highway.

The channel is straight for about 50 feet above and 50 feet below the station, and the velocity is moderate. Both banks are rather steep and 3 to 4 feet high and are not likely to overflow. The bed and banks are sandy, with little vegetation, and the channel is subject to slight change. At low stages the stream is about 10 feet wide and 0.5 feet deep.

Discharge measurements are made from a board used as a foot-bridge.

The gage is a vertical staff, about 3.5 feet long, graduated to inches and tenths, and nailed securely to a post driven in the bank. The bench mark is a spike driven in the base of a cottonwood tree 20 feet south of gage; elevation, 3.75 feet above the zero of the gage.

Discharge measurements of Taboose Creek near Tibbetts, Cal., by G. R. Shuey in 1906.

| Date. | Width. | Area of section. | Gage height. | Discharge. | Date. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|--------------|------------------|--------------|-----------------|-------------------|--------------|------------------|--------------|-----------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| January 18..... | | | | 3.6 | May 23..... | 7.8 | 7.4 | | |
| February 21..... | | | | 2.7 | June 1..... | 7.8 | 5.9 | | |
| March 20..... | | | | 3.6 | June 11..... | 7.0 | 7.8 | | |
| March 27..... | | | | 3.5 | July 2..... | 8.0 | 10 | | |
| April 6..... | | | | 3.4 | July 7..... | 10 | 14 | | |
| April 12..... | 7.0 | 3.2 | | 4.2 | July 14..... | 10 | 15 | | |
| April 19..... | | | | 8.0 | July 27..... | 8.5 | 12 | | |
| April 24..... | | | | 8.4 | August 2 a..... | 6.0 | 6.9 | 2.35 | |
| May 2..... | 7.4 | 4.5 | | 6.8 | October 8 a..... | 3.7 | 1.9 | 1.80 | |
| May 8..... | 8.0 | 7.1 | | 12 | December 8 a..... | 4.0 | 1.8 | 1.65 | |
| May 16..... | 7.8 | 6.9 | | 12 | | | | | |

^a Measured at regular station.

Daily gage height, in feet, of Taboose Creek near Tibbetts, Cal., for 1906.

| Day. | Aug. | Sept. | Oct. | Nov. | Dec. | Day. | Aug. | Sept. | Oct. | Nov. |
|---------|------|-------|------|------|------|---------|------|-------|------|------|
| 1..... | | 2.1 | 1.85 | | 1.75 | 17..... | | 2.25 | 1.81 | 1.75 |
| 2..... | | 2.1 | 1.85 | | | 18..... | | 2.28 | | |
| 3..... | | 2.1 | 1.85 | 1.7 | 1.7 | 19..... | 2.30 | 2.25 | | 1.75 |
| 4..... | | 2.2 | 1.85 | | | 20..... | 2.32 | 2.15 | 1.80 | |
| 5..... | | 2.2 | 1.85 | 1.7 | 1.7 | 21..... | 2.35 | 2.1 | | 1.75 |
| 6..... | | 2.18 | 1.84 | | | 22..... | 2.30 | 2.05 | | |
| 7..... | | 2.2 | | 1.8 | 1.65 | 23..... | 2.25 | 2.07 | 1.80 | |
| 8..... | | 2.18 | 1.80 | | 1.65 | 24..... | | 1.95 | | 1.75 |
| 9..... | | 2.2 | 1.82 | | | 25..... | 2.15 | 1.9 | 1.80 | |
| 10..... | | 2.2 | | 1.75 | | 26..... | 2.1 | 1.88 | | |
| 11..... | | 2.2 | | | 1.65 | 27..... | 2.1 | 1.9 | 1.8 | 1.75 |
| 12..... | | 2.2 | | | | 28..... | 2.1 | 1.9 | | |
| 13..... | | 2.2 | 1.82 | 1.7 | 1.65 | 29..... | 2.1 | 1.88 | 1.8 | 1.75 |
| 14..... | | 2.25 | | | | 30..... | 2.1 | 1.85 | | |
| 15..... | | 2.25 | 1.82 | 1.7 | 1.65 | 31..... | 2.1 | | 1.78 | |
| 16..... | | 2.26 | | | | | | | | |

Monthly discharge of Taboose Creek near Tibbetts, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total acre- |
|----------------|---------------------------|----------|-------|-------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 4.0 | 3.3 | 3.7 | |
| February..... | 3.0 | 2.7 | 2.9 | |
| March..... | 3.6 | 3.0 | 3.3 | |
| April..... | 8.4 | 3.4 | 5.8 | |
| May..... | 12 | 6.8 | 10.4 | |
| June..... | 28 | 9.0 | 21.8 | |
| July..... | 56 | 29 | 46.3 | |
| August..... | 40 | 15 | 25.7 | |
| September..... | 21 | 5.6 | 15.0 | |
| October..... | 5.6 | 3.2 | 3.7 | |
| November..... | 4.0 | 3.0 | 3.6 | |
| December..... | 4.0 | 3.0 | 3.5 | |
| The year..... | 56 | 3.0 | 12.1 | |

NOTE.—Daily discharge prior to August 19 was obtained by interpolation between measurements. Values are approximate.

GOODALE CREEK NEAR TIBBETTS, CAL.

Goodale Creek is tributary to Owens River from the eastern slope of the Sierra Nevada.

The station was established September 20, 1906. It is located where the stream leaves the foothills, about 13 miles north of Independence, 4 miles west of Tibbetts railway station, and one-fourth mile west of the upper road crossing.

The channel is straight for 20 feet above and 15 feet below the measuring section, and the current is swift at all times. Both banks are low, clean, and sandy, but not likely to change materially. There is but one channel at all stages and discharge measurements are made from a plank used as a footbridge. At low water the stream is about 8 feet wide and nearly a foot deep.

The gage is a vertical staff nailed securely to a post driven in the bank. The reference bench mark is the top of a piece of steel driven in the ground about 5 feet south of gage and witnessed by a guard stake; elevation, 2.10 feet above the zero of the gage.

Discharge measurements of Goodale Creek near Tibbetts, Cal., by G. R. Shuey, in 1906.

| Date. | Width. | Area of section. | Gage height. | Dis-charge. | Date. | Width. | Area of section. | Gage height. | Dis-charge. |
|----------------------------|--------------|------------------|--------------|-----------------|-------------------------------|--------------|------------------|--------------|-----------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| April 12..... | 4.0 | 1.8 | ..... | 2.6 | June 19 ^a..... | ..... | ..... | ..... | 12 |
| April 24..... | ..... | ..... | ..... | 4.2 | July 2 ^a..... | ..... | ..... | ..... | 17 |
| May 2..... | 4.0 | 1.8 | ..... | 2.5 | July 7 ^a..... | ..... | ..... | ..... | 27 |
| May 9..... | 4.7 | 2.9 | ..... | 7.4 | July 14 ^a..... | ..... | ..... | ..... | 27 |
| May 16..... | 4.7 | 2.9 | ..... | 7.4 | July 27 ^a | 4.4 | 4.1 | ..... | 8.7 |
| May 23..... | 5.0 | 3.5 | ..... | 7.5 | October 31 ^b | 5.6 | 3.4 | 0.60 | 5.4 |
| June 1..... | 4.7 | 2.8 | ..... | 4.9 | December 8 ^b | 6.0 | 3.6 | .60 | 4.6 |
| June 11 ^a..... | ..... | ..... | ..... | 11 | | | | | |

^a At upper road crossing.

^b At regular station.

Daily gage height, in feet, of Goodale Creek near Tibbetts, Cal., for 1906.

| Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. |
|---------|-------|-------|-------|---------|-------|-------|-------|---------|-------|-------|-------|
| 1..... | 0.68 | ..... | 0.60 | 12..... | ..... | ..... | ..... | 23..... | 0.62 | ..... | ..... |
| 2..... | ..... | ..... | ..... | 13..... | 0.60 | 0.60 | 0.55 | 24..... | ..... | 0.60 | 0.50 |
| 3..... | .68 | 0.50 | .60 | 14..... | ..... | ..... | ..... | 25..... | .60 | ..... | ..... |
| 4..... | ..... | ..... | ..... | 15..... | .60 | .60 | .55 | 26..... | ..... | ..... | .50 |
| 5..... | ..... | .50 | .60 | 16..... | ..... | ..... | ..... | 27..... | .60 | .60 | ..... |
| 6..... | .65 | ..... | ..... | 17..... | .62 | .65 | ..... | 28..... | ..... | ..... | ..... |
| 7..... | ..... | .60 | .55 | 18..... | ..... | .50 | ..... | 29..... | .60 | .60 | .50 |
| 8..... | ..... | ..... | .60 | 19..... | ..... | .65 | ..... | 30..... | ..... | ..... | ..... |
| 9..... | .62 | ..... | ..... | 20..... | .60 | .50 | ..... | 31..... | .60 | ..... | ..... |
| 10..... | ..... | .55 | ..... | 21..... | ..... | .65 | ..... |  |  |  |  |
| 11..... | .61 | ..... | .55 | 22..... | ..... | .50 | ..... |  |  |  |  |

Monthly discharge of Goodale Creek near Tibbetts, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total acre-ft. |
|----------------|---------------------------|----------|-------|-------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | | | | ^a 2.0 |
| February..... | | | | ^a 1.4 |
| March..... | | | | ^a 1.0 |
| April..... | 4.2 | 2.6 | | 3.5 |
| May..... | 7.5 | 2.5 | | 6.3 |
| June..... | 16 | 4.9 | | 11.2 |
| July..... | 27 | 6.8 | | 19.0 |
| August..... | 6.6 | 6.2 | | 6.4 |
| September..... | 6.3 | 4.8 | | 5.9 |
| October..... | 6.3 | 5.4 | | 5.6 |
| November..... | 5.6 | 5.0 | | 5.3 |
| December..... | 4.6 | 4.0 | | 4.3 |
| The year..... | 27 | | 6.0 | |

^a Estimated.

NOTE.—The daily discharge from April to September was obtained by interpolation between measurements. Values are approximate.

DIVISION CREEK NEAR INDEPENDENCE, CAL.

Division Creek is tributary to Owens River from the eastern slope of Sierra Nevada, and measurements are made near where it leaves the foothills and enters the valley.

The station was established January 10, 1906, but no gage record was kept until September. It is located about 10 miles north of Independence on the upper road crossing, about 1½ miles west of Ricky ranch house.

The channel is straight for about 10 feet above and 20 feet below the station. Both banks are low, and composed of gravel covered with weeds which extend a foot or two into the water; they are subject to overflow. The bed is also of gravel, but is clean and likely to change. The velocity is moderate and there is one channel at all stages. At low water the stream is 6 or 8 feet wide and about a foot deep. Discharge measurements are made from a plank used as a footbridge.

The gage is a vertical staff driven in the ground and nailed to a post. The bench mark is the top of a steel gage driven in the ground near a willow tree 20 feet west of gage; elevation, 4.45 feet above datum of gage.

Discharge measurements of Division Creek near Independence, Cal., by G. R. Shucy, in 1906.

| Date. | Width. | Area of section. | Gage height. | Dis-charge. | Date. | Width. | Area of section. | Gage height. | Dis-charge. |
|------------------|--------------|------------------|--------------|-----------------|------------------------------|--------------|------------------|--------------|-----------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| January 18..... | | | | 8.1 | May 16..... | 6.5 | 3.3 | 2.26 | 7.5 |
| February 15..... | | | 2.23 | 5.1 | May 23..... | 6.5 | 3.3 | 2.26 | 7.5 |
| February 21..... | | | 2.23 | 5.1 | June 1..... | 6.2 | 3.1 | 2.25 | 6.0 |
| March 3..... | | | | 5.0 | June 11..... | 6.1 | 3.3 | 2.28 | 7.7 |
| March 15..... | | | | 9.0 | June 19..... | 6.1 | 3.7 | 2.30 | 9.2 |
| March 20..... | | | | 5.4 | June 25..... | 6.3 | 4.3 | 2.35 | 9.9 |
| March 27..... | | | | 4.7 | July 2..... | 6.3 | 4.2 | 2.40 | 11 |
| April 6..... | | | | 4.9 | July 7..... | 6.6 | 5.0 | 2.45 | 13 |
| April 12..... | | 3.0 | 2.25 | 5.4 | July 14..... | 7.0 | 6.7 | 2.65 | 17 |
| April 18..... | | | 2.30 | 6.5 | July 27..... | 6.5 | 7.1 | 2.95 | 22 |
| April 24..... | | | | 7.4 | August 18 ^a | 4.0 | 4.0 | 1.10 | 12 |
| May 2..... | 6.4 | 3.0 | 2.25 | 6.6 | October 31..... | 5.5 | 4.8 | 2.60 | 14 |
| May 9..... | 6.6 | 3.3 | 2.30 | 7.9 | December 8..... | 5.5 | 4.2 | 2.55 | 11 |

^a Measured at ranch house.

Daily gage height, in feet, of Division Creek near Independence, Cal., for 1906.

| Day. | Aug. | Sept. | Oct. | Nov. | Dec. | Day. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|------|------|---------|------|-------|------|------|------|
| 1..... | | 1.1 | | | | 17..... | | | | | |
| 2..... | | 1.1 | | | 2.5 | 18..... | 1.1 | | | 2.55 | |
| 3..... | | 1.1 | | | | 19..... | 1.1 | | | | |
| 4..... | | 1.1 | | 2.6 | | 20..... | 1.1 | | | | |
| 5..... | | 1.1 | | | | 21..... | 1.1 | | 2.6 | | |
| 6..... | | 1.1 | | | | 22..... | 1.1 | | | | |
| 7..... | | 1.1 | 2.65 | | | 23..... | 1.1 | 2.65 | | | 2.5 |
| 8..... | | 1.1 | | | | 24..... | 1.1 | | | | |
| 9..... | | 1.1 | | 2.55 | | 25..... | 1.1 | | | 2.4 | |
| 10..... | | 1.1 | | | | 26..... | 1.1 | | | | |
| 11..... | | 1.1 | | 2.6 | | 27..... | 1.1 | | | | |
| 12..... | | 1.1 | | | | 28..... | 1.1 | | 2.6 | | |
| 13..... | | 1.1 | | | | 29..... | 1.1 | | | | |
| 14..... | | 1.1 | 2.62 | | | 30..... | 1.1 | 2.65 | | | 2.5 |
| 15..... | | 1.1 | | | | 31..... | 1.1 | | 2.6 | | |
| 16..... | | 1.1 | | 2.5 | | | | | | | |

NOTE.—From August 18 to September 18 the gage record was kept at the ranch house.

Monthly discharge of Division Creek near Independence, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|-------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 8.1 | 5.3 | 6.7 | 412 |
| February..... | 5.3 | 5.0 | 5.1 | 283 |
| March..... | 9.0 | 4.7 | 6.1 | 375 |
| April..... | 7.4 | 4.8 | 6.0 | 357 |
| May..... | 7.9 | 6.1 | 7.3 | 449 |
| June..... | 10 | 6.0 | 8.4 | 500 |
| July..... | 22 | 10 | 17.2 | 1,060 |
| August..... | 20 | 12 | 14.3 | 879 |
| September..... | 12 | 10 | 10.9 | 649 |
| October..... | 14 | 10 | 12.6 | 775 |
| November..... | 14 | 8.0 | 11.5 | 684 |
| December..... | 11 | 10 | 10.1 | 621 |
| The year | 22 | 4.7 | 9.7 | 7,040 |

NOTE.—The daily discharge prior to August 18 was obtained by interpolation between measurements. Values are approximate.

EIGHTMILE CREEK NEAR INDEPENDENCE, CAL.

Eightmile Creek is tributary to Owens River from the eastern slope of Sierra Nevada; measurements are made near where the stream leaves the foothills and enters the valley.

The station was established September 20, 1906. It is located on the upper road crossing about 8 miles north of Independence and about 300 feet beyond the Eightmile ranch.

The channel is straight for about 15 feet above and 10 feet below the station. The bottom is of gravel, not likely to shift, but both banks are very low and liable to overflow. The velocity is high and there is only one channel at low water, but at high water there are two or three. At low water the stream has a width of about 6 feet and a depth of 0.5 foot. Measurements are made from a plank used as a footbridge.

The gage is a staff graduated into feet and tenths and nailed to a post. The bench mark is a spike driven in fence post 10 feet east of the gage; elevation, 1.49 feet above the zero of the gage. During 1906 no gage-height record was kept.

Discharge measurements of Eightmile Creek near Independence, Cal., by G. R. Shoup, 1906.

| Date. | Width. | Area of section. | Discharge. | Date. | Width. | Area of section. | Discharge. |
|------------------|--------------|------------------|-----------------|-------------------------------|--------------|------------------|-----------------|
| | <i>Feet.</i> | <i>Sq. Ft.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Sec. ft.</i> |
| February 15..... | | | 2.7 | May 23..... | | | |
| March 3..... | | | 2.5 | June 1..... | 4.0 | 1.8 | |
| March 15..... | | | 5.0 | June 19..... | 4.0 | 2.0 | |
| March 27..... | | | 3.4 | June 25..... | 4.0 | 2.6 | |
| April 6..... | | | 3.0 | July 7..... | | | |
| April 18..... | | | 3.4 | July 27..... | 9.5 | 5.1 | |
| April 24..... | 4.0 | 1.6 | 4.1 | August 18..... | 3.2 | 3.2 | |
| May 2..... | 4.0 | 1.6 | 3.7 | October 31 ^a | 6.0 | 2.8 | |
| May 9..... | 4.0 | 1.6 | 4.5 | December 8..... | 8.0 | 3.5 | |
| May 16..... | 4.0 | 1.6 | 4.4 | | | | |

^a Gage height 0.40 foot at regular station.

Monthly discharge of Eightmile Creek near Independence, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total acre- |
|----------------|---------------------------|----------|------------------|-------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | | | ^a 3.0 | |
| February..... | 2.8 | 2.5 | 2.7 | |
| March..... | 5.0 | 2.5 | 3.7 | |
| April..... | 4.1 | 3.0 | 3.4 | |
| May..... | 4.6 | 3.7 | 4.3 | |
| June..... | 13 | 4.6 | 7.6 | |
| July..... | 20 | 13 | 16.3 | |
| August..... | 14 | 11 | 12.6 | |
| September..... | 11 | 8.3 | 9.8 | |
| October..... | 8.2 | 5.0 | 6.7 | |
| November..... | | | ^a 5.0 | |
| December..... | | | ^a 5.0 | |
| The year..... | | | 6.7 | |

^a Estimated.

NOTE.—The daily discharge, February to October, was obtained by interpolation between measurements. Values are approximate.

OAK CREEK NEAR INDEPENDENCE, CAL.

This station was established June 15, 1905, about 1 mile west of old Fort Independence. The conditions and the bench marks are described in Water-Supply Paper No. 177, page 83.

A new station was established October 1, 1906. It is located at Bell's flour mill, about 3 miles northwest of Independence, and just above the division boxes which divide the stream into three parts.

The channel at the point of measurement is a flume 12 feet wide and 1 foot deep, with a gravel bottom which has to be cleaned out after high water. At very high stages the stream divides above the flume and forms two channels. Measurements are made by wading or from a plank used as a footbridge.

The gage is a staff nailed to a post on the north side of the stream.

Discharge measurements of Oak Creek near Independence, Cal., by G. R. Shucy, in 1906.

| Date. | Width. | Area of section. | Gage height. | Dis-charge. | Date. | Width. | Area of section. | Gage height. | Dis-charge. |
|------------------|--------------|------------------|--------------|-----------------|----------------------------|--------------|------------------|--------------|-----------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| February 14..... | | | 0.20 | 7.7 | May 23..... | 5 | 7.7 | 1.08 | 34 |
| February 21..... | | | .20 | 7.1 | June 3..... | 5 | 7.7 | 1.08 | 36 |
| March 3..... | | | | 7.5 | June 16 ^a | | | | 60 |
| March 10..... | | | | 7.5 | June 23..... | 18 | 21 | | 93 |
| March 20..... | | | | 7.5 | July 7..... | 18 | 26 | | 162 |
| March 27..... | | | | 8.9 | July 14..... | 17 | 24 | | 143 |
| April 6..... | | | | 8.5 | July 27..... | 16 | 23 | | 132 |
| April 12..... | 4 | 3.5 | .30 | 10 | August 9..... | 16 | 22 | | 77 |
| April 21..... | 4 | 4.3 | .50 | 14 | August 20..... | 14 | 20 | | 68 |
| April 24..... | 4 | 4.6 | .50 | 17 | September 23..... | | 6.0 | | 21 |
| May 2..... | 4 | 4.1 | .44 | 14 | October 20..... | 12 | 4.8 | .35 | 17 |
| May 9..... | 4 | 6.5 | .60 | 26 | November 19..... | 12 | 5.6 | .30 | 12.4 |
| May 14..... | 5 | 6.9 | .98 | 27 | December 21..... | 12 | 5.6 | .25 | 10.6 |

^a Measured in two channels.

Daily gage height, in feet, of Oak Creek near Independence, Cal., for 1906.

| Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. |
|---------|------|------|------|---------|------|------|------|---------|------|-------|------|
| 1..... | 0.40 | 0.30 | 0.20 | 12..... | 0.40 | 0.30 | 0.30 | 23..... | 0.37 | 0.25 | 0.25 |
| 2..... | .40 | .30 | .25 | 13..... | .40 | .30 | .30 | 24..... | .36 | .25 | .25 |
| 3..... | .40 | .30 | .30 | 14..... | .40 | .30 | .30 | 25..... | .36 | .25 | .25 |
| 4..... | .41 | .30 | .30 | 15..... | .40 | .30 | .30 | 26..... | .36 | .25 | .25 |
| 5..... | .42 | .30 | .30 | 16..... | .39 | .30 | .30 | 27..... | .35 | .20 | .25 |
| 6..... | .40 | .30 | .30 | 17..... | .39 | .30 | .25 | 28..... | .35 | .20 | .25 |
| 7..... | .40 | .30 | .30 | 18..... | .38 | .30 | .25 | 29..... | .30 | .20 | .25 |
| 8..... | .40 | .30 | .30 | 19..... | .38 | .30 | .25 | 30..... | .30 | .20 | .20 |
| 9..... | .40 | .30 | .30 | 20..... | .35 | .30 | .25 | 31..... | .30 | ..... | .20 |
| 10..... | .40 | .30 | .30 | 21..... | .35 | .30 | .25 | | | | |
| 11..... | .40 | .30 | .30 | 22..... | .35 | .30 | .20 | | | | |

Monthly discharge of Oak Creek near Independence, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total ac |
|----------------|---------------------------|----------|------------------|-------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | | | ^a 6.0 | |
| February..... | 7.7 | 7.1 | 7.3 | |
| March..... | 8.9 | 7.4 | 7.8 | |
| April..... | 17 | 8.5 | 11.9 | |
| May..... | 36 | 14 | 28.0 | |
| June..... | 128 | 36 | 69.9 | |
| July..... | 162 | 113 | 140 | |
| August..... | 109 | 53 | 73.5 | |
| September..... | 51 | 20 | 32.2 | |
| October..... | 26 | 12 | 20.5 | |
| November..... | 12 | 10 | 11.8 | |
| December..... | 12 | 10 | 11.3 | |
| The year..... | 162 | | 35.0 | |

^a Estimated.

NOTE.—The daily discharge February to September was obtained by interpolation between measurements; after October 1 a rating table, based on three discharge measurements, was used and are approximate.

INDEPENDENCE CREEK NEAR INDEPENDENCE, CAL.

The old station at the city waterworks, which was established June 1905, was wrecked in June, 1906, and a new station was established on August 20, 1906. It is located about 1 mile west of the town of Independence and about 300 feet above the waterworks for the city.

The channel is straight for about 40 feet above and 30 feet below the station. Both banks are high and rocky and not liable to overflow. The bed is also rocky, but clean and fairly permanent. There is one channel at all stages and the velocity is high. At very high stages the section may change on account of the displacement of bowlders. Measurements are made from a plank used as a bridge. At low water the stream is about 10 feet wide and 0.3 feet deep.

The gage is a staff nailed to a post on the south bank of the creek. The bench mark is a spike driven in a willow tree about 10 feet above the gage on south bank; elevation, 1.32 feet above zero of gage.

Discharge measurements of Independence Creek near Independence, Cal., in 1906.

| Date. | Width. | Area of section. | Gage height. | Discharge. | Date. | Width. | Area of section. | Gage height. |
|------------------|--------------|------------------|--------------|-----------------|-------------------|--------------|------------------|--------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> |
| January 23..... | | | 0.42 | 4.5 | June 4..... | 8 | 8.6 | 0.85 |
| January 30..... | | | | 2.8 | June 12..... | 13 | 18 | 1.55 |
| February 13..... | | | .36 | 2.4 | June 23..... | 11 | 17 | |
| March 2..... | | | | 4.6 | July 1..... | 11 | 16 | |
| March 25..... | | | | 4.9 | July 9..... | 11 | 20 | |
| April 5..... | | | | 5.0 | July 19..... | 11 | 22 | |
| April 14..... | 9 | 4.6 | .50 | 6.6 | August 9..... | | | |
| April 22..... | 10 | 5.9 | .60 | 11 | September 11..... | 11 | 13 | .90 |
| April 30..... | 9 | 6.1 | .61 | 11 | September 23..... | 11 | 9.1 | .67 |
| May 10..... | 10 | 7.5 | .80 | 25 | October 20..... | 10 | 6.6 | .50 |
| May 22..... | 10 | 11 | .98 | 43 | November 13..... | 10 | 6.6 | .45 |
| May 29..... | 9 | 9.4 | .87 | 32 | | | | |

NOTE.—Measurements January to August were made at old station; the gage was out after 12. Measurements September to November were made at new station.

Daily gage height, in feet, of Independence Creek near Independence, Cal., for 1906.

| Day. | Sept. | Oct. | Nov. | Dec. | Day. | Sept. | Oct. | Nov. | Dec. | Day. | Sept. | Oct. | Nov. | Dec. |
|---------|-------|------|------|------|---------|-------|------|------|------|---------|-------|------|------|------|
| 1..... | | 0.6 | | | 12..... | | | 0.4 | 0.4 | 23..... | 0.67 | | | |
| 2..... | | | 0.5 | 0.5 | 13..... | 0.8 | 0.6 | .45 | | 24..... | | | 0.4 | 0.4 |
| 3..... | 0.9 | .6 | | | 14..... | | | .5 | .4 | 25..... | .7 | | | |
| 4..... | | | .5 | .5 | 15..... | .8 | .6 | | | 26..... | | | .5 | .4 |
| 5..... | .9 | .6 | | | 16..... | | | .4 | .5 | 27..... | .6 | | | |
| 6..... | | | .4 | .4 | 17..... | .8 | | | | 28..... | | | .4 | .5 |
| 7..... | .9 | | | | 18..... | | .6 | .4 | .4 | 29..... | .7 | | | |
| 8..... | | | .5 | .4 | 19..... | .8 | | | | 30..... | | | | .4 |
| 9..... | | | | | 20..... | | .5 | .5 | .4 | 31..... | | | | .4 |
| 10..... | | | .5 | .4 | 21..... | .7 | | | | | | | | |
| 11..... | .9 | .7 | | | 22..... | | .6 | .5 | .5 | | | | | |

Monthly discharge of Independence Creek near Independence, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|-------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 4.5 | 2.8 | 4.0 | 246 |
| February..... | 4.2 | 2.4 | 2.8 | 156 |
| March..... | 5.0 | 4.4 | 4.8 | 295 |
| April..... | 11 | 5.0 | 8.0 | 476 |
| May..... | 43 | 12 | 29.6 | 1,820 |
| June..... | 226 | 31 | 96.4 | 5,740 |
| July..... | 144 | 88 | 127 | 7,810 |
| August..... | 84 | 37 | 54.4 | 3,340 |
| September..... | 36 | 15 | 22.9 | 1,360 |
| October..... | 16 | 7.5 | 12.4 | 762 |
| November..... | 10 | 4.0 | 6.1 | 363 |
| December..... | 7.5 | 4.0 | 5.2 | 320 |
| The year..... | 226 | 2.4 | 31.1 | 22,700 |

NOTE.—The daily discharge, January to August, was obtained by interpolation between measurements. Values are approximate.

SHEPHERDS CREEK NEAR INDEPENDENCE, CAL.

Shepherds Creek is tributary to Owens River from the eastern slope of Sierra Nevada. No regular station has been established on this stream, but a sufficient number of measurements have been made during 1906 to warrant a rough estimate of the yearly flow. All measurements have been made near the foothills.

Discharge measurements of Shepherds Creek near Independence, Cal., by G. R. Shucy, in 1906.

| Date. | Discharge. | Date. | Discharge. |
|-----------------|------------|-------------------|------------|
| | Sec.-ft. | | Sec.-ft. |
| February 7..... | 1.7 | June 21..... | 95 |
| April 14..... | 6.2 | June 29..... | 70 |
| April 22..... | 16 | July 9..... | 109 |
| May 1..... | 9.8 | July 23..... | 111 |
| May 10..... | 34 | September 10..... | 11 |
| May 18..... | 32 | October 22..... | 1.2 |
| May 26..... | 27 | November 14..... | .3 |
| June 2..... | 15 | December 19..... | 3.4 |
| June 12..... | 60 | | |

Monthly discharge of Shepherds Creek near Independence, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total acre-feet |
|----------------|---------------------------|----------|-------|--------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | | | 2.0 | |
| February..... | | | 2.0 | |
| March..... | | | 2.0 | |
| April..... | 16 | 4.5 | 9.0 | |
| May..... | 34 | 9.8 | 26.5 | 1 |
| June..... | 95 | 15 | 62.2 | 3 |
| July..... | 111 | 78 | 104 | 6 |
| August..... | 93 | 33 | 63.0 | 3 |
| September..... | 31 | 5.5 | 12.0 | |
| October..... | 5.3 | 1.0 | 2.6 | |
| November..... | | | .5 | |
| December..... | | | 3.0 | |
| The year..... | | | 24.1 | 17 |

NOTE.—The daily discharge, April to October, was obtained by interpolation between measurements; mean for other months estimated. Values are approximate.

MOFFETT CREEK NEAR INDEPENDENCE, CAL.

Moffett Creek is tributary to Owens River from the eastern slope of the Sierra Nevada. No regular station has been established but during 1906 enough measurements were made to justify a rough estimate of the yearly flow. All measurements were made near the foothills.

Discharge measurements of Moffett Creek near Independence, Cal., by G. R. Shucy, 1906.

| Date. | Discharge. | Date. | Discharge. |
|-------------------------|-----------------|-----------------------------|-----------------|
| | <i>Sec.-ft.</i> | | <i>Sec.-ft.</i> |
| April 14..... | 1.5 | June 21 <i>a</i> | |
| April 22 <i>a</i> | 6.5 | June 29 <i>a</i> | |
| May 1 <i>a</i> | 3.9 | July 9..... | |
| May 10 <i>a</i> | 14 | July 23 <i>a</i> | |
| May 18..... | 14 | September 10 <i>a</i> | |
| May 26..... | 15 | October 22 <i>a</i> | |
| June 2..... | 10 | December 19 <i>b</i> | |
| June 12..... | 37 | | |

a Measured at diversion gates.

b Estimated.

Monthly discharge of Moffett Creek near Independence, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total acre-feet |
|----------------|---------------------------|----------|-------|--------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | | | 1.0 | |
| February..... | | | 1.0 | |
| March..... | | | 1.0 | |
| April..... | 6.5 | 1.5 | 3.2 | |
| May..... | 15 | 3.9 | 12.5 | |
| June..... | 44 | 10 | 31.3 | 1 |
| July..... | 39 | 19 | 30.3 | 1 |
| August..... | 19 | 8.2 | 13.4 | |
| September..... | 7.8 | 2.9 | 4.3 | |
| October..... | 2.9 | 1.3 | 2.0 | |
| November..... | | | 1.0 | |
| December..... | | | .5 | |
| The year..... | | | 8.5 | 6 |

NOTE.—The daily discharge April to October was obtained by interpolation between measurements; mean for other months estimated. Values are approximate.

GEORGES CREEK NEAR INDEPENDENCE, CAL.

Georges Creek is a tributary to Owens River from the eastern slope of the Sierra Nevada. No regular station has been established, but enough measurements were made during 1906 to warrant a rough estimate of the flow for the year. Measurements were made at or above the division gates.

Discharge measurements of Georges Creek near Independence, Cal., by G. R. Shucy, in 1906.

| Date. | Discharge. | Date. | Discharge. |
|-----------------|-----------------|------------------|-----------------|
| | <i>Sec.-ft.</i> | | <i>Sec.-ft.</i> |
| February 7..... | 1.0 | June 29..... | 66 |
| April 14..... | 5.1 | July 9..... | 84 |
| April 22..... | 14 | July 23..... | 102 |
| May 1..... | 7.4 | August 10..... | 42 |
| May 10..... | 21 | October 22..... | 4.5 |
| May 18..... | 28 | October 30..... | 3.1 |
| May 26..... | 20 | December 19..... | 1.6 |
| June 12..... | 53 | | |

Monthly discharge of Georges Creek near Independence, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|--------------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | | | <i>a</i> 1.0 | 61 |
| February..... | | | <i>a</i> 1.0 | 56 |
| March..... | | | <i>a</i> 2.0 | 123 |
| April..... | 14 | | 10.3 | 613 |
| May..... | 29 | 7.4 | 21.1 | 1,300 |
| June..... | 68 | 31 | 52.9 | 3,150 |
| July..... | 102 | 70 | 86.9 | 5,340 |
| August..... | 72 | 29 | 42.3 | 2,600 |
| September..... | 29 | 14 | 21.0 | 1,250 |
| October..... | 14 | 3.0 | 7.7 | 473 |
| November..... | 3.0 | 2.1 | 2.6 | 155 |
| December..... | 2.1 | 1.4 | 1.7 | 105 |
| The year..... | 102 | | 20.9 | 15,200 |

a Estimated.

NOTE.—The daily discharge April to November was obtained by interpolation between measurements. Values are approximate.

LONE PINE CREEK NEAR LONE PINE, CAL.

Lone Pine Creek is tributary to Owens River from the eastern slope of the Sierra Nevada. The station was established September 25, 1906. It is located about three-fourths mile west of the town of Lone Pine and about 500 feet above the division boxes on the creek.

The channel is straight for 30 feet above and 20 feet below the station. Both banks are high and rocky and not subject to overflow. The bed is rocky and not likely to change, but the cross section is rough and uneven. There is one channel at all stages and the current is swift. At low water the stream is 7 feet wide and 0.8 foot deep. Measurements are made by wading or from a plank used as a footbridge.

The gage is a staff graduated to feet and tenths and is nailed securely to a post. The bench mark is a spike driven in the base of a birch tree on the south bank near the station; elevation, 4.85 feet above zero of gage.

Discharge measurements of Lone Pine Creek near Lone Pine, Cal., by G. R. Shuey, in 1906.

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|------------------|--------------|-----------------|---------------------------------|--------------|-------------|
| | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sec.</i> |
| January 31..... | | 3.1 | June 13..... | | |
| February 17..... | | 3.1 | June 21..... | | |
| February 24..... | | 2.2 | June 29..... | | |
| March 13..... | | 4.0 | July 10..... | | |
| March 23..... | | 4.0 | July 25..... | | |
| March 29..... | | 4.4 | August 10..... | | |
| April 15..... | | 5.5 | September 6..... | | |
| April 28..... | | 12 | September 24 ^a | 1.92 | |
| May 10..... | | 26 | October 23 ^a | 1.80 | |
| May 17..... | | 33 | November 20 ^a | 1.70 | |
| May 26..... | | 32 | | | |

^a Measured at regular station.

Daily gage height, in feet, of Lone Pine Creek near Lone Pine, Cal., for 1906.

| Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. |
|---------|------|------|------|---------|------|------|------|---------|------|------|------|
| 1..... | 1.89 | | 1.7 | 12..... | 1.81 | 1.7 | | 23..... | 1.8 | 1.7 | |
| 2..... | | 1.7 | | 13..... | | | 1.7 | 24..... | | | |
| 3..... | 1.89 | | 1.7 | 14..... | | | | 25..... | | 1.7 | |
| 4..... | | 1.7 | | 15..... | | 1.7 | 1.7 | 26..... | | | |
| 5..... | 1.89 | | 1.7 | 16..... | | | | 27..... | | | |
| 6..... | | 1.7 | | 17..... | | | 1.7 | 28..... | | 1.7 | |
| 7..... | | | 1.7 | 18..... | | | | 29..... | | | |
| 8..... | 1.89 | 1.7 | | 19..... | | 1.7 | 1.7 | 30..... | | 1.7 | |
| 9..... | | | 1.7 | 20..... | | 1.7 | | 31..... | | | |
| 10..... | 1.83 | | | 21..... | | 1.7 | 1.7 | | | | |
| 11..... | | | 1.7 | 22..... | | | | | | | |

Monthly discharge of Lone Pine Creek near Lone Pine, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total acre-feet. |
|----------------|---------------------------|----------|------------------|------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | | | ^a 3.0 | |
| February..... | 3.1 | 2.2 | 2.9 | |
| March..... | 4.5 | 2.7 | 3.8 | |
| April..... | 14 | 4.5 | 7.2 | |
| May..... | 40 | 15 | 28.5 | 1 |
| June..... | 103 | 42 | 73.5 | 4 |
| July..... | 139 | 106 | 129 | 7 |
| August..... | 111 | 44 | 68.4 | 4 |
| September..... | 43 | 17 | 27.2 | 1 |
| October..... | 16 | 12 | 14.0 | |
| November..... | 8.0 | 8.0 | 8.0 | |
| December..... | 8.0 | 8.0 | 8.0 | |
| The year..... | 139 | 2.2 | 31.1 | 22 |

^a Estimated.

NOTE.--The daily discharge January to September was obtained by interpolation between measurements. Values are approximate.

TUTTLE CREEK NEAR LONE PINE, CAL.

Tuttle Creek is tributary to Owens River from the eastern slope of the Sierra Nevada. During 1906 measurements were made regularly at a point near Lone Pine, where the stream leaves the foothills and

enters the valley. These measurements are numerous enough to warrant a monthly estimate of the flow of the stream for the year. A gage-height record has been kept during November and December.

Discharge measurements of Tuttle Creek near Lone Pine, Cal., by G. R. Shucy, in 1906.

| Date. | Gage height. | Dis-charge. | Date. | Gage height. | Dis-charge. |
|------------------|--------------|-----------------|-------------------|--------------|-----------------|
| | <i>Fect.</i> | <i>Sec.-ft.</i> | | <i>Fect.</i> | <i>Sec.-ft.</i> |
| January 31..... | | 4.9 | June 13..... | 1.15 | 20 |
| February 17..... | 0.90 | 5.0 | June 21..... | 1.45 | 32 |
| February 24..... | .90 | 4.4 | June 29..... | 1.60 | 39 |
| March 13..... | | 4.2 | July 25..... | | 67 |
| March 23..... | | 4.2 | August 11..... | 1.65 | 35 |
| March 29..... | | 4.6 | September 6..... | 1.40 | 18 |
| April 15..... | .87 | 4.6 | September 25..... | 1.18 | 11 |
| May 11..... | .98 | 10 | October 24..... | 1.12 | 9.5 |
| May 18..... | 1.02 | 12 | November 20..... | 1.13 | 8.5 |
| May 26..... | 1.05 | 13 | | | |

Daily gage height, in feet, of Tuttle Creek near Lone Pine, Cal., for 1906.

| Day. | Nov. | Dec. | Day. | Nov. | Dec. | Day. | Nov. | Dec. | Day. | Nov. | Dec. |
|--------|------|------|---------|------|------|---------|------|------|---------|------|------|
| 1..... | | 1.1 | 9..... | | 1.1 | 17..... | | | 25..... | 1.15 | |
| 2..... | 1.1 | | 10..... | 1.1 | | 18..... | | 1.1 | 26..... | | 1.1 |
| 3..... | | 1.1 | 11..... | | 1.1 | 19..... | 1.15 | | 27..... | | |
| 4..... | 1.1 | | 12..... | 1.15 | | 20..... | 1.13 | 1.1 | 28..... | 1.1 | 1.1 |
| 5..... | | 1.1 | 13..... | | 1.1 | 21..... | 1.15 | | 29..... | | |
| 6..... | 1.1 | | 14..... | | | 22..... | | 1.1 | 30..... | 1.1 | 1.1 |
| 7..... | | 1.1 | 15..... | | 1.1 | 23..... | 1.15 | | 31..... | | |
| 8..... | 1.1 | | 16..... | | | 24..... | | 1.1 | | | |

Monthly discharge of Tuttle Creek near Lone Pine, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|--------------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | | | <i>a</i> 5.0 | 307 |
| February..... | 5.0 | 4.4 | 4.8 | 267 |
| March..... | 4.6 | 4.2 | 4.3 | 264 |
| April..... | 7.6 | 4.6 | 5.4 | 321 |
| May..... | 15 | 7.8 | 11.1 | 682 |
| June..... | 40 | 16 | 26.0 | 1,550 |
| July..... | 67 | 41 | 54.1 | 3,330 |
| August..... | 51 | 22 | 33.1 | 2,040 |
| September..... | 21 | 10 | 14.2 | 845 |
| October..... | 11 | 9.5 | 9.6 | 590 |
| November..... | 10 | 8.0 | 9.0 | 536 |
| December..... | 8.0 | 8.0 | 8.0 | 492 |
| The year..... | 67 | | 15.4 | 11,200 |

a Estimated.

NOTE.—The daily discharge February to December was obtained by interpolation between measurements. Values are approximate.

COTTONWOOD CREEK NEAR OLANCHA, CAL.

Cottonwood Creek discharges into Owens Lake from the Sierra Nevada; measurements are made near the foothills.

The station was established September 25, 1906. It is located about 15 miles south of Lone Pine and about one-fourth mile above the point of crossing of the Los Angeles conduit.

The channel is straight for about 40 feet above and 50 feet below the station. The right bank is high, rocky, and wooded; the left comparatively low and not wooded; but neither bank is likely to overflow. The bed is rocky and permanent, and there is but one channel at all stages, but the current is very swift. At low water the stream is about 10 feet wide and 1 foot deep. Measurements were made from a plank used as a footbridge.

The gage is a staff nailed to a post.

Discharge measurements of Cottonwood Creek near Olancha, Cal., by G. R. Shury, in

| Date. | Gage height. | Discharge. | Date. | Gage height. |
|----------------|--------------|-----------------|-----------------------------|--------------|
| | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> |
| January 6..... | | 5.6 | June 28..... | |
| March 29..... | | 12 | July 10..... | |
| April 20..... | | 28 | July 24..... | |
| April 27..... | | 31 | August 12..... | |
| May 19..... | | 158 | September 26 <i>a</i> | 0.80 |
| May 27..... | | 131 | October 26 <i>a</i> | .74 |
| June 13..... | | 434 | November 21 <i>a</i> | .50 |

a Measured at regular station.

Daily gage height, in feet, of Cottonwood Creek near Olancha, Cal., for 1906.

| Day. | Sept. | Oct. | Nov. | Dec. | Day. | Sept. | Oct. | Nov. | Dec. | Day. | Sept. | Oct. | Nov. |
|---------|-------|------|------|------|---------|-------|------|------|------|---------|-------|------|------|
| 1..... | 0.8 | | 0.7 | 0.5 | 12..... | | 0.7 | | | 23..... | | 0.5 | 0.6 |
| 2..... | | .8 | .75 | | 13..... | | .7 | | 0.6 | 24..... | | .7 | |
| 3..... | | .8 | .75 | | 14..... | | .7 | | | 25..... | | .75 | .5 |
| 4..... | | .8 | | .5 | 15..... | | .7 | | .8 | 26..... | 0.8 | .74 | |
| 5..... | | .75 | | | 16..... | | .7 | 0.6 | | 27..... | .8 | .7 | .5 |
| 6..... | | .7 | | | 17..... | | .65 | | | 28..... | .8 | .7 | |
| 7..... | | .7 | | .5 | 18..... | | .65 | .6 | .6 | 29..... | .8 | .65 | .5 |
| 8..... | | .7 | | | 19..... | | .6 | | | 30..... | .8 | .70 | |
| 9..... | | .7 | | .6 | 20..... | | .5 | | .6 | 31..... | | .65 | |
| 10..... | | .7 | | | 21..... | | .5 | .5 | | | | | |
| 11..... | | .7 | | .6 | 22..... | | .65 | | .6 | | | | |

Monthly discharge of Cottonwood Creek near Olancha, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total acre- |
|----------------|---------------------------|----------|-------|-------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 7.4 | 5.5 | 6.2 | |
| February..... | 9.4 | 7.4 | 8.2 | |
| March..... | 13 | 9.5 | 10.9 | |
| April..... | 35 | 14 | 24.2 | |
| May..... | 158 | 40 | 114 | |
| June..... | 434 | 172 | 333 | |
| July..... | 287 | 166 | 225 | |
| August..... | 161 | 70 | 104 | |
| September..... | 68 | 22 | 42.4 | |
| October..... | 22 | 19 | 15.9 | |
| November..... | 17 | 9.0 | 13.3 | |
| December..... | 22 | 9.0 | 12.8 | |
| The year..... | 434 | 5.5 | 75.8 | |

NOTE.—The daily discharge January to September was obtained by interpolation between measurements. During high water measurements were made below the point of diversion, so that the discharge is probably too low. Values are approximate.

ASH CREEK NEAR LONE PINE, CAL.

Ash Creek discharges into Owens Lake from the eastern slope of the Sierra Nevada. Numerous measurements have been made on this stream during 1906, but they have not been made at the same point, although all were above the point of diversion.

Discharge measurements of Ash Creek near Lone Pine, Cal., by G. R. Shucy in 1906.

| Date. | Discharge. | Date. | Discharge. |
|----------------|-----------------|-------------------|-----------------|
| | <i>Sec.-ft.</i> | | <i>Sec.-ft.</i> |
| January 6..... | 1.3 | June 29..... | 58 |
| March 29..... | 4.8 | July 10..... | 31 |
| April 27..... | 10.7 | August 13..... | 5.9 |
| May 19..... | 16 | September 26..... | 3.2 |
| May 27..... | 16 | October 26..... | 2.8 |
| June 14..... | 21 | November 21..... | 2.4 |

Monthly discharge of Ash Creek near Lone Pine, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|------------------|------------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 2.2 | 1.3 | 1.7 | 105 |
| February..... | 3.8 | 2.4 | 3.2 | 178 |
| March..... | 5.2 | 4.0 | 4.5 | 277 |
| April..... | 11 | 5.4 | 8.3 | 494 |
| May..... | 17 | 12 | 14.8 | 910 |
| June..... | 58 | 17 | 30.6 | 1,820 |
| July..... | 53 | 9.0 | 25.3 | 1,560 |
| August..... | 8.5 | 5.0 | 5.8 | 357 |
| September..... | 5.0 | 3.2 | 4.0 | 238 |
| October..... | 3.2 | 2.8 | 3.0 | 184 |
| November..... | 2.7 | 2.4 | 2.5 | 149 |
| December..... | | | ^a 2.2 | 135 |
| The year..... | 5.8 | 1.3 | 8.8 | 6,410 |

^a Estimated.

NOTE.—The daily discharge January to November was obtained by interpolation between measurements. Values are approximate.

MISCELLANEOUS MEASUREMENTS IN OWENS RIVER DRAINAGE BASIN.

The following is a list of the miscellaneous discharge measurements made in the Owens River drainage basin during 1906:

Black Rock Springs near Independence, Cal.—These springs are near the foothills, about 8 miles northwest of Independence, and the water from them discharges into Owens River. The following measurement was made December 12, 1906, at the point where the water emerges from the ground.

Width, 11 feet; area, 19 square feet; discharge, 27 second-feet.

Cottonwood Creek near Lone Pine, Cal.—This stream discharges into Owens Lake from the eastern slope of the Sierra Nevada. The following measurement was made September 26, 1906, at the mouth of the canyon where the stream enters the valley:

Width, 10 feet; area, 12 square feet; discharge, 25 second-feet.

Fish Springs near Tinemaha, Cal.—These springs are near foothills, about 8 miles south of Big Pine, and the water from the discharges into Owens River. The following measurement was made December 7, 1906, in a flume near their source:

Width, 7 feet; area, 20 square feet; discharge, 36 second-feet.

Georges Creek near Independence, Cal.—This stream is tributary to Owens River from the eastern slope of Sierra Nevada. The following measurements were made in 1906, at the mouth of the canyon where the stream enters the valley:

September 7: Discharge, 25 second-feet.

October 30: Discharge, 4.8 second-feet.

Independence Creek near Independence, Cal.—This creek is tributary to Owens River from the Sierra Nevada. The following measurements were made in 1906:

September 11, at mouth of canyon: Area, 11 square feet; discharge, 28 second-feet.

November 13, at Pinon ditch: Width, 5.4 feet; area, 3.3 square feet; discharge, 5.3 second-feet.

Lone Pine Creek near Lone Pine, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made in 1906, at the mouth of the canyon where the stream enters the valley:

September 8: Width, 10 feet; area, 12 square feet; discharge, 31 second-feet.

September 24: Area, 9.3 square feet; discharge, 20 second-feet.

October 23: Width, 8.3 feet; area, 6.7 square feet; discharge, 10 second-feet.

North Fork Oak Creek near Independence, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made in 1906:

August 20, in canyon: Area, 7.8 square feet; discharge, 49 second-feet.

November 17, 3 miles above junction with South Fork: Width, 4.3 feet; area, 3.3 square feet; discharge, 12 second-feet.

November 19, at junction with South Fork: Width, 8 feet; area, 4.6 square feet; discharge, 12 second-feet.

South Fork Oak Creek near Independence, Cal.—This stream is south of North Fork and is tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made in 1906:

August 20, in Canyon: Area, 9.9 square feet; discharge, 52 second-feet.

November 19, at junction with North Fork: Width, 6.5 feet; area, 3.3 square feet; discharge, 4.3 second-feet.

Shepherds Creek near Independence, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. The following measurements were made November 14, 1906:

At mouth of canyon: Width, 6.5 feet; area, 3.9 square feet; discharge, 5.4 second-feet.

At fork 4 miles east of canyon: Width, 6 feet; area, 4 square feet; discharge, 4.3 second-feet.

Taboose Creek near Tibbetts, Cal.—This creek is tributary to Owens River from the eastern slope of the Sierra Nevada. On December 8, 1906, a measurement was made on the upper road crossing 2 miles above gaging station.

Width, 8 feet; area, 3.6 square feet; discharge, 5.4 second-feet.

Thebaut Creek near Independence, Cal.—This stream is tributary to Owens River from the eastern slope of the Sierra Nevada. On November 17, 1906, the following measurement was made at the mouth of the canyon where it enters the valley:

Width, 1.4 feet; area, 0.5 square foot; discharge, 1.6 second-feet.

MOHAVE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Mohave River rises on the northern slope of the San Bernardino Mountains, and, flowing in a northerly direction, finally disappears in the sands of the Mohave Desert. This stream has few tributaries, the only ones of importance being West Fork and Deep Creek, which have their source in the higher elevations of the San Bernardino Mountains. The formation is of granite, with a good covering of soil. On the higher elevations there is a considerable growth of timber, which diminishes as one approaches the lower reaches, changing to a light growth of brush and grass, finally merging into the barren desert. During the greater portion of the year the stream bed is dry below the junction of West Fork and Deep Creek, where the waters disappear in the sand and gravelly bed of the stream. Water again rises at a point lower down on the river above Victorville, where the gaging station is located. Water is diverted above and below the gaging station, but is again returned to the river channel. There are several artesian wells along the river above the gaging station, the water being used for irrigation. This stream does not discharge in any large quantity except during an extremely heavy rainfall in the winter months. The precipitation throughout this basin is very light, with the possible exception of the higher elevation of the San Bernardino Mountains, where there is a considerable fall of snow during the winter months, which melts in the early spring.

MOHAVE RIVER AT VICTORVILLE, CAL.

This station was established February 27, 1899, and discontinued July 31, 1906. It is located in the town of Victorville, a station on the Atchison, Topeka and Santa Fe Railroad, where the Mohave River passes through a narrow gorge locally known as the "Narrows." The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 87, where are given also references to publications that contain data for previous years.

The gage heights observed at this station in 1906 are of no value, therefore no discharges have been computed.

Discharge measurements of Mohave River at Victorville, Cal., by P. H. Leahy in 1906.

| Date. | Gage height. | Dis-charge. | Date. | Gage height. | Dis-charge. |
|-------------------------|--------------|-----------------|----------------------------|--------------|-------------|
| | <i>Fct.</i> | <i>Sec.-ft.</i> | | <i>Fct.</i> | <i>Sec.</i> |
| January 2..... | 4.03 | 65 | March 28 <i>a</i> | 4.40 | |
| January 6..... | | 63 | March 30..... | 4.30 | |
| January 9..... | 4.03 | 67 | March 31..... | 4.30 | |
| January 12..... | 4.09 | 66 | April 2..... | 4.60 | |
| January 16..... | | 66 | April 6..... | 4.50 | |
| January 20..... | 4.17 | 88 | April 10..... | 4.50 | |
| January 23..... | 4.11 | 92 | April 13..... | 4.30 | |
| January 26..... | 4.10 | 72 | April 17..... | 4.20 | |
| January 31..... | 4.10 | 65 | April 20..... | 4.20 | |
| February 2..... | 4.10 | 64 | April 24..... | 4.10 | |
| February 6..... | 4.10 | 67 | April 28..... | 4.20 | |
| February 10..... | 4.10 | 68 | May 1..... | 4.20 | |
| February 13..... | 4.11 | 64 | May 3..... | 4.20 | |
| February 17..... | 4.11 | 50 | May 11..... | 4.00 | |
| February 21..... | 4.12 | 79 | May 19..... | 4.00 | |
| February 24..... | 4.12 | 65 | May 25..... | 4.02 | |
| February 27..... | 4.08 | 70 | June 1..... | 4.40 | |
| March 2..... | 4.11 | 67 | June 10..... | 4.00 | |
| March 7..... | 4.11 | 52 | June 17..... | 3.92 | |
| March 9..... | 4.10 | 56 | June 24..... | 4.05 | |
| March 12..... | 7.80 | 9,260 | June 29..... | 4.16 | |
| March 18..... | 4.15 | 1,620 | July 5..... | 4.24 | |
| March 20..... | 4.11 | 828 | July 13..... | 4.31 | |
| March 23..... | 4.45 | 552 | July 19..... | 4.32 | |
| March 25..... | 6.25 | 4,530 | July 22..... | 4.36 | |
| March 26..... | 5.60 | 5,370 | July 29..... | 4.41 | |
| March 27 <i>a</i> | 4.90 | 2,100 | July 31 <i>b</i> | 4.39 | |
| March 27 <i>a</i> | 4.80 | 1,880 | November 12 <i>c</i> | | |

a Measured by Burrage and Leahy.

b Measured by W. B. Clapp.

c Measured by W. F. Ma

SOUTHERN PACIFIC OCEAN DRAINAGE.

GENERAL FEATURES.

The Southern Pacific Ocean drainage includes those streams south of San Francisco Bay whose waters, in times of flood at least, reach the Pacific Ocean.

SAN DIEGO BAY DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The principal streams tributary to San Diego Bay are Tia Juana, Sweetwater, and San Diego rivers.

The Tia Juana is not measured at any regular station, but stations are maintained on Cottonwood Creek, which discharges into it about 30 miles east of San Diego city, and on Pine Creek, a branch of Cottonwood, and stations are also maintained on Sweetwater and San Diego rivers.

Measurements in this basin are made for use in connection with the construction of reservoirs for irrigation purposes.

COTTONWOOD CREEK NEAR JAMUL, CAL.

Cottonwood Creek rises on the west side of the San Jacinto Mountains, in the southwestern part of San Diego County, at an elevation of about 5,000 feet, and flows in a southwesterly direction, discharging

into the Tia Juana River just above the California-Mexico boundary line and about 30 miles east of San Diego city. Its drainage basin is rough and broken, with numerous hills and gorges and only a few small valleys. A scrubby timber growth throughout the basin consists mainly of oak, with some sycamore and cottonwood. The annual precipitation varies from 10 to 30 inches and is mainly in the form of rain. The light snowfall on the higher parts of the area melts rapidly, increasing the torrential nature of the run-off. There are several dam sites in this basin, at least two of which have been utilized. The rock formation through which the creek flows is a loose granite with a good soil covering.

The station was established December 14, 1905. It is located at the Barrett dam site, about 8 miles north of the California-Mexico boundary line, and is reached by driving from San Diego to Jamul ranch house, about 20 miles east of San Diego, then driving to the dam site, about 15 miles farther east, making the total distance from San Diego about 35 miles.

The measuring section was first located on the broad crest of the concrete foundation wall of the original Barrett dam, but some time in the late summer the gage was removed on account of constructive operations in connection with the new dam. Above this section the channel had filled in so that the sand was level with the crest of the wall, while on the lower side the water had a free fall of 30 feet. Vertical timber walls had been built up at each end of the dam, so that the width of the channel at all stages was 70 feet. The grade above the section was heavy, so that very high velocities prevailed in flood stages. A new section has been selected a few hundred feet above the old one, at the foundation of the new dam. At low stages the flow is restricted to a rectangular wooden flume through the foundation wall, but at higher stages the flow is over the entire length of the foundation wall.

Discharge measurements are usually made by wading, except in high stages, when only float measurements can be made, owing to the torrential nature of the stream. In low stages a section suitable for wading is always used. There is no cable and car equipment at this station.

The old gage was a 2 by 4 inch pine scantling, graduated to feet and tenths with black stripes and staples and attached in a vertical position to the timber wall on the left bank. The new gage is in two sections, a low-water gage attached to the foundation wall near the wooden flume and a high-water gage fastened to boulders on the left bank. During 1906 the gage was read twice a day by Joe Hooker. No permanent bench mark for reference has yet been established.

Discharge measurements of Cottonwood Creek near Jamul, Cal., in 1905-6.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | ch |
|-------------------------|-------------------|--------------|------------------|--------------|----------------|
| 1905. | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sq. ft.</i> |
| November 18... | W. B. Clapp..... | 27 | 0.5 | | |
| December 14... | C. H. Lee..... | 5 | 1.6 | 0.05 | |
| 1906. | | | | | |
| January 5..... | W. V. Hardy..... | 6 | 2.9 | 0.10 | |
| January 19..... | do..... | 16 | 6.7 | 0.21 | |
| January 19..... | do..... | 22 | 12.5 | 0.30 | |
| January 20..... | do..... | 70 | 20 | 0.40 | |
| January 20..... | do..... | 70 | 28 | 0.50 | |
| January 20..... | do..... | 70 | 29 | 0.55 | |
| February 3..... | do..... | 10 | 3 | 0.05 | |
| February 14..... | do..... | 20 | 8.7 | 0.23 | |
| March 11..... | do..... | 21 | 7.7 | 0.12 | |
| March 12..... | do..... | 70 | 71 | 1.21 | |
| March 13 <i>a</i> | Joe Hooker..... | 70 | 154 | 2.20 | |
| March 16 <i>a</i> | do..... | 70 | 57 | 0.82 | |
| March 21 <i>a</i> | do..... | 70 | 41 | 0.58 | |
| March 24 <i>a</i> | do..... | 70 | 420 | 6.00 | |
| March 25 <i>a</i> | do..... | 70 | 455 | 6.50 | |
| March 31 <i>a</i> | do..... | 70 | 77 | 1.10 | |
| April 7 <i>a</i> | do..... | 70 | 57 | 0.81 | |
| April 19..... | W. V. Hardy..... | 70 | 37 | 0.59 | |
| May 8..... | do..... | 70 | 27 | 0.40 | |
| June 22..... | C. H. Lee..... | 36 | 9.9 | 0.28 | |
| October 5..... | W. F. Martin..... | 2.8 | 0.8 | | |
| November 27..... | W. V. Hardy..... | 6 | 5.4 | b 0.90 | |
| December 15..... | do..... | 6 | 6 | b 2.00 | |

a Measured by floats.*b* New gage.*Monthly discharge of Cottonwood Creek near Jamul, Cal., for 1906.*

| Month. | Discharge in second-feet. | | | Total acre |
|----------------|---------------------------|----------|-------|------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 59 | 2.0 | 15.5 | |
| February..... | 100 | 7.0 | 24.1 | |
| March..... | 5,800 | 5.0 | 594 | |
| April..... | 350 | 93 | 176 | |
| May..... | 93 | 20 | 54.9 | |
| June..... | 55 | 20 | 30.5 | |
| July..... | 93 | 2.0 | 12.0 | |
| August..... | 51 | .9 | 6.0 | |
| September..... | 4.8 | .8 | 1.3 | |
| October..... | 7.1 | .9 | 3.0 | |
| November..... | 33 | 7.6 | 20.4 | |
| December..... | 375 | 30 | 80.8 | |
| The year..... | 5,800 | .8 | 84.9 | |

NOTE.—Discharges were obtained by the indirect method for shifting channels. Values are for

PINE VALLEY CREEK NEAR JAMUL, CAL.

Pine Valley Creek flows in a southerly direction and enters Cottonwood Creek about 1 mile north of Barrett's dam. Its drainage area is about half of the total drainage area of Cottonwood Creek at Barrett's dam. The gaging station is located a few hundred feet above the confluence of the two creeks and was established in January, 1906. It is reached in connection with the Cottonwood station by driving from San Diego.

The channel at the station is composed of shifting sand, and is straight for about 200 feet above and 250 feet below the point of measurement. The right bank is high and rocky and not subject to overflow, while the left bank is liable to overflow in very high stages.

forming two channels. In almost all stages measurements can be made by wading, but two wires have been stretched across the channel 50 feet apart for convenience in float measurements. There is no cable and car.

The gage, which during 1906 was read twice a day by Joe Hooker, is a piece of 2 by 6 inch pine painted white and graduated to feet and tenths with staples. It is fastened to a small tree in a vertical position and the graduations run from 3 to 9.9 feet. The initial point for soundings is the top of a boulder on the right bank marked with a ring of white paint. The top of this boulder is also taken as a bench mark, with assumed elevation 1,600 feet. The zero of gage is 13.16 feet below, or at elevation 1,586.84.

Discharge measurements of Pine Valley Creek near Jamul, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Dis-charge. |
|------------------|-------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| January 5..... | W. V. Hardy..... | 6 | 1.5 | | 1.8 |
| January 19..... | do..... | 14 | 7.2 | 3.10 | 14.4 |
| January 19..... | do..... | 34 | 12.3 | 3.20 | 17.6 |
| January 20..... | do..... | 41 | 19.4 | 3.45 | 41 |
| February 3..... | do..... | 8 | 2.8 | 2.94 | 4 |
| February 15..... | do..... | 42 | 13.1 | 3.12 | 20 |
| March 11..... | do..... | 12 | 5.4 | 3.00 | 8.2 |
| April 19..... | do..... | 46 | 23 | 4.50 | 57 |
| May 8..... | do..... | 47 | 16 | 4.40 | 32 |
| June 22..... | C. H. Lee..... | 17 | 4.8 | 4.20 | 7.7 |
| October 5..... | W. F. Martin..... | 2.8 | 0.21 | 4.00 | 0.24 |
| November 27..... | W. V. Hardy..... | 11 | 4.1 | 4.21 | 6.7 |
| December 15..... | do..... | 19 | 6.7 | 4.30 | 14.6 |

Daily gage height, in feet, of Pine Valley Creek near Jamul, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1..... | | 3.00 | 3.00 | 4.90 | 4.55 | 4.40 | 4.12 | 4.02 | 3.95 | 3.94 | 4.10 | 4.15 |
| 2..... | | 2.95 | 3.00 | 4.90 | 4.55 | 4.35 | 4.12 | 4.01 | 3.95 | 4.03 | 4.05 | 4.20 |
| 3..... | | 2.95 | 2.98 | 4.75 | 4.50 | 4.35 | 4.11 | 4.01 | 3.95 | 4.10 | 4.05 | 4.20 |
| 4..... | | 2.95 | 3.00 | 4.75 | 4.50 | 4.30 | 4.12 | 4.00 | 3.95 | 3.98 | 4.00 | 4.20 |
| 5..... | | 2.96 | 3.04 | 4.80 | 4.55 | 4.30 | 4.13 | 3.95 | 3.94 | 3.80 | 4.10 | 4.20 |
| 6..... | | 3.24 | 2.98 | 4.75 | 4.50 | 4.30 | 4.10 | 3.93 | 3.94 | 3.55 | 4.10 | 4.25 |
| 7..... | | 3.15 | 2.92 | 4.80 | 4.50 | 4.30 | 4.20 | 3.80 | 4.00 | 3.60 | 4.10 | 4.25 |
| 8..... | | 3.07 | 2.93 | 4.70 | 4.40 | 4.30 | 4.20 | 3.79 | 4.00 | 3.70 | 4.10 | 4.25 |
| 9..... | | 3.09 | 2.92 | 4.65 | 4.40 | 4.30 | 1.22 | 3.76 | 3.98 | 3.75 | 4.10 | 4.25 |
| 10..... | | 3.01 | 2.95 | 4.65 | 4.40 | 4.30 | 4.20 | 3.65 | 3.98 | 3.80 | 4.10 | 4.20 |
| 11..... | | 3.11 | 2.97 | 4.60 | 4.35 | 4.25 | 4.17 | 3.60 | 4.00 | 4.00 | 4.05 | 4.25 |
| 12..... | | 3.01 | 4.35 | 4.55 | 4.40 | 4.20 | 4.15 | 3.55 | 4.00 | 4.90 | 4.10 | 4.30 |
| 13..... | | 3.01 | 5.00 | 4.60 | 4.40 | 4.20 | 4.12 | 3.48 | 4.09 | 4.05 | 4.10 | 4.45 |
| 14..... | | 3.09 | 4.03 | 4.55 | 4.40 | 4.20 | 4.12 | 3.40 | 4.08 | 4.05 | 4.05 | 4.45 |
| 15..... | | 4.02 | 3.70 | 4.55 | 4.40 | 4.20 | 4.10 | 3.37 | 4.12 | 3.95 | 4.10 | 4.30 |
| 16..... | | 3.60 | 4.04 | 4.50 | 4.40 | 4.20 | 4.11 | 3.00 | 4.02 | 3.95 | 4.10 | 4.30 |
| 17..... | | 3.40 | 3.95 | 4.50 | 4.35 | 4.20 | 4.10 | 2.70 | 4.05 | 4.00 | 4.10 | 4.20 |
| 18..... | 3.00 | 3.30 | 3.60 | 4.50 | 4.35 | 4.20 | 4.10 | 4.40 | 3.96 | 4.00 | 4.10 | 4.20 |
| 19..... | 3.20 | 3.28 | 3.50 | 4.50 | 4.30 | 4.15 | 4.11 | 4.40 | 4.05 | 4.10 | 4.05 | 4.30 |
| 20..... | 3.45 | 3.20 | 3.38 | 4.50 | 4.30 | 4.15 | 4.10 | 4.20 | 4.03 | 4.05 | 4.05 | 4.20 |
| 21..... | 3.25 | 3.21 | 3.31 | 4.45 | 4.30 | 4.10 | 4.07 | 4.20 | 3.98 | 4.10 | 4.10 | 4.20 |
| 22..... | 3.20 | 3.22 | 3.35 | 4.45 | 4.40 | 4.20 | 4.05 | 4.20 | 4.02 | 4.10 | 4.10 | 4.15 |
| 23..... | 3.18 | 3.19 | 3.30 | 4.50 | 4.40 | 4.15 | 4.06 | 4.20 | 3.91 | 4.05 | 4.20 | 4.20 |
| 24..... | 3.10 | 3.08 | | 4.50 | 4.40 | 4.15 | 4.06 | 4.19 | 4.01 | 4.10 | 4.20 | 4.20 |
| 25..... | 3.08 | 3.01 | | 4.50 | 4.40 | 4.15 | 4.05 | 4.18 | 4.03 | 4.05 | 4.20 | 4.20 |
| 26..... | 3.05 | 2.96 | | 4.50 | 4.50 | 4.15 | 4.05 | 4.18 | 4.00 | 4.00 | 4.20 | 4.20 |
| 27..... | 3.03 | 2.94 | | 4.50 | 4.45 | 4.15 | 4.05 | 4.18 | 4.04 | 4.10 | 4.20 | 4.30 |
| 28..... | 3.03 | 2.97 | 5.20 | 4.65 | 4.50 | 4.20 | 4.04 | 4.16 | 3.98 | 4.10 | 4.20 | 4.70 |
| 29..... | 3.03 | | 4.82 | 4.75 | 4.50 | 4.15 | 4.03 | 4.10 | 3.92 | 4.10 | 4.10 | 4.60 |
| 30..... | 3.03 | | 4.80 | 4.65 | 4.40 | 4.15 | 4.02 | 4.00 | 4.00 | 4.00 | 4.15 | 4.50 |
| 31..... | 3.03 | | 5.00 | | 4.40 | | 4.02 | 4.00 | | 4.10 | | 4.50 |

Monthly discharge of Pine Valley Creek near Jamul, Cal., for 1906.

| Month. | Discharge in second-feet. | | | To acre |
|----------------|---------------------------|----------|-------|---------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 41 | 1 | 10.4 | |
| February..... | 75 | 5 | 19.4 | |
| March..... | 1,500 | 3 | 156 | |
| April..... | 150 | 44 | 89.6 | |
| May..... | 71 | 15 | 39.4 | |
| June..... | 32 | 1.8 | 8.8 | |
| July..... | 8.2 | .6 | 2.6 | |
| August..... | 32 | .2 | 4.0 | |
| September..... | 2.7 | .2 | .6 | |
| October..... | 1.8 | 0.0 | .8 | |
| November..... | 6.5 | .3 | 2.6 | |
| December..... | 114 | 4.2 | 20.1 | |
| The year..... | 1,500 | 0.0 | 29.6 | |

NOTE.—Discharges were obtained by the indirect method for shifting channels. Values are approximate.

SWEETWATER RIVER NEAR DESCANSO, CAL.

Sweetwater River heads on the west slope of San Jacinto Mountains in the west-central portion of San Diego County and flows in a southwesterly direction, discharging into San Diego Bay near National City. The highest parts of the basin are found about 2 miles west of Cuyamaca, at an elevation of more than 5,000 feet. This highland consists of a loose granite formation, and the topography is much broken with numerous canyons, mountain peaks, and small valleys. There is a scrubby timber growth on the highlands, consisting mainly of oak brush. The annual precipitation in the basin varies from 5 to 20 inches near National City, but increases on the higher elevations up to from 30 to 60 inches near Cuyamaca, where 20 to 30 inches of snowfall occur in some years. The run-off in the surface flow is heavy in the spring, but during the summer and fall the surface flow entirely disappears in the sands of the lower reach.

This station was established December 9, 1905. It is located on the Ellis ranch, about 1 mile south of Descanso post-office, and is reached by stage from Lakeside. This station is at an elevation of 3,300 feet and has a drainage area of only 40 square miles, which is almost rectangular in outline, being about 10 miles long north and south and 4 miles wide.

The station is equipped with cable and car, but measurements can always be made by wading, except at very high stages. The bed of the stream is composed of sand and gravel, with isolated boulders, and is subject to more or less change. Both banks can be overflowed at exceptionally high stages. The channel is straight for 150 feet above and 300 feet below the station. A dense growth of willows on each bank has been cleared away for 20 feet above and below the cable. The grade is heavy above the section, so that high velocities are encountered at the highest stage, when only low velocities can be taken.

The gage consists of a 2 by 6 inch pine timber painted white and graduated to feet and tenths. It is bolted to granite boulders on the left bank, and is in three sections—two for low water and one for high water. The graduations extend from 2.8 to 10.7 feet.

The initial point for soundings is the head of a big rail driven in the base of the oak tree anchorage on the right bank. The bench mark is the highest point on the boulder to which the lowest low-water gage is fastened, and is 20 feet upstream from station 60 of cable. It is marked 0.0 in white paint and its elevation is assumed to be 3,300 feet. The zero of the gage is 5 feet below the bench mark, or at an elevation of 3,295.0.

During 1906 the gage was read twice a day by C. H. Ellis.

Discharge measurements of Sweetwater River near Descanso, Cal., in 1905-6.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-----------------|---------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1905. | | | | | |
| September 11 a. | D. W. Murphy | | | | 0.4 |
| November 21 | C. H. Lee | 3 | 0.9 | 3.54 | 1.1 |
| December 10 | do. | 6 | 1.9 | 3.62 | 2.5 |
| 1906. | | | | | |
| January 6 | W. V. Hardy | 6.5 | 1.7 | 3.62 | 2.7 |
| January 23 | do. | 11 | 4.9 | 3.79 | 9.3 |
| February 4 | do. | 10 | 3.7 | 3.68 | 4.8 |
| February 15 | do. | 40 | 41 | 4.60 | 115 |
| February 16 | do. | 38 | 35 | 4.50 | 96 |
| February 16 | do. | 36 | 30 | 4.40 | 75 |
| February 16 | do. | 36 | 27 | 4.30 | 62 |
| February 16 | do. | 34 | 22 | 4.20 | 51 |
| February 16 | do. | 32 | 20 | 4.10 | 46 |
| February 17 | do. | 31 | 15.9 | 4.00 | 32 |
| February 19 | do. | 30 | 12.4 | 3.90 | 20 |
| March 10 | do. | 11.7 | 5.1 | 3.88 | 10.7 |
| April 5 | do. | 40 | 32 | 4.85 | 81 |
| April 6 | do. | 41 | 33 | 4.65 | 74 |
| April 18 | do. | 36 | 14 | 4.27 | 37 |
| April 20 | do. | 35 | 13 | 4.20 | 35 |
| May 8 | do. | 31 | 10.4 | 4.05 | 24 |
| June 19 | C. H. Lee | 12 | 2.6 | 3.60 | 4.3 |
| August 7 | R. S. Hawley | 2.5 | 0.8 | 3.16 | 1.1 |
| October 9 | W. F. Martin | 2 | 1.2 | 3.15 | 1.1 |
| November 28 | W. V. Hardy | 6 | 3.2 | 3.20 | 4.4 |
| December 13 | do. | 12 | 6.8 | 3.48 | 12.7 |

a Weir measurement.

Daily gage height, in feet, of Sweetwater River near Descanso, Cal., for 1905-6.

| Day. | Nov. | Dec. | Day. | Nov. | Dec. | Day. | Nov. | Dec. | Day. | Nov. | Dec. |
|-------|------|------|------|------|------|------|------|------|------|------|------|
| 1905. | | | | | | | | | | | |
| 1 | | 3.69 | 8 | | 3.58 | 16 | | 3.60 | 24 | | 3.54 |
| 2 | | 3.64 | 9 | | 3.58 | 17 | | 3.60 | 25 | | 3.53 |
| 3 | | 3.61 | 10 | | 3.64 | 18 | | 3.67 | 26 | | 3.54 |
| 4 | | 3.60 | 11 | | 3.68 | 19 | | 3.66 | 27 | | 3.84 |
| 5 | | 3.60 | 12 | | 3.69 | 20 | | 3.66 | 28 | | 3.84 |
| 6 | | 3.58 | 13 | | 3.65 | 21 | 3.53 | 3.78 | 29 | 3.71 | 3.69 |
| 7 | | 3.58 | 14 | | 3.60 | 22 | 3.54 | 3.70 | 30 | 3.70 | 3.66 |
| | | | 15 | | 3.60 | 23 | 3.54 | 3.62 | 31 | | 3.72 |

a Estimated.

Daily gage height, in feet, of Sweetwater River near Descanso, Cal., for 1905-6—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|------|------|------|------|---------------|-------|---------------|-------|--------------|---------------|
| 1906. | | | | | | | | | | | |
| 1..... | 3.7 | 3.65 | 4.0 | 4.8 | 4.2 | 3.9 | 3.45 | 3.2 | 3.3 | 3.15 | <i>a</i> 3.2 |
| 2..... | 3.65 | 3.65 | 3.95 | 4.7 | 4.15 | 3.85 | 3.4 | 3.2 | 3.3 | 3.15 | <i>a</i> 3.2 |
| 3..... | 3.7 | 3.65 | 3.9 | 4.7 | 4.1 | 3.85 | 3.4 | 3.2 | 3.3 | 3.15 | <i>a</i> 3.2 |
| 4..... | 3.7 | 3.7 | 4.0 | 4.6 | 4.1 | 3.85 | 3.4 | 3.2 | 3.3 | 3.15 | <i>a</i> 3.2 |
| 5..... | 3.65 | 3.85 | 3.95 | 4.7 | 4.2 | 3.85 | 3.4 | 3.2 | 3.3 | 3.1 | 3.2 |
| 6..... | 3.65 | 3.95 | 3.9 | 4.7 | 4.15 | 3.85 | 3.4 | 3.2 | 3.3 | 3.1 | 3.2 |
| 7..... | 3.6 | 3.9 | 3.85 | 4.65 | 4.15 | 3.8 | 3.4 | 3.2 | 3.3 | 3.1 | 3.2 |
| 8..... | 3.6 | 3.8 | 3.85 | 4.6 | 4.1 | 3.8 | 3.4 | 3.2 | 3.3 | 3.1 | 3.2 |
| 9..... | 3.6 | 3.8 | 3.85 | 4.6 | 4.25 | 3.75 | 3.4 | 3.2 | 3.3 | 3.1 | 3.2 |
| 10..... | 3.6 | 3.85 | 3.85 | 4.5 | 4.0 | 3.7 | 3.4 | 3.15 | 3.25 | 3.1 | 3.15 |
| 11..... | 3.6 | 3.95 | 3.9 | 4.45 | 4.0 | 3.7 | 3.35 | 3.15 | 3.25 | 3.1 | 3.15 |
| 12..... | 3.6 | 3.9 | 4.05 | 4.4 | 4.1 | 3.7 | 3.35 | <i>a</i> 3.15 | 3.25 | 3.1 | 3.15 |
| 13..... | 3.65 | 3.9 | 5.05 | 4.4 | 4.0 | 3.7 | 3.35 | 3.15 | 3.25 | 3.1 | 3.15 |
| 14..... | 3.75 | 3.9 | 4.5 | 4.35 | 4.0 | <i>a</i> 3.65 | 3.4 | 3.15 | 3.3 | 3.1 | 3.2 |
| 15..... | 3.7 | 4.45 | 4.4 | 4.35 | 3.95 | <i>a</i> 3.65 | 3.4 | 3.15 | 3.65 | 3.1 | <i>a</i> 3.2 |
| 16..... | 3.7 | 4.2 | 4.65 | 4.3 | 3.9 | <i>a</i> 3.6 | 3.35 | 3.15 | 3.45 | 3.1 | <i>a</i> 3.15 |
| 17..... | 3.65 | 4.1 | 5.05 | 4.3 | 3.9 | 3.6 | 3.35 | 3.3 | 3.25 | 3.15 | <i>a</i> 3.15 |
| 18..... | 3.65 | 3.95 | 4.15 | 4.25 | 3.9 | 3.6 | 3.3 | 3.6 | 3.2 | 3.15 | 3.15 |
| 19..... | 4.05 | 3.9 | 4.5 | 4.25 | 3.9 | 3.6 | 3.3 | 3.6 | 3.15 | 3.15 | 3.15 |
| 20..... | 4.15 | 3.85 | 4.4 | 4.2 | 3.9 | 3.6 | 3.3 | 3.5 | 3.15 | 3.15 | 3.15 |
| 21..... | 3.9 | 3.95 | 4.35 | 4.2 | 3.9 | 3.55 | 3.3 | 3.45 | 3.15 | 3.15 | 3.15 |
| 22..... | 3.85 | 4.0 | 4.45 | 4.15 | 3.85 | 3.55 | 3.3 | 3.4 | 3.1 | 3.15 | 3.4 |
| 23..... | 3.8 | 3.95 | 4.35 | 4.1 | 3.9 | 3.55 | 3.3 | 3.4 | 3.1 | 3.2 | 3.45 |
| 24..... | 3.75 | 3.9 | 7.35 | 4.15 | 3.9 | 3.55 | 3.3 | 3.45 | 3.15 | 3.2 | 3.35 |
| 25..... | 3.75 | 3.85 | 6.8 | 4.15 | 3.9 | 3.5 | 3.35 | 3.35 | 3.15 | 3.2 | 3.3 |
| 26..... | 3.75 | 3.85 | 6.6 | 4.1 | 4.05 | 3.55 | 3.35 | 3.35 | 3.15 | 3.2 | 3.3 |
| 27..... | 3.7 | 3.85 | 5.6 | 4.1 | 4.0 | 3.6 | 3.3 | 3.35 | 3.1 | 3.2 | 3.35 |
| 28..... | 3.7 | 3.95 | 5.2 | 4.4 | 4.2 | 3.55 | 3.25 | 3.35 | 3.1 | 3.25 | 3.2 |
| 29..... | 3.7 | | 4.85 | 4.4 | 4.0 | 3.5 | 3.25 | 3.35 | 3.15 | 3.25 | 3.2 |
| 30..... | 3.7 | | 4.7 | 4.25 | 3.95 | 3.45 | 3.2 | 3.35 | 3.2 | 3.2 | 3.2 |
| 31..... | 3.7 | | 4.7 | | 3.9 | | 3.2 | 3.3 | | <i>a</i> 3.2 | |

a Estimated.

Monthly discharge of Sweetwater River near Descanso, Cal., for 1906.

[Drainage area, 40 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|-----------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Dep. inc. |
| January..... | 44 | 2.0 | 8.7 | 534 | 0.217 | |
| February..... | 86 | 4.2 | 22.3 | 1,240 | .558 | |
| March..... | 1,250 | 17.6 | 180 | 11,100 | 4.50 | |
| April..... | 84 | 26 | 48.5 | 2,890 | 1.21 | |
| May..... | 36 | 13 | 21.6 | 1,330 | .540 | |
| June..... | 15 | 2.6 | 7.0 | 418 | .176 | |
| July..... | 2.6 | 1.2 | 1.8 | 112 | .046 | |
| August..... | 4.6 | 1.1 | 1.8 | 108 | .044 | |
| September..... | 5.8 | 1.0 | 1.5 | 90 | .038 | |
| October..... | 1.4 | 1.0 | 1.1 | 68 | .028 | |
| November..... | 12 | 1.1 | 3.0 | 177 | .074 | |
| December..... | 66 | 4.4 | 10.1 | 121 | .252 | |
| The year..... | 1,250 | 1.0 | 25.6 | 18,200 | .640 | |

NOTE.—Discharges were obtained from several rating tables covering short periods of time. Values are fair.

SAN DIEGO RIVER NEAR LAKESIDE, CAL.

San Diego River has its headwaters on the west side of San Jacinto Mountains in the western portion of San Diego County, and flows in a southwesterly direction, discharging into the Pacific Ocean just north of San Diego city. This drainage basin lies just north of the Sweetwater drainage basin and south of the Santa Ysabel basin.

The extreme headwaters reach almost to the Santa Ysabel Indian Reservation on the north, and include the Cuyamaca reservoir. The topography of the basin is very rough, owing to numerous narrow canyons with small streams and mountain peaks, some of which have an elevation of 6,000 feet. The discharge is heavy in the spring and is of a torrential nature, but during the summer and fall there is no surface flow in the lower portion of the basin, the water disappearing in the sands 30 or 40 miles above San Diego city. The annual precipitation ranges from 10 to 20 inches near San Diego and from 20 to 30 or even 50 inches in the mountains, where some of it appears as snow. The formation is a loose granite and there is only a scrubby timber growth.

This station was established in December, 1905. It is located about 1 mile northwest of the Lakeside hotel and about three-fourths mile above the railroad station, on the road from Lakeside to Padre Barona Valley. It is 23 miles northeast of San Diego and is reached by the San Diego, Cuyamaca and Eastern Railway.

This station has a cable and car equipment, but, except in high stages, discharge measurements can always be made by wading. The bed of the stream is composed of a fine, shifting sand which supports no vegetation, and the channel is continually changing from side to side in low water. The left bank is high and rocky above the station and not liable to overflow, except below the measuring section. The right bank is composed of old river deposit and is subject to overflow above and below the station in very high stages. The channel is straight for 200 feet above and 250 feet below the station. The willow growth on right bank has been cleared away 20 feet above and below the cable. In low stages the quantity of water flowing on the surface depends on the saturation of the sand, and measurements will appear inconsistent, owing to the filling and scouring.

The gage consists of a 2 by 6 inch pine timber painted white and graduated to feet and tenths. It is on the left bank and is in two sections, a low and high water section, each bolted to granite boulders.

The graduations extend from 2 to 7.8 feet.

The initial point for soundings is the head of a large nail on the left bank driven into a soft granite rock and painted yellow. 0.0 in yellow paint is placed on the rock. A reference bench mark has been established on the top of the flat boulder lying between the sycamore tree supporting the cable on the left bank and the boulder used for an anchor. It is 8 feet downstream from station 20 of cable and is surrounded by a ring of white paint and has the assumed elevation of 400 feet marked on it. The zero of the gage is 7.77 feet below the bench mark, or at an elevation of 392.23 feet.

During 1906 the gage was read once a day by J. H. Lucas.

Discharge measurements of San Diego River near Lakeside, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | D ⁵ cha |
|-------------|---------------|--------------|------------------|--------------|--------------------|
| 1906. | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.</i> |
| January 9 | W. V. Hardy | 2 | 0.7 | 2.67 | |
| January 24 | do | 25 | 8.3 | 3.04 | |
| February 6 | do | 6 | 1.2 | 2.90 | |
| February 12 | do | 52 | 24 | 3.20 | |
| February 20 | do | 52 | 25 | 3.28 | |
| February 22 | do | 50 | 42 | 3.54 | |
| February 22 | do | 55 | 39 | 3.50 | |
| February 22 | do | 54 | 30 | 3.40 | |
| March 9 | do | 35 | 12 | 3.10 | |
| March 13 | do | 68 | 123 | 4.50 | |
| March 13 | do | 78 | 166 | 4.80 | |
| March 14 | do | 68 | 75 | 4.10 | |
| March 15 | do | 52 | 60 | 3.90 | |
| April 7 | do | 62 | 75 | 4.50 | |
| April 17 | do | 58 | 57 | 4.25 | |
| April 21 | do | 57 | 39 | 4.15 | |
| April 24 | do | 57 | 47 | 4.07 | |
| April 30 | do | 50 | 46 | 4.25 | |
| May 1 | do | 55 | 37 | 3.92 | |
| May 9 | do | 50 | 30 | 3.86 | |
| May 12 | do | 55 | 36 | 3.94 | |
| June 20 | C. H. Lee | 10 | 2.6 | 3.45 | |
| August 8 | R. S. Hawley | 2 | 0.4 | 3.39 | |
| December 13 | W. V. Hardy | | | 3.30 | |

^a Estimated, water too shallow to measure.

Daily gage height, in feet, of San Diego River near Lakeside, Cal., for 1905-6.

| Day. | 1905. | 1906. | | | | | | | | | |
|------|-------|-------|------|------|------|------|-------|-------|------|-------|------|
| | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. |
| 1 | | 2.66 | 2.90 | 3.32 | 4.9 | 4.2 | 3.8 | 3.45 | 3.4 | 3.35 | |
| 2 | | 2.66 | 2.91 | 3.26 | 4.75 | 4.15 | 3.75 | 3.45 | 3.4 | 3.35 | |
| 3 | 2.60 | 2.66 | 2.91 | 3.20 | 4.65 | 4.0 | 3.75 | 3.45 | 3.4 | 3.35 | |
| 4 | 2.60 | 2.67 | 2.91 | 3.20 | 4.6 | 3.95 | 3.75 | 3.45 | 3.4 | 3.35 | |
| 5 | 2.60 | 2.68 | 2.92 | 3.28 | 4.5 | 3.9 | 3.7 | 3.45 | 3.4 | 3.3 | |
| 6 | 2.60 | 2.68 | 2.98 | 3.18 | 4.5 | 3.95 | 3.7 | 3.45 | 3.4 | 3.3 | |
| 7 | 2.60 | 2.68 | 3.02 | 3.12 | 4.5 | 3.9 | 3.7 | 3.4 | 3.4 | 3.3 | |
| 8 | 2.60 | 2.68 | 3.12 | 3.11 | 4.55 | 3.85 | 3.65 | 3.4 | 3.4 | 3.3 | |
| 9 | 2.60 | 2.68 | 3.02 | 3.10 | 4.45 | 3.85 | 3.65 | 3.4 | 3.4 | | |
| 10 | 2.62 | 2.67 | 3.12 | 3.08 | 4.4 | 3.8 | 3.65 | 3.4 | 3.4 | | |
| 11 | 2.62 | 2.66 | 3.15 | 3.08 | 4.35 | 3.85 | 3.6 | 3.4 | 3.4 | | |
| 12 | 2.63 | 2.65 | 3.18 | 3.20 | 4.35 | 3.85 | 3.6 | 3.4 | 3.4 | | |
| 13 | 2.63 | 2.65 | 3.18 | 4.50 | 4.25 | 3.9 | 3.6 | 3.4 | 3.4 | | |
| 14 | 2.63 | 2.66 | 3.20 | 4.10 | 4.2 | 3.85 | 3.6 | 3.4 | 3.4 | | |
| 15 | 2.63 | 2.66 | 3.28 | 3.96 | 4.2 | 3.8 | 3.55 | 3.4 | 3.4 | | |
| 16 | 2.63 | 2.67 | 4.00 | 4.05 | 4.2 | 3.8 | 3.55 | 3.4 | 3.4 | | |
| 17 | 2.63 | 2.67 | 3.64 | 4.65 | 4.2 | 3.8 | 3.5 | 3.4 | 3.4 | | |
| 18 | 2.64 | 2.67 | 3.48 | 4.36 | 4.2 | 3.75 | 3.5 | 3.4 | 3.4 | | |
| 19 | 2.64 | 2.74 | 3.41 | 4.25 | 4.15 | 3.8 | 3.5 | 3.4 | 3.4 | | |
| 20 | 2.66 | 3.91 | 3.28 | 3.94 | 4.1 | 3.75 | 3.5 | 3.4 | 3.4 | | |
| 21 | 2.66 | 3.40 | 3.26 | 3.88 | 4.15 | 3.75 | 3.5 | 3.4 | 3.4 | | |
| 22 | 2.66 | 3.35 | 3.54 | 3.84 | 4.1 | 3.75 | 3.5 | 3.4 | 3.4 | | |
| 23 | 2.65 | 3.68 | 3.48 | 3.90 | 4.1 | 3.75 | 3.5 | 3.4 | 3.4 | | |
| 24 | 2.65 | 3.07 | 3.38 | 5.58 | 4.05 | 3.75 | 3.5 | 3.4 | 3.4 | | |
| 25 | 2.65 | 3.00 | 3.24 | 7.00 | 4.05 | 3.75 | 3.45 | 3.4 | 3.4 | | |
| 26 | 2.65 | 2.96 | 3.22 | 6.88 | 4.0 | 3.75 | 3.45 | 3.4 | 3.35 | | |
| 27 | 2.67 | 2.92 | 3.18 | 5.80 | 4.0 | 3.85 | 3.45 | 3.4 | 3.35 | | |
| 28 | 2.67 | 2.92 | 3.18 | 5.42 | 4.05 | 3.75 | 3.5 | 3.4 | 3.35 | | |
| 29 | 2.67 | 2.92 | | 5.14 | 4.2 | 3.95 | 3.5 | 3.4 | 3.35 | | |
| 30 | 2.66 | 2.91 | | 4.96 | 4.25 | 3.85 | 3.5 | 3.4 | 3.35 | | |
| 31 | | 2.90 | | 4.99 | | 3.8 | | 3.4 | 3.35 | | |

NOTE.—The river was dry September 9 to December 3, 1906.

Monthly discharge of San Diego River near Lakeside, Cal., for 1906.

[Drainage area, 208 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 212 | 0.6 | 16.7 | 1,030 | .080 | .09 |
| February..... | 252 | 1.4 | 43.6 | 2,420 | .210 | .22 |
| March..... | 800 | 15 | 683 | 42,000 | 3.28 | 3.78 |
| April..... | 890 | 105 | 277 | 16,500 | 1.33 | 1.48 |
| May..... | 170 | 39 | 65.7 | 4,040 | .316 | .36 |
| June..... | 51 | 2.8 | 15.1 | 898 | .073 | .08 |
| July..... | 2.8 | .8 | 1.2 | 74 | .0058 | .007 |
| August..... | .8 | .4 | .6 | 37 | .0029 | .003 |
| September..... | .3 | 0 | .1 | 6 | .00048 | .0005 |
| October..... | 0 | 0 | 0 | 0 | .00 | .00 |
| November..... | 0 | 0 | 0 | 0 | .00 | .00 |
| December..... | 152 | 0 | 11.0 | 676 | .053 | .06 |
| The year..... | 3,800 | 0 | 92.8 | 67,700 | .446 | 6.08 |

NOTE. Discharges were obtained by the indirect method for shifting channels. Values are fair.

BERNARDO RIVER DRAINAGE BASIN.**DESCRIPTION OF BASIN.**

Bernardo River, or Santa Ysabel Creek, as it is known at its source, rises in the Volcan Range, on of the western ranges of San Jacinto Mountains, in the western part of San Diego County, at an elevation of 5,600 feet, and flows in a westerly direction through the San Pasqual Valley, below which it takes its true name and empties into the Pacific Ocean just north of the mouth of San Diego River. The upper part of this basin is on a loose granite formation and has a very rough topography, being cut up by numerous ravines in which small mountain streams flow continuously throughout the year. Below the mouth of the canyon, however, the surface flow of the Bernardo disappears in the sands of the San Pasqual Valley during the summer and fall.

The annual precipitation varies from 10 to 20 inches near San Diego, and from 20 to 30 or even 50 inches in the mountains, where some of it appears as snow. The heaviest discharge occurs in the spring, and is torrential in its nature. The drainage area above the mouth of the canyon where the gaging station is located is 128 square miles.

Measurements in this basin are useful for irrigation purposes.

SANTA YSABEL CREEK NEAR ESCONDIDO, CAL.

This station was established in December, 1905. It is located at the mouth of the canyon and at the head of the San Pasqual Valley, about 13 miles east of the town of Escondido. It is reached by driving up through the San Pasqual Valley from Escondido to Pott's ranch, the station being directly east of and only a few hundred feet from the ranch house.

This station is equipped with a cable and car, but it is only during very high water that they need to be brought into use, as measurements can be made by wading, except in flood. The bed is composed of fine sand and is constantly changing. The channel is straight 150 feet above and 100 feet below the cable, and both banks are high and rocky and not liable to overflow at any stage. The gradient is heavy above the section, so that high velocities are encountered at flood stages, and in extremely high water only float velocities can be taken.

The gage is a 2 by 4 inch timber painted white and graduated in feet and tenths. It is in one section and is bolted in an inclined position to a large granite boulder on the left bank. It is located 100 feet downstream from station 175 of the cable, and the graduations extend from 2 to 8 feet.

The initial point for soundings is the head of the eyebolt sulphur into the large granite boulder on the right bank. A reference bench mark has been established on the highest point of the boulder above which the gage is bolted, 11 feet downstream from station 180 of the cable. A circle of white paint indicates the point, and the assumed elevation of 500 feet is marked on the boulder. The zero of the gage is 11.66 feet below the bench mark, or at an elevation of 488.34 feet.

During 1906 the gage was read once a day by S. F. Potts.

Discharge measurements of Santa Ysabel River near Escondido, Cal., in 1905-6.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-----------------|-------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec. ft.</i> |
| 1905. | | | | | |
| November 21.... | W. B. Clapp..... | 5 | 2.2 | | |
| November 28.... | C. H. Lee..... | 83 | 24 | 3.72 | |
| December 21.... |do..... | 24 | 7.2 | 3.55 | |
| 1906. | | | | | |
| January 10.... | W. V. Hardy..... | 8 | 2.5 | 3.56 | |
| January 30.... |do..... | 27 | 8.4 | 3.55 | |
| February 8.... |do..... | 38 | 12.8 | 3.57 | |
| February 11.... |do..... | 37 | 14.6 | 3.64 | |
| February 22.... |do..... | 61 | 21 | 3.70 | |
| March 8.... |do..... | 72 | 17.4 | 3.70 | |
| March 15.... |do..... | 62 | 45 | 3.75 | |
| March 23.... |do..... | 69 | 48 | 3.52 | |
| March 26.... |do..... | 119 | 654 | 4.00 | 5.0 |
| March 26.... |do..... | 108 | 461 | 2.65 | 3.0 |
| March 26.... |do..... | 103 | 362 | 2.00 | 2.0 |
| March 27.... |do..... | 95 | 216 | 1.00 | |
| March 27.... |do..... | 94 | 177 | 0.85 | |
| March 27.... |do..... | 94 | 186 | 0.70 | |
| March 28.... |do..... | 83 | 143 | 0.50 | |
| April 14.... |do..... | 58 | 46 | 1.00 | |
| April 25.... |do..... | 52 | 38 | 1.45 | |
| April 30.... |do..... | 77 | 51 | 1.82 | |
| May 12.... |do..... | 106 | 32 | 2.18 | |
| June 24.... | C. H. Lee..... | 39 | 14 | 2.35 | |
| August 10.... | R. S. Hawley..... | 10 | 2.8 | 2.45 | |
| October 3 a.... | W. F. Martin..... | | | 2.46 | |
| November 30.... | W. V. Hardy..... | 16 | 6.4 | 2.54 | |
| December 7.... |do..... | 15 | 6 | 2.64 | |
| December 20.... |do..... | 15 | 7 | 2.70 | |

a Stream flowing in several channels.

Daily gage height, in feet, of Santa Ysabel Creek near Escondido, Cal., for 1905-6.

| Day. | 1905. | | | | | | 1906. | | | | | | |
|---------|-------|------|-------|------|-------|--------|-------|-------|-------|-------|------|-------|------|
| | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
| 1..... | | 3.55 | 3.5 | 3.7 | 0.7 | 1.85 | 2.4 | 2.4 | 2.4 | 2.45 | 2.45 | 2.5 | 2.55 |
| 2..... | | 3.5 | 3.5 | 3.65 | 0.9 | 1.85 | 2.4 | 2.4 | 2.45 | 2.45 | 2.45 | 2.5 | 2.6 |
| 3..... | | 3.55 | 3.5 | 3.65 | 0.7 | 1.8 | 2.4 | 2.35 | 2.4 | 2.45 | 2.45 | 2.5 | 2.6 |
| 4..... | | 3.45 | 3.5 | 3.7 | 0.7 | 1.8 | 2.35 | 2.4 | (2.4) | 2.4 | 2.45 | 2.5 | 2.6 |
| 5..... | | 3.55 | 3.5 | 3.7 | 0.75 | 1.9 | 2.35 | 2.35 | 2.35 | 2.45 | 2.4 | 2.5 | 2.65 |
| 6..... | | 3.6 | 3.65 | 3.65 | 0.55 | 1.95 | 2.35 | 2.4 | 2.4 | 2.45 | 2.4 | 2.5 | 2.6 |
| 7..... | | 3.55 | 3.6 | 3.65 | 0.4 | 1.95 | 2.35 | 2.4 | 2.4 | 2.5 | 2.45 | 2.5 | 2.65 |
| 8..... | | 3.55 | 3.55 | 3.7 | 0.45 | 1.95 | 2.3 | 2.4 | 2.4 | 2.4 | 2.45 | 2.4 | 2.7 |
| 9..... | | 3.5 | 3.6 | 3.65 | 0.7 | 2.0 | 2.3 | 2.35 | 2.4 | 2.45 | 2.45 | 2.5 | 2.7 |
| 10..... | | 3.55 | 3.5 | 3.7 | 0.7 | 2.0 | 2.35 | 2.4 | 2.45 | 2.45 | 2.4 | 2.45 | 2.7 |
| 11..... | | 3.55 | 3.65 | 3.7 | 0.7 | 2.0 | 2.3 | 2.35 | 2.4 | 2.5 | 2.4 | 2.45 | 2.7 |
| 12..... | | 3.6 | 3.6 | 4.2 | 0.9 | 2.2 | 2.3 | 2.35 | 2.4 | 2.5 | 2.4 | 2.45 | 3.0 |
| 13..... | | 3.6 | 3.6 | 4.5 | 0.9 | 2.2 | 2.3 | 2.4 | 2.4 | 2.5 | 2.4 | 2.5 | 2.7 |
| 14..... | | 3.6 | 3.6 | 3.75 | 1.0 | 2.15 | 2.3 | 2.4 | 2.4 | 2.5 | 2.4 | a 2.5 | 2.7 |
| 15..... | | 3.6 | 3.9 | 3.7 | 1.0 | 2.1 | 2.35 | 2.4 | 2.45 | 2.5 | 2.4 | 2.55 | 2.7 |
| 16..... | | 3.5 | 3.9 | 3.8 | 1.05 | 2.2 | 2.3 | 2.4 | 2.45 | 2.5 | 2.45 | 2.5 | 2.7 |
| 17..... | | 3.46 | 3.5 | 3.75 | 4.25 | 1.15 | 2.2 | 2.3 | 2.4 | 2.45 | 2.5 | 2.45 | 2.7 |
| 18..... | | 3.47 | 3.6 | 3.7 | 3.9 | a 1.15 | 2.2 | 2.25 | 2.4 | 2.5 | 2.5 | 2.5 | 2.7 |
| 19..... | | 3.47 | 3.85 | 3.7 | 3.65 | a 1.15 | 2.2 | 2.3 | 2.4 | 2.55 | 2.45 | 2.5 | 2.7 |
| 20..... | | 3.48 | 3.75 | 3.7 | 3.6 | a 1.15 | 2.15 | 2.3 | 2.4 | 2.45 | 2.4 | 2.5 | 2.7 |
| 21..... | 3.54 | 3.6 | 3.65 | 3.55 | a 1.2 | 2.2 | 2.3 | 2.4 | 2.45 | 2.4 | 2.5 | 2.55 | 2.7 |
| 22..... | 3.52 | 3.5 | 3.7 | 3.6 | 1.2 | 2.25 | 2.25 | 2.4 | 2.4 | (2.4) | 2.5 | 2.55 | 2.7 |
| 23..... | 3.50 | 3.5 | 3.7 | 3.5 | 1.3 | 2.25 | 2.2 | 2.4 | 2.4 | 2.45 | 2.5 | 2.6 | 2.75 |
| 24..... | 3.48 | 3.55 | 3.65 | 6.3 | 1.4 | 2.3 | 2.3 | 2.4 | 2.45 | 2.45 | 2.5 | 2.5 | 2.7 |
| 25..... | 3.49 | 3.5 | 3.65 | 3.5 | 1.45 | 2.3 | 2.4 | 2.45 | (2.4) | 2.5 | 2.5 | 2.55 | 2.7 |
| 26..... | 3.48 | 3.5 | 3.65 | 1.9 | 1.4 | 2.45 | 2.3 | 2.45 | 2.4 | 2.5 | 2.5 | 2.6 | 2.8 |
| 27..... | 3.47 | 3.55 | 3.65 | 0.9 | 1.5 | 2.35 | 2.35 | 2.4 | 2.4 | 2.5 | 2.5 | 2.55 | 2.8 |
| 28..... | 3.48 | 3.55 | 3.7 | 0.6 | 1.6 | 2.25 | 2.4 | 2.4 | 2.45 | 2.5 | 2.5 | 2.55 | 2.75 |
| 29..... | 3.51 | 3.55 | ..... | 0.8 | 1.7 | 2.3 | 2.35 | 2.4 | 2.4 | 2.5 | 2.5 | 2.55 | 2.7 |
| 30..... | 3.52 | 3.55 | ..... | 0.9 | 1.6 | 2.4 | 2.3 | 2.4 | 2.4 | 2.45 | 2.5 | 2.55 | 2.75 |
| 31..... | 3.55 | 3.55 | ..... | 0.9 | ..... | 2.4 | ..... | 2.4 | 2.45 | ..... | 2.5 | ..... | 2.85 |

a Estimated.

Monthly discharge of Santa Ysabel Creek near Escondido, Cal., for 1906.

[Drainage area, 128 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 83 | 2 | 11.4 | 701 | 0.089 | 0.10 |
| February..... | 95 | 8 | 30.5 | 1,690 | .238 | .25 |
| March..... | 8,000 | 29 | 633 | 38,900 | 4.94 | 5.70 |
| April..... | 400 | 102 | 221 | 13,200 | 1.73 | 1.93 |
| May..... | 90 | 35 | 69.7 | 4,290 | .545 | .63 |
| June..... | 35 | 23 | 28.4 | 1,690 | .222 | .25 |
| July..... | 50 | 5 | 12.4 | 762 | .097 | .11 |
| August..... | 6 | 4 | 4.2 | 258 | .033 | .04 |
| September..... | 4 | 3 | 3.1 | 184 | .024 | .03 |
| October..... | 7 | 3 | 4.7 | 289 | .037 | .04 |
| November..... | 15 | 6 | 9.6 | 571 | .075 | .08 |
| December..... | 21 | 11 | 12.4 | 762 | .097 | .11 |
| The year..... | 8,000 | 2 | 86.7 | 63,300 | .677 | 9.27 |

NOTE. —Discharges were obtained by the indirect method for shifting channels. Values are approximate.

SAN LUIS REY RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

San Luis Rey River rises on the western slope of the Coast Range in the northern portion of San Diego County, and flows in a westerly direction, discharging its waters into the Pacific Ocean near the town

of Oceanside. It has numerous small tributaries, none of which have their sources at elevations above 5,000 feet. On the upper reaches of this stream the country is rolling, with several small valleys which are under cultivation, being used principally for the raising of grain and for the pasturage of stock. At a point below what is known as the Warner's ranch reservoir site the river flows through a deep, narrow canyon with a heavy grade for a distance of about 10 miles. Below this point the grade is light, and the discharge is over a sandy and gravelly bed, where the water soon disappears, again rising in small quantities near the town of Pala, where the gaging station is located. Below the station it flows for a distance of about 25 miles on a light grade to the Pacific Ocean. There is a good soil covering throughout the basin, with a considerable growth of brush and grass, and with small areas of timber on the extreme higher elevations. The water is diverted at several points for irrigation, a considerable quantity being taken from the canyon above the gaging station and used in the vicinity of Escondido, which lies in an entirely separate drainage basin. This stream is torrential in its character, the discharge being very light except during the winter season, in times of heavy rainfall. The mean precipitation varies from 10 to 20 inches and falls principally in the form of rain, there being only a light fall of snow on the extreme higher elevations, which soon melts and only adds to the flood discharge.

SAN LUIS REY RIVER NEAR PALA, CAL.

This station was established October 9, 1903. It is located at Siler's mill, 4 miles above Pala, Cal. It is reached by driving from Folsom brook or Temecula, stations on the Southern California Railway, 10 and 13 miles distant, respectively. The conditions at this station and the bench marks are described in Water-Supply Paper No. 1, page 91, where are given also references to publications that contain data for previous years. The datum of the gage was lowered 4 feet November 13, 1906.

Discharge measurements of San Luis Rey River near Pala, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Dis-charge. |
|------------------|-------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| January 11..... | W. V. Hardy..... | 10 | 6 | 0.60 | 9.0 |
| January 28..... | do..... | 12 | 8.3 | 0.18 | 14.7 |
| February 9..... | do..... | 12 | 5.5 | 0.13 | 10.4 |
| February 26..... | do..... | 19 | 8.6 | 0.66 | 17.9 |
| March 4..... | do..... | 22 | 14 | 1.02 | 38 |
| March 4..... | do..... | 22 | 16 | 1.10 | 43 |
| March 5..... | do..... | 22 | 18.8 | 1.20 | 48 |
| March 6..... | do..... | 20 | 14. | 1.00 | 38 |
| March 7..... | do..... | 20 | 12.4 | 0.93 | 32 |
| March 16..... | do..... | 72 | 116 | 3.70 | 447 |
| March 17..... | do..... | 89 | 287 | 5.30 | 1,540 |
| March 17..... | do..... | 79 | 191 | 4.70 | 984 |
| March 17..... | do..... | 72 | 156 | 4.30 | 811 |
| March 18..... | do..... | 72 | 113 | 3.80 | 532 |
| March 19..... | do..... | 67 | 105 | 2.70 | 367 |
| March 20..... | do..... | 52 | 73 | 2.50 | 238 |
| March 21..... | do..... | 52 | 64 | 2.40 | 182 |
| April 12..... | do..... | 65 | 84 | 2.20 | 307 |
| April 26..... | do..... | 57 | 37 | 1.52 | 119 |
| May 14..... | do..... | 48 | 58 | 1.18 | 166 |
| June 27..... | C. H. Lee..... | 33 | 15 | 0.61 | 28 |
| August 5..... | R. S. Hawley..... | 11 | 3.8 | 0.30 | 5.9 |
| October 10..... | W. F. Martin..... | 15 | 2.8 | ..... | 3.0 |
| November 13..... | W. V. Hardy..... | 8 | 3.2 | a 5.27 | 3.5 |
| December 5..... | do..... | 25 | 9.0 | a 5.55 | 13 |
| December 28..... | do..... | 57 | 102 | a 7.15 | 322 |

a By new gage.*Daily gage height, in feet, of San Luis Rey River near Pala, Cal., for 1906.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|-------|-------|------|
| 1..... | 0.75 | 0.1 | 0.8 | 3.35 | 1.6 | 1.1 | 0.5 | 0.5 | 0.2 | 0.2 | ..... | 5.6 |
| 2..... | .7 | .1 | .8 | 2.9 | 1.5 | 1.1 | .5 | .5 | .2 | .2 | ..... | 5.6 |
| 3..... | .7 | .9 | .8 | 2.55 | 1.4 | 1.1 | .5 | .5 | .2 | .2 | ..... | 5.55 |
| 4..... | .7 | .9 | 1.0 | 2.5 | 1.4 | 1.1 | .5 | .5 | .2 | .2 | ..... | 5.55 |
| 5..... | .7 | .15 | 1.2 | 2.75 | 1.5 | 1.1 | .5 | .5 | .2 | .2 | ..... | 5.55 |
| 6..... | .7 | .2 | 1.0 | 3.0 | 1.45 | 1.05 | .5 | .5 | .2 | .2 | ..... | 5.55 |
| 7..... | .7 | .3 | .95 | 3.0 | 1.4 | 1.0 | .5 | .25 | .2 | .2 | ..... | 5.5 |
| 8..... | .7 | .3 | .7 | 3.05 | 1.3 | 1.0 | .5 | .3 | .2 | .2 | ..... | 5.5 |
| 9..... | .65 | .25 | .6 | 2.6 | 1.3 | .9 | .5 | .25 | .2 | .2 | ..... | 5.5 |
| 10..... | .65 | .2 | .65 | 2.6 | 1.3 | .85 | .5 | .25 | .2 | .2 | ..... | 5.45 |
| 11..... | .6 | .65 | .65 | 2.45 | 1.25 | .8 | .5 | .3 | .2 | .2 | ..... | 5.4 |
| 12..... | .6 | .5 | 5.0 | 2.2 | 1.55 | .7 | .5 | .25 | .2 | .2 | ..... | 7.8 |
| 13..... | .6 | .4 | 6.55 | 2.15 | 1.4 | .7 | .5 | .2 | .2 | .2 | 5.25 | 7.2 |
| 14..... | .7 | .4 | 3.55 | 2.15 | 1.2 | .65 | .5 | .2 | .2 | .2 | 5.25 | 6.5 |
| 15..... | .7 | .8 | 2.3 | 2.15 | 1.15 | .6 | .5 | .2 | .5 | .2 | 5.25 | 5.8 |
| 16..... | .7 | 2.65 | 2.85 | 2.05 | 1.1 | .6 | .5 | .2 | .35 | ..... | 5.25 | 5.8 |
| 17..... | .65 | .85 | 4.8 | 2.05 | 1.05 | .85 | .5 | .2 | .2 | ..... | 5.25 | 5.7 |
| 18..... | .65 | .95 | 3.65 | 1.95 | 1.0 | .8 | .5 | .8 | .2 | ..... | 5.25 | 5.65 |
| 19..... | 1.0 | .85 | 2.95 | 1.95 | 1.0 | .7 | .5 | .7 | .2 | ..... | 5.25 | 5.6 |
| 20..... | 2.6 | .75 | 2.5 | 1.85 | .95 | .6 | .5 | .6 | .2 | ..... | 5.25 | 5.55 |
| 21..... | 1.2 | .9 | 2.4 | 1.8 | 1.0 | .6 | .5 | .5 | .2 | ..... | 5.25 | 5.55 |
| 22..... | .9 | .95 | 2.5 | 1.75 | .9 | .65 | .5 | .3 | .2 | ..... | 5.5 | 5.5 |
| 23..... | .6 | 1.0 | 2.5 | 1.75 | .9 | .6 | .5 | .25 | .2 | ..... | 5.65 | 5.5 |
| 24..... | .3 | .95 | 10.0 | 1.65 | .9 | .55 | .5 | .25 | .2 | ..... | 5.6 | 5.45 |
| 25..... | .3 | .9 | 7.0 | 1.6 | .9 | .5 | .5 | .2 | .2 | ..... | 5.6 | 5.4 |
| 26..... | .25 | .6 | 7.25 | 1.5 | 1.25 | .5 | .5 | .2 | .2 | ..... | 5.6 | 5.8 |
| 27..... | .2 | .6 | 4.6 | 1.45 | 1.5 | .5 | .5 | .2 | .2 | ..... | 5.7 | 6.6 |
| 28..... | .18 | .9 | 4.4 | 1.7 | 1.7 | .5 | .5 | .2 | .2 | ..... | 5.6 | 6.7 |
| 29..... | .15 | ..... | 4.1 | 1.7 | 1.5 | .5 | .5 | .2 | .2 | ..... | 5.6 | 6.8 |
| 30..... | .15 | ..... | 3.35 | 1.6 | 1.3 | .5 | .5 | .2 | .2 | ..... | 5.6 | 6.6 |
| 31..... | .15 | ..... | 4.0 | ..... | 1.25 | ..... | .5 | .2 | ..... | ..... | ..... | 6.7 |

NOTE.--Gage heights after November 13 are by the new gage, the datum of which is 4.66 feet below that of the old gage.

Monthly discharge of San Luis Rey River near Pala for 1906.

[Drainage area, 318 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|------------------------|---------------------------|--------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Dep. inc. |
| January..... | 232 | 9 | 21.4 | 1,320 | 0.067 | |
| February..... | 241 | 10 | 28.6 | 1,590 | .090 | |
| March..... | 13,000 | 17 | 1,120 | 68,900 | 3.52 | |
| April..... | 620 | 114 | 301 | 17,900 | .947 | |
| May..... | 260 | 100 | 158 | 9,720 | .497 | |
| June..... | 128 | 19 | 65.6 | 3,900 | .206 | |
| July..... | 19 | 19 | 19.0 | 1,170 | .060 | |
| August..... | 43 | 3 | 10.3 | 633 | .032 | |
| September..... | 19 | 3 | 3.7 | 220 | .012 | |
| October..... | 3 | 3 | 3.0 | 184 | .0094 | |
| November..... | 28 | 3 | 8.3 | 494 | .026 | |
| December..... | 550 | 9 | 79.3 | 4,880 | .249 | |
| The year..... | 13,000 | 3 | 152 | 111,000 | .476 | |

NOTE. -Discharges were obtained by the indirect method for shifting channels. Values are for

SANTA MARGARITA RIVER DRAINAGE BASIN.**DESCRIPTION OF BASIN.**

Temecula Creek, as Santa Margarita River is known at its beginning, rises on the western slope of the San Jacinto Mountains in the northwestern part of San Diego County just north of the San Luis Rey drainage basin, flows north into Riverside County, then west about 15 miles to Temecula, where it flows southwest through Temecula Canyon into San Diego County and empties into the Pacific Ocean as Santa Margarita River. The highest elevation in the basin is about 5,500 feet on the divide between Temecula and San Luis Rey. Temecula Creek has few tributaries, and the topography is rather broken, though there are several small valleys in the upper reaches. The rock formation through which it flows is a loose granite with good soil covering, and there is considerable growth of scrubby timber. The annual precipitation varies from 10 to 20 inches and occurs almost entirely as rain. The discharge is quite heavy in the spring during the flood season, but is small during the rest of the year.

Measurements are useful in connection with irrigation.

TEMECULA CREEK NEAR TEMECULA, CAL.

This station was established December 30, 1905. It is located about $1\frac{1}{2}$ miles south of the town of Temecula at the bridge on the road from Temecula to Pala and Falbrook. It is reached by driving from Temecula.

The channel is straight for 500 feet above and 100 feet below. The bed is shifting sand and the channel is continually changing, but

usually in two channels at low water. Neither bank is liable to overflow at any stage.

During low water, discharge measurements are made by wading below the bridge. High-water measurements are made from the downstream side of the bridge.

The gage, which during 1906 was read once a day by Hugh McConville, is a 2 by 6 inch timber fastened to the downstream pier nearest to the right bank by two pieces of strap iron. It is in one vertical section, painted white, and graduated into feet and tenths. The graduations run from 0.0 to 10 feet. Marks 10 feet apart are put on the bridge rail in yellow paint for use in soundings. The bench mark is a nail in the base of a willow tree on the right bank of the river below the bridge; elevation, 8.13 feet above the zero of the gage.

Discharge measurements of Temecula River near Temecula, Cal., in 1905-6.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Dis-charge. |
|-------------------|---------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1905. | | | | | |
| November 14... | W. B. Clapp. | 11 | 5.4 | 3.10 | 5.8 |
| December 30... | W. V. Hardy | 9 | 3.5 | 2.98 | 4.6 |
| 1906. | | | | | |
| January 12..... | W. V. Hardy | 8 | 3.3 | 2.90 | 4.4 |
| January 29..... | do. | 8 | 4.0 | 2.94 | 4.9 |
| February 10..... | do. | 10 | 4.1 | 2.96 | 4.4 |
| February 24..... | do. | 16.5 | 7.7 | 3.20 | 3.3 |
| March 5..... | do. | 12 | 10.3 | 3.19 | 6.0 |
| March 6..... | do. | 12 | 9.3 | 3.42 | 5.4 |
| March 18..... | do. | 36 | 18.0 | 3.82 | 16.8 |
| March 19..... | do. | 27 | 11.9 | 3.69 | 12.0 |
| April 13..... | do. | 65 | 16.0 | 5.84 | 12.1 |
| April 27..... | do. | 11 | 4.1 | 5.82 | 5.6 |
| May 15..... | do. | 15 | 5.0 | 5.88 | 6.4 |
| June 26..... | C. H. Lee | 11 | 2.1 | 5.80 | 2.6 |
| August 5..... | R. S. Hawley | 3 | 0.8 | ..... | 0.8 |
| October 10..... | W. F. Martin | 16 | 2.5 | ..... | 3.9 |
| November, 12..... | W. V. Hardy | 14.5 | 5.7 | 5.80 | 7.6 |
| December 4..... | do. | 10 | 4.4 | 6.00 | 7.2 |
| December 29..... | do. | 12 | 6.0 | 6.10 | 14.9 |

Daily gage height, in feet, of Temecula River near Temecula, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | D. |
|---------|------|-------|------|-------|------|-------|-------|-------|
| 1..... | 3.0 | 2.9 | 3.4 | 5.9 | 5.75 | 5.8 | 5.8 | ..... |
| 2..... | 3.0 | 2.8 | 3.5 | 5.8 | 5.7 | 5.8 | 5.8 | ..... |
| 3..... | 3.0 | 2.8 | 3.5 | 5.8 | 5.7 | 5.8 | 5.8 | ..... |
| 4..... | 3.0 | 2.8 | 3.45 | 5.8 | 5.7 | 5.8 | 5.8 | ..... |
| 5..... | 3.0 | 2.8 | 3.45 | 6.7 | 5.75 | 5.8 | 5.8 | ..... |
| 6..... | 3.0 | 2.8 | 3.5 | 6.3 | 5.75 | 5.8 | 5.8 | ..... |
| 7..... | 3.0 | 2.8 | 3.5 | 5.8 | 5.75 | 5.8 | 5.8 | ..... |
| 8..... | 3.0 | 2.9 | 3.55 | 5.8 | 5.75 | 5.8 | 5.8 | ..... |
| 9..... | 2.9 | 2.95 | 3.5 | 5.8 | 5.75 | 5.8 | 5.8 | ..... |
| 10..... | 2.9 | 2.95 | 3.6 | 5.8 | 5.75 | 5.8 | 5.8 | ..... |
| 11..... | 2.9 | 3.0 | 3.9 | 5.8 | 5.75 | 5.75 | 5.8 | ..... |
| 12..... | 2.9 | 3.0 | 4.9 | 5.8 | 5.7 | 5.7 | 5.8 | ..... |
| 13..... | 2.9 | 3.0 | 5.0 | 5.8 | 5.7 | 5.75 | 5.8 | ..... |
| 14..... | 2.9 | 3.0 | 4.9 | 5.8 | 5.7 | 5.8 | 5.8 | ..... |
| 15..... | 2.9 | 3.0 | 4.9 | 5.8 | 5.7 | 5.75 | 5.8 | ..... |
| 16..... | 2.9 | 3.2 | 3.7 | 5.8 | 5.8 | 5.75 | 5.8 | ..... |
| 17..... | 2.9 | 3.2 | 3.7 | 5.8 | 5.85 | 5.75 | 5.8 | ..... |
| 18..... | 2.9 | 3.25 | 3.65 | 5.8 | 5.85 | 5.75 | ..... | ..... |
| 19..... | 3.1 | 3.25 | 3.65 | 5.75 | 5.85 | 5.75 | ..... | ..... |
| 20..... | 3.0 | 3.25 | 3.5 | 5.75 | 5.85 | 5.75 | ..... | ..... |
| 21..... | 3.0 | 3.25 | 3.3 | 5.75 | 5.85 | 5.75 | ..... | ..... |
| 22..... | 3.0 | 3.25 | 3.4 | 5.75 | 5.9 | 5.75 | ..... | ..... |
| 23..... | 3.0 | 3.25 | 9.6 | 5.75 | 5.9 | 5.75 | ..... | ..... |
| 24..... | 3.0 | 3.25 | 9.65 | 5.75 | 5.85 | 5.75 | ..... | ..... |
| 25..... | 3.0 | 3.25 | 8.0 | 5.75 | 5.85 | 5.75 | ..... | ..... |
| 26..... | 3.0 | 3.3 | 7.6 | 5.75 | 5.9 | 5.8 | ..... | ..... |
| 27..... | 2.9 | 3.4 | 6.0 | 5.75 | 5.85 | 5.8 | ..... | ..... |
| 28..... | 2.9 | 3.4 | 5.5 | 5.75 | 5.8 | 5.8 | ..... | ..... |
| 29..... | 2.9 | ..... | 5.5 | 5.75 | 5.8 | 5.8 | ..... | ..... |
| 30..... | 2.9 | ..... | 5.9 | 5.75 | 5.8 | 5.8 | ..... | ..... |
| 31..... | 2.9 | ..... | 5.9 | ..... | 5.8 | ..... | ..... | ..... |

NOTE.—No gage height record was kept from July 18 to December 2. Discharges have not been computed on account of the small number of measurements at times of excessive changes in channel.

SANTA ANA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Santa Ana River has its source in the southern slope of the San Bernardino Mountains. It traverses the San Bernardino Valley in a southwesterly direction, breaks in a narrow canyon through the Santa Ana Mountains, and finally discharges through the Santa Ana Valley into the Pacific Ocean below the town of Santa Ana. Numerous tributaries rise in the southern slope of the San Bernardino Mountains, the surface flow of most of which reaches Santa Ana River where it traverses San Bernardino Valley only in times of flood discharge. The topography on the higher elevations is rough and rugged, reaching elevations of from 10,000 to 12,000 feet, the formation being of granite with good soil covering and considerable growth of timber. On the lower elevations the topography is less rough and the soil covering is principally of brush. A gaging station is located on this stream at Warm Springs, about 8 miles above Redlands. Below this the river leaves the mountainous country and discharges over a sandy and gravelly bed through the San Bernardino Valley. During the summer months the entire flow of the stream is diverted above this gaging station and used for power development at

mouth of the canyon, below which point it is again taken out and used for irrigation on the higher elevations of the San Bernardino Valley along the base of the mountains, where the country is under a high state of cultivation, principally for the raising of citrus fruits. The water rises to the surface in San Bernardino Valley near the city of San Bernardino and is diverted and used extensively for irrigation in the neighborhood of Riverside. In addition to this surface flow, a large number of wells have been sunk in this territory, many of which are artesian, while others require pumping. This developed water is also used extensively for irrigation in the vicinity of San Bernardino and Riverside. The water is again forced to the surface by bed-rock obstructions at Riverside Narrows below the city of Riverside, and gradually increases in volume until it reaches Santa Ana Canyon, where it is diverted for irrigation on the lower valley lands in the vicinity of Santa Ana and Fullerton. During the summer months measurements are made of the flow at Rincon, Cal., at the head of Santa Ana Canyon. There are only occasional flood discharges of this river which flow continuously from the mountain to the sea. The mean precipitation throughout this basin is from 15 to 30 inches, which falls in the form of rain except on the higher elevations of the San Bernardino Mountains, where there is a considerable snowfall, usually remaining on the extreme high elevations until midsummer. A storage reservoir has been constructed on Bear Creek, a tributary of this stream, and is known as the Bear Valley reservoir. This stored water is held until the summer months and used for irrigation in the San Bernardino Valley.

SANTA ANA RIVER NEAR MENTONE, CAL.

This station was established in June, 1896. It is located 5 miles northeast of Mentone, Cal., three-fourths of a mile below the head works of the Mentone Power Company's canal and opposite the warm springs in the canyon.

The Edison Electric Company diverts the greater portion of the water from 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.

The Mentone Power Company's canal, formerly called the Santa Ana canal, diverts water above the station, all of which is returned below the point of measurement. During the low-water season the entire flow of the river is diverted by the canals. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 94, where are given also references to publications that contain data for previous years.

Discharge measurements of Santa Ana River near Mentone, Cal., in 1906.

| Date. | Hydrographer. | Gage height of river. | Discharge. | | |
|------------------|-------------------|-----------------------|-----------------|--------------------------------|-------------|
| | | | River. | Mentone Power Company's canal. | Total. |
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Sec.-ft.</i> | <i>Sec.</i> |
| January 20..... | C. H. Lee..... | 2.17 | 87 | 37 | |
| February 11..... | do..... | 1.51 | 11 | 42 | |
| February 11..... | do..... | 1.57 | 15.8 | 42 | |
| February 11..... | do..... | 1.54 | 12.8 | 42 | |
| February 12..... | do..... | 1.45 | 6.7 | 52 | |
| March 14..... | do..... | 3.50 | 351 | 27 | |
| March 16..... | do..... | 5.40 | 1,410 | 49 | |
| March 16..... | do..... | 5.80 | 1,870 | 49 | |
| March 17..... | do..... | 4.15 | 977 | 0 | |
| March 17..... | do..... | 3.85 | 597 | 0 | |
| March 18..... | do..... | 3.70 | 405 | 11 | |
| March 23..... | M. P. Beeson..... | 3.05 | 156 | 55 | |
| March 25..... | do..... | 4.90 | 913 | 35 | |
| March 26..... | do..... | 6.35 | 2,250 | 34 | |
| March 26..... | do..... | 5.90 | 1,780 | 34 | |
| March 27..... | do..... | 5.25 | 1,200 | 25 | |
| April 10..... | C. H. Lee..... | 3.00 | 130 | 68 | |
| April 21..... | M. P. Beeson..... | 3.50 | 214 | 72 | |
| May 12..... | do..... | 3.60 | 148 | 71 | |
| May 12..... | do..... | 3.60 | 160 | 71 | |
| June 2..... | do..... | 3.50 | 149 | 66 | |
| June 28..... | do..... | 3.00 | 70 | 71 | |
| August 4..... | R. S. Hawley..... | 2.55 | 13 1 | 72 | |
| October 11..... | W. F. Martin..... | 2.31 | 2.9 | 61 | |
| December 28..... | do..... | 3.85 | 276 | 74 | |

Daily gage height, in feet, of Santa Ana River near Mentone, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|------|-------|------|
| 1..... | 1.3 | 1.3 | 1.9 | 3.9 | 3.1 | 4.0 | 3.0 | 2.6 | 2.3 | 2.5 | 2.3 | |
| 2..... | 1.3 | 1.3 | 1.9 | 3.4 | 3.0 | 3.5 | 3.0 | 2.6 | 2.3 | 2.5 | 2.3 | |
| 3..... | 1.3 | 1.3 | 1.7 | 3.3 | 2.9 | 3.5 | 2.9 | 2.5 | 2.3 | 2.5 | 2.3 | |
| 4..... | 1.3 | 1.3 | 1.6 | 3.4 | 2.9 | 3.3 | 2.9 | 2.5 | 2.3 | 2.5 | 2.3 | |
| 5..... | 1.3 | 1.3 | 1.5 | 2.4 | 3.6 | 3.3 | 3.0 | 2.4 | 2.3 | 2.5 | 2.3 | |
| 6..... | 1.3 | 1.3 | 1.5 | 3.3 | 3.7 | 3.3 | 3.0 | 2.4 | 2.3 | 2.5 | 2.3 | |
| 7..... | 1.3 | 1.3 | 1.4 | 3.2 | 3.4 | 3.2 | 3.0 | 2.4 | 2.2 | 2.5 | 2.3 | |
| 8..... | 1.3 | 1.3 | 1.4 | 3.1 | 3.8 | 3.2 | 3.0 | 2.4 | 2.2 | 2.5 | 2.3 | |
| 9..... | 1.3 | 1.3 | 1.4 | 3.0 | 3.8 | 3.2 | 2.9 | 2.4 | 2.2 | 2.5 | 2.3 | |
| 10..... | 1.3 | 1.3 | 1.4 | 3.0 | 3.8 | 3.2 | 2.9 | 2.4 | 2.2 | 2.5 | 2.3 | |
| 11..... | 1.3 | 1.3 | 1.4 | 3.0 | 3.8 | 3.4 | 2.9 | 2.4 | 2.2 | 2.5 | 2.3 | |
| 12..... | 1.3 | 1.3 | 6.5 | 2.9 | 3.6 | 3.2 | 2.9 | 2.4 | 2.2 | 2.5 | 2.3 | |
| 13..... | 1.3 | 1.3 | 4.5 | 2.9 | 3.6 | 3.2 | 2.9 | 2.6 | 2.2 | 2.5 | 2.3 | |
| 14..... | 1.3 | 1.3 | 3.4 | 3.0 | 3.4 | 3.2 | 2.9 | 2.6 | 2.2 | 2.5 | 2.3 | |
| 15..... | 1.3 | 1.3 | 3.0 | 2.9 | 3.3 | 3.2 | 2.9 | 2.5 | 2.2 | 2.5 | 2.3 | |
| 16..... | 1.3 | 1.3 | 5.0 | 2.9 | 3.3 | 3.2 | 3.0 | 2.6 | 2.3 | 2.5 | 2.3 | |
| 17..... | 1.3 | 1.3 | 4.15 | 2.9 | 3.2 | 3.1 | 2.9 | 2.9 | 2.3 | 2.5 | 2.3 | |
| 18..... | 1.3 | 1.3 | 3.7 | 2.9 | 3.2 | 3.1 | 2.9 | 3.0 | 2.3 | 2.5 | 2.3 | |
| 19..... | 2.4 | 1.3 | 3.45 | 2.9 | 3.2 | 3.1 | 2.8 | 2.7 | 2.3 | 2.5 | 2.3 | |
| 20..... | 2.2 | 1.3 | 3.25 | 3.0 | 3.2 | 3.1 | 2.8 | 2.6 | 2.3 | 2.5 | 2.3 | |
| 21..... | 1.7 | 1.3 | 3.15 | 3.5 | 3.2 | 3.1 | 2.7 | 2.5 | 2.3 | 2.3 | 2.3 | |
| 22..... | 1.5 | 1.9 | 3.1 | 3.8 | 3.4 | 3.1 | 2.8 | 2.4 | 2.5 | 2.3 | 2.3 | |
| 23..... | 1.5 | 2.0 | 3.05 | 3.9 | 3.5 | 3.1 | 2.8 | 2.3 | 2.5 | 2.3 | 2.3 | |
| 24..... | 1.4 | 2.0 | 4.6 | 3.9 | 3.5 | 3.4 | 2.9 | 2.1 | 2.5 | 2.3 | 2.3 | |
| 25..... | 1.4 | 2.0 | 4.95 | 3.7 | 3.2 | 3.1 | 2.8 | 2.0 | 2.5 | 2.3 | 2.5 | |
| 26..... | 1.3 | 2.0 | 5.8 | 3.7 | 3.2 | 3.0 | 2.8 | 2.3 | 2.5 | 2.3 | 2.3 | |
| 27..... | 1.3 | 2.0 | 5.2 | 3.1 | 3.3 | 3.1 | 2.8 | 2.3 | 2.5 | 2.3 | 2.3 | |
| 28..... | 1.3 | 2.0 | 4.9 | 3.3 | 4.9 | 3.1 | 2.7 | 2.3 | 2.5 | 2.3 | 2.3 | |
| 29..... | 1.3 | ..... | 4.6 | 3.8 | 4.4 | 3.0 | 2.7 | 2.3 | 2.5 | 2.3 | 2.3 | |
| 30..... | 1.3 | ..... | 4.3 | 3.8 | 4.3 | 3.0 | 2.7 | 2.3 | 2.5 | 2.3 | 2.3 | |
| 31..... | 1.3 | ..... | 4.2 | ..... | 4.0 | ..... | 2.6 | 2.3 | ..... | 2.3 | ..... |  |

Daily discharge, in second-feet, of Mentone Power Company's canal near Mentone, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|------|-------|------|
| 1..... | 34 | 32 | 51 | 0 | 70 | 71 | 71 | 72 | 63 | 64 | 67 | 62 |
| 2..... | 33 | 32 | 48 | 56 | 71 | 66 | 66 | 72 | 58 | 64 | 60 | 61 |
| 3..... | 34 | 32 | 48 | 55 | 71 | 70 | 71 | 72 | 58 | 64 | 60 | 70 |
| 4..... | 34 | 32 | 43 | 57 | 71 | 71 | 71 | 72 | 63 | 63 | 62 | 71 |
| 5..... | 34 | 32 | 56 | 56 | 71 | 70 | 71 | 72 | 63 | 63 | 64 | 71 |
| 6..... | 34 | 35 | 52 | 52 | 71 | 70 | 71 | 72 | 63 | 63 | 66 | 72 |
| 7..... | 34 | 35 | 51 | 65 | 71 | 70 | 71 | 71 | 66 | 61 | 66 | 67 |
| 8..... | 34 | 35 | 50 | 70 | 70 | 70 | 71 | 68 | 64 | 61 | 56 | 60 |
| 9..... | 34 | 44 | 50 | 70 | 72 | 70 | 71 | 70 | 63 | 61 | 60 | 60 |
| 10..... | 34 | 41 | 50 | 68 | 71 | 70 | 71 | 71 | 62 | 61 | 60 | 68 |
| 11..... | 33 | 42 | 46 | 73 | 66 | 70 | 71 | 71 | 62 | 61 | 60 | 61 |
| 12..... | 34 | 52 | 43 | 74 | 71 | 70 | 71 | 71 | 62 | 61 | 60 | 59 |
| 13..... | 35 | 59 | 40 | 74 | 66 | 71 | 71 | 71 | 59 | 61 | 58 | 74 |
| 14..... | 45 | 55 | 27 | 66 | 63 | 71 | 71 | 72 | 60 | 61 | 54 | 72 |
| 15..... | 44 | 63 | 43 | 66 | 66 | 71 | 71 | 72 | 64 | 61 | 57 | 72 |
| 16..... | 44 | 62 | 49 | 66 | 66 | 71 | 71 | 72 | 63 | 61 | 54 | 65 |
| 17..... | 37 | 64 | 0 | 68 | 66 | 70 | 71 | 45 | 58 | 61 | 54 | 68 |
| 18..... | 37 | 51 | 11 | 68 | 68 | 70 | 71 | 42 | 58 | 64 | 56 | 65 |
| 19..... | 59 | 49 | 35 | 71 | 70 | 71 | 71 | 72 | 56 | 63 | 56 | 65 |
| 20..... | 37 | 48 | 44 | 72 | 70 | 71 | 71 | 72 | 56 | 63 | 54 | 59 |
| 21..... | 48 | 48 | 43 | 72 | 66 | 70 | 71 | 72 | 57 | 67 | 57 | 59 |
| 22..... | 50 | 60 | 58 | 71 | 71 | 72 | 71 | 72 | 54 | 67 | 53 | 59 |
| 23..... | 37 | 58 | 55 | 71 | 71 | 71 | 71 | 72 | 52 | 67 | 53 | 56 |
| 24..... | 37 | 56 | 71 | 71 | 71 | 71 | 71 | 72 | 52 | 67 | 53 | 61 |
| 25..... | 41 | 55 | 35 | 70 | 66 | 71 | 72 | 72 | 52 | 67 | 52 | 59 |
| 26..... | 38 | 53 | 34 | 71 | 66 | 66 | 72 | 70 | 52 | 67 | 52 | 76 |
| 27..... | 35 | 51 | 25 | 71 | 64 | 64 | 72 | 70 | 59 | 66 | 59 | 74 |
| 28..... | 35 | 49 | 55 | 71 | 0 | 71 | 72 | 66 | 62 | 64 | 56 | 74 |
| 29..... | 33 | ..... | 34 | 71 | 66 | 71 | 72 | 66 | 63 | 68 | 57 | 74 |
| 30..... | 33 | ..... | 21 | 71 | 66 | 71 | 72 | 65 | 64 | 67 | 62 | 73 |
| 31..... | 33 | ..... | 27 | ..... | 64 | ..... | 72 | 66 | ..... | 67 | ..... | 74 |

Monthly discharge of Santa Ana River near Mentone, Cal., for 1906.

[Drainage area, 182 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 181 | 34 | 46.8 | 2,880 | 0.257 | 0.30 |
| February..... | 121 | 33 | 63.1 | 3,500 | .347 | .36 |
| March..... | 2,440 | 51 | 530 | 32,600 | 2.91 | 3.36 |
| April..... | 495 | 186 | 274 | 16,300 | 1.50 | 1.67 |
| May..... | 536 | 163 | 245 | 15,100 | 1.35 | 1.56 |
| June..... | 329 | 135 | 172 | 10,200 | .945 | 1.05 |
| July..... | 140 | 90 | 119 | 7,320 | .654 | .75 |
| August..... | 111 | 67 | 80.5 | 4,950 | .442 | .51 |
| September..... | 74 | 58 | 64.1 | 3,810 | .352 | .39 |
| October..... | 74 | 66 | 71.4 | 4,390 | .392 | .45 |
| November..... | 69 | 54 | 60.3 | 3,590 | .331 | .37 |
| December..... | 859 | 56 | 111 | 6,820 | .610 | .70 |
| The year..... | 2,440 | 33 | 153 | 111,000 | .841 | 11.47 |

NOTE.—The discharge includes that of the Mentone Power Company's canal. Discharges for the river were obtained from rating tables covering short periods of time on account of the constant change in channel. Values are fair.

SEEPAGE MEASUREMENTS.

In the vicinity of Colton and San Bernardino large quantities of water are developed in addition to the natural surface flow. This water is used for the irrigation of land in the vicinity of San Ber-

nardino, Colton, and Riverside, and also for domestic supply these towns. Much of this water returns to Santa Ana River below Riverside, above a point known as Slover Mountain, and is again diverted and used for irrigation on the lower lands below Riverside and above what is known as Riverside Narrows. Below this point there are still further diversions which irrigate the lower lands along the river bottom, much of this water again returning to the river above Rincon. Measurements were made during the summer of 1905 and 1906 to determine the amount of water, including natural flow and developed water, above Colton, Cal. Also measurements were made of natural flow and developed water below Slover Mountain and above Riverside Narrows, this all being returned water from irrigated lands on the higher elevations. Measurements were also made of diversion ditches and Santa Ana River below Riverside Narrows and above what is known as the Auburn Dam Bridge. The following tabulations show the result of these measurements, which were made by K. Sanborn, of Riverside, Cal.

Measurements made during 1905 are contained in Water-Supply Paper No. 177, pages 99 to 102.

Natural flow, in second-feet, of return water to Santa Ana River, compared with developed water in San Bernardino above Colton, Cal., 1906.

[Measurements by Kingsbury Sanborn, engineer Riverside Water Company.]

| Date. | Location. | De- veloped. | Natural. | To |
|-------------------|---|-----------------|----------|----|
| June 23..... | Barnhill pumping plant..... | 1.30 | ..... |  |
| August 27..... | do..... | 1.50 | ..... |  |
| June 18..... | Beam ditch..... | ..... | 0.00 | |
| August 23..... | do..... | ..... | .00 | |
| June 20..... | Bloomington pumping plant..... | 10.50 | ..... |  |
| September 20..... | do..... | 6.70 | ..... |  |
| September 20..... | Citizens Water Co. pumping plant..... | 1.50 | ..... |  |
| June 29..... | City of San Bernardino, Sixth street pumping plant..... | 2.00 | ..... |  |
| October 23..... | do..... | 4.80 | ..... |  |
| June 20..... | City of San Bernardino, Lytle Creek..... | ..... | 1.90 | |
| September 20..... | do..... | ..... | 2.00 | |
| June 19..... | City of Colton pumping plant (total)..... | 2.40 | ..... |  |
| August 27..... | do..... | 3.50 | ..... |  |
| June 19..... | City of Colton (water used for irrigating)..... | .70 | ..... |  |
| August 27..... | do..... | 1.60 | ..... |  |
| June 20..... | Camp Carlton ditch..... | 2.70 | ..... |  |
| September 7..... | do..... | 1.94 | ..... |  |
| June 19..... | Carr pumping plant..... | .40 | ..... |  |
| August 24..... | do..... | .70 | ..... |  |
| June 25..... | Daley ditch..... | ..... | .00 | |
| October 24..... | do..... | ..... | .00 | |
| June 27..... | Excelsior Land and Water Co..... | .60 | ..... |  |
| August 24..... | do..... | .75 | ..... |  |
| June 19..... | Grand Terrace pumping plant..... | .30 | ..... |  |
| September 7..... | do..... | .35 | ..... |  |
| June 20..... | Gage Canal, Palm avenue weir..... | 22.90 | 8.30 | |
| September 7..... | do..... | 38.00 | ..... |  |
| June 19..... | Gage Canal intake, Santa Ana River..... | ..... | 8.30 | |
| September 7..... | do..... | ..... | .00 | |
| June 14..... | Haws & Talmadge ditch..... | ..... | .05 | |
| August 23..... | do..... | ..... | .08 | |
| June 19..... | Hunter pumping plant..... | 1.90 | ..... |  |
| August 27..... | do..... | 1.50 | ..... |  |
| June 23..... | Johnson & Hubbard pumping plant..... | .52 | ..... |  |
| August 27..... | do..... | .48 | ..... |  |
| June 23..... | Lamb pumping plant..... | .00 | ..... |  |
| August 27..... | do..... | .00 | ..... |  |
| June 23..... | Lawson Well Co. pumping plant..... | .60 | ..... |  |
| August 27..... | do..... | .70 | ..... |  |
| June 18..... | Logsdon & Farrell ditch..... | ..... | .00 | |

Natural flow, in second-feet, of return water to Santa Ana River, compared with developed water in San Bernardino above Colton, Cal., 1906—Continued.

| Date. | Location. | De- veloped. | Natural. | Total. |
|-------------------|---|-----------------|----------|--------|
| October 24..... | Logedon & Farrell ditch..... | | 0.00 | 0.00 |
| June 20..... | Lytle Creek Water and Improvement Co. pumping plant..... | 0.00 | | .00 |
| September 20..... |do..... | .60 | | .00 |
| June 28..... | Merryfield pumping plant..... | .80 | | .80 |
| August 24..... |do..... | .79 | | .79 |
| June 18..... | McKenzie ditch..... | | .00 | .00 |
| August 23..... |do..... | | .00 | .00 |
| June 28..... | Meeks & Daley ditch..... | | 16.90 | 16.90 |
| August 31..... |do..... | | 17.10 | 17.10 |
| June 22..... | McIntyre ditch..... | | .00 | .00 |
| September 20..... |do..... | | .00 | .00 |
| June 23..... | Orange Land and Water Co. pumping plant..... | .00 | | .00 |
| August 27..... |do..... | .00 | | .00 |
| June 20..... | Riverside Highland Water Co. pumping plant..... | 3.60 | | 3.60 |
| September 20..... |do..... | 6.10 | | 6.10 |
| June 20..... | Riverside Highland Water Co., Santa Ana River..... | 1.80 | 2.50 | 4.30 |
| September 7..... |do..... | 6.90 | | 6.90 |
| June 20..... | Rancheria pumping plant..... | 2.00 | | 2.00 |
| September 20..... |do..... | 1.90 | | 1.90 |
| June 14..... | Rabel ditch..... | | .00 | .00 |
| August 23..... |do..... | | .00 | .00 |
| June 19..... | Riverside Water Co., upper canal..... | 2.90 | 38.60 | 41.50 |
| August 31..... |do..... | 23.65 | 26.35 | 50.00 |
| June 23..... | Riverside Water Co. mill pumping plant..... | .00 | | .00 |
| August 31..... |do..... | .00 | | .00 |
| June 20..... | Riverside Water Co. flume..... | | 16.70 | 16.70 |
| August 31..... |do..... | | .00 | .00 |
| June 25..... | Riverside Water Co. flume pump No. 1..... | .00 | | .00 |
| August 31..... |do..... | .00 | | .00 |
| June 25..... | Riverside Water Co. flume pump No. 2..... | .00 | | .00 |
| August 31..... |do..... | .00 | | .00 |
| June 28..... | Rosedale Water Co. pumping plant..... | .50 | | .50 |
| August 24..... |do..... | .00 | | .00 |
| June 19..... | Rogers pumping plant..... | 1.60 | | 1.60 |
| September 7..... |do..... | 2.40 | | 2.40 |
| June 25..... | Shay or Stout Dam ditch..... | | .00 | .00 |
| August 23..... |do..... | | .24 | .24 |
| June 23..... | Swamp ditch..... | | .80 | .80 |
| August 29..... |do..... | | .64 | .64 |
| June 27..... | West Riverside 350-inch Water Co. pumping plant..... | 6.00 | | 6.00 |
| August 31..... |do..... | 6.50 | | 6.50 |
| June 22..... | Whitlock ditch..... | | .00 | .00 |
| October 24..... |do..... | | .00 | .00 |
| October 24..... | Whiting ditch..... | | .00 | .00 |
| June 20..... | Ward and Warren ditch..... | | 5.10 | 5.10 |
| September 7..... |do..... | | .06 | .06 |

Return waters, in second-feet, in San Bernardino Valley below Slover Mountain and above Riverside Narrows, 1906.

[Measurements by Kingsbury Sanborn, engineer Riverside Water Company.]

| Date. | Location. | De- veloped. | Natural. | Total. |
|-------------------|---|-----------------|----------|--------|
| June 27..... | Alvitrez ditch at headgate, east end of West Riverside Bridge..... | | 5.20 | 5.20 |
| August 28..... |do..... | | 5.00 | 5.00 |
| June 29..... | Cuttle's pumping plant..... | 2.50 | | 2.50 |
| September 7..... |do..... | 2.50 | | 2.50 |
| June 29..... | California Orange Co..... | 1.30 | | 1.30 |
| September 7..... |do..... | 1.40 | | 1.40 |
| June 29..... | Evans Island or Jansen ditch, under west end of West Riverside Bridge..... | | .00 | .00 |
| September 3..... |do..... | | .00 | .00 |
| June 26..... | Evans ditch near county line..... | | 1.90 | 1.90 |
| September 3..... |do..... | | .00 | .00 |
| June 23..... | Evans Well ditch, Santa Ana street..... | | .00 | .00 |
| September 3..... |do..... | | .00 | .00 |
| June 29..... | Evans pipe line to China garden at headworks..... | | .00 | .00 |
| September 13..... |do..... | | 2.70 | 2.70 |
| June 27..... | Evans pumping plant 1,000 feet south of west end of West Riverside Bridge..... | 3.60 | | 3.60 |
| August 28..... |do..... | 5.53 | | 5.53 |
| June 29..... | Evans Jurupa pumping plant..... | .00 | | .00 |
| June 30..... | Ferris Gallagher ditch, near headworks..... | | 2.90 | 2.90 |
| September 13..... |do..... | | 3.25 | 3.25 |
| June 30..... | Gallagher ditch, near headworks..... | | .76 | .76 |
| September 13..... |do..... | | .00 | .00 |

Return waters, in second-feet, in San Bernardino Valley below Slower Mountain above Riverside Narrows, 1906—Continued.

| Date. | Location. | De- veloped. | Natural. | To |
|-------------------|--|-----------------|----------|----|
| June 26..... | Jurupa pumping plant to supply Rubidoux ditch..... | 2.30 | ..... |  |
| September 3..... | do..... | 5.20 | ..... |  |
| June 27..... | Lower canal, Riverside Water Co..... | ..... | 3.10 | |
| September 3..... | do..... | ..... | .00 | |
| June 29..... | Pond's pumping plant..... | 1.30 | ..... |  |
| September 7..... | do..... | 2.50 | ..... |  |
| June 26..... | Rubidoux ditch at measuring box..... | ..... | 4.40 | |
| September 3..... | do..... | ..... | 2.00 | |
| June 21..... | Riverside Power Co. canal at Pedley crossing..... | ..... | 27.70 | |
| September 29..... | do..... | ..... | 35.00 | |
| June 29..... | Rivino Land Co. pumping plant No. 1..... | .86 | ..... |  |
| September 7..... | do..... | .70 | ..... |  |
| September 13..... | Rivino Land Co. pumping plant No. 2..... | .83 | ..... |  |
| June 25..... | Smith or Evans ditch 1 mile below Riverside County line..... | ..... | 1.70 | |
| September 3..... | do..... | ..... | .00 | |
| June 27..... | Soquel ditch at intake..... | ..... | 6.00 | |
| August 28..... | do..... | ..... | 5.30 | |
| June 23..... | Spring Brook pumping plant at weir at end of main..... | .00 | ..... |  |
| September 3..... | do..... | .00 | ..... |  |
| June 26..... | Spanishtown pumping plant at weir at end of main..... | 4.60 | ..... |  |
| September 3..... | do..... | .00 | ..... |  |
| June 30..... | Zimmerman pipe line..... | ..... | 2.20 | |
| September 13..... | do..... | ..... | .00 | |

Discharge measurements, in second-feet, of canals between Riverside Narrows and Auburndale Bridge having their source in Santa Ana River, 1906.

| Date. | Location. | Discha |
|-------------------|--|--------|
| June 21..... | Castile ditch near intake..... | ..... |
| September 29..... | do..... | ..... |
| June 21..... | Durkee ditch at Auburndale road crossing..... | ..... |
| September 29..... | do..... | ..... |
| June 21..... | Fuller ditch..... | ..... |
| September 29..... | do..... | ..... |
| June 21..... | Gilliland ditch at Auburndale road crossing..... | ..... |
| September 29..... | do..... | ..... |
| June 21..... | Newton ditch near intake..... | ..... |
| September 29..... | do..... | ..... |
| June 21..... | Newberry ditch at Auburndale road crossing..... | ..... |
| September 29..... | do..... | ..... |
| June 21..... | Roberts or LeGay ditch near intake, Santa Ana River..... | ..... |
| September 29..... | do..... | ..... |
| June 21..... | Wilbur ditch at Rogers pipe trestle crossing, Santa Ana River..... | ..... |
| September 29..... | do..... | ..... |
| June 21..... | Santa Ana River at Auburndale Bridge..... | ..... |
| September 29..... | do..... | ..... |
| June 21..... | Santa Ana River at Auburndale Bridge, including ditches..... | ..... |
| September 29..... | do..... | ..... |

MISCELLANEOUS MEASUREMENTS IN SANTA ANA RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in the Santa Ana River drainage basin during 1906.

Cable Canyon Creek near Glen Helen, Cal.—This stream is a tributary of the Santa Ana River. A measurement was made July 1906, at the diversion weir in the canyon:

Diversion over weir, 1.1 second-feet; waste below weir, 2.1 second-feet; total of creek, 2.2 second-feet.

Cajon Creek near Keenbrook, Cal.—This stream is a tributary of Lytle Creek. A measurement was made July 16, 1906, in the canyon at Keenbrook:

Width, 3 feet; area, 1.3 square feet; discharge, 3.3 second-feet.

Chino Creek near Rincon, Cal.—This stream is a tributary of Santa Ana River. The following measurements were made during 1906, at the wagon bridge at Rincon road crossing, one-fourth mile above junction with Santa Ana River:

June 25: Width, 3 feet; area, 1.5 square feet; discharge, 3.9 second-feet.

August 31: Width, 3.5 feet; area, 1.3 square feet; discharge, 2.6 second-feet.

November 7: Width, 5.5 feet; area, 6.2 square feet; discharge, 10.3 second-feet.

Devil Canyon Creek near Irvington, Cal.—This stream is a tributary of Santa Ana River. A measurement was made July 14, 1906, at the mouth of the canyon:

Width, 4 feet; area, 2.4 square feet; discharge, 5.2 second-feet.

East Twin Creek near Arrowhead Springs, Cal.—This stream is a tributary of the Santa Ana River. A measurement was made July 14, 1906, in the canyon above the canal diversion:

Width, 2 feet; area, 1.8 square feet; discharge, 2.7 second-feet.

Lytle Creek near Rialto, Cal.—This stream is one of the principal tributaries of Santa Ana River. A measurement was made July 16, 1906, at the head of the Fontella Development Company's canal at the mouth of the canyon:

Diversion over weir, 25.4 second-feet; waste below weir, 56 second-feet; total flow of creek, 81.4 second-feet.

Santa Ana River near Rincon, Cal.—The following measurements were made during 1906, at the Rincon wagon bridge, at the lower end of the San Bernardino Valley and at the head of the lower Santa Ana Canyon. These measurements, with the addition of those of Chino Creek, show the total discharge of Santa Ana River below all diversions in the San Bernardino Valley, and show the amount of water used for irrigation in the vicinity of Orange, Santa Ana, Anaheim, and Fullerton, Cal., diversions being made below this point of measurement:

June 25: Width, 47 feet; area, 40 square feet; discharge, 82 second-feet.

August 3: Width, 47 feet; area, 33 square feet; discharge, 56 second-feet.

November 7: Width, 43 feet; area, 45 square feet; discharge, 94 second-feet.

Waterman Canyon or West Twin Creek near Arrowhead Springs, Cal.—This stream is a tributary of Santa Ana River. A measurement was made July 14, 1906, at the crossing on the road to Waterman Ranch near the mouth of the canyon:

Width, 4.7 feet; area, 3.6 square feet; discharge, 4 second-feet.

SAN GABRIEL RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

San Gabriel River rises in the Sierra Madre Mountains and, flowing in a southwesterly direction through the San Gabriel and Los Angeles valleys, discharges its waters into the Pacific Ocean near Long Beach, Cal. In the upper reaches of this basin there are

numerous tributaries, which have their source in the higher elevations of the Sierra Madre Range. The topography in the upper reaches of this basin is rough and rugged, with deep and narrow canyons, while on the lower elevations the country is rolling, with large areas of valley land. The formation on the higher mountain elevation is of granite, with a light soil covering, with sparse timber growth. As one approaches the middle elevations the covering is brush, with scattering timber, while in the foothill country there is nothing but a growth of grass. The gaging station on this stream is located at a point where the stream leaves the higher mountains in the vicinity of Azusa. Below this point the river enters the San Gabriel Valley, where the stream has a comparatively light grade, the bed being composed of boulders, gravel, and sand, in which the water quickly disappears, except in times of flood discharge. The waters of this stream again appear on the surface at the lower end of the San Gabriel Valley, at the point of discharge from the foothills where an obstruction to the underground passage forces the water to the surface, on which it flows for a short distance and again disappears in the sands of the flat country below the foothills. The entire flow of this stream during the summer months is diverted at a point about 5 miles above the gaging station and is used for power purposes at the mouth of the canyon. From this point it is carried in ditches and used for irrigation in the San Gabriel Valley. The water is again diverted where it appears on the surface at the lower end of this valley and is used for irrigation on the lower levels below this point. The mean precipitation in this basin varies from 15 to 30 inches and is principally in the form of rain. On small areas on the higher mountain elevations the precipitation is in the form of snow, which melts in the early spring months.

SAN GABRIEL RIVER AND CANALS NEAR AZUSA, CAL.

Owing to the numerous diversions, it has been difficult to obtain accurate discharge measurements at Azusa, 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 head works of this company are located about 6 miles above the mouth of the canyon. The water is carried around 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 80 second-feet.

The cable and gage are located about 1 mile from Azusa. During the season of low water for a period of from six to eight months the canals above the station divert the entire flow and there is no running water at the station. The total flow of the river is obtained by adding the daily discharge for the river to the figures for the c

responding dates for the canals. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 104, where are given also references to publications that contain data for previous years.

Discharge measurements of San Gabriel River and canals near Azusa, Cal., in 1906.

| Date. | Hydrographer. | Gage height. | Discharge. | | |
|------------------|-----------------------------------|--------------|-----------------|-----------------|-----------------|
| | | | River. | Canal. | Total. |
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Sec.-ft.</i> | <i>Sec.-ft.</i> |
| January 19..... | M. P. Beeson..... | 3.88 | 375 | 0 | 375 |
| January 20..... | do..... | 2.90 | 104 | 76 | 180 |
| January 20..... | do..... | 2.95 | 110 | 76 | 186 |
| February 10..... | do..... | 1.70 | 3.5 | 57 | 60 |
| February 15..... | do..... | 2.70 | 60 | 15 | 75 |
| February 15..... | do..... | 2.70 | 69 | 15 | 84 |
| February 17..... | do..... | 2.60 | 49 | 40 | 89 |
| March 12..... | do..... | 6.60 | 4,940 | 74 | 5,010 |
| March 13..... | do..... | 5.90 | 3,360 | 74 | 3,430 |
| March 13..... | do..... | 5.40 | 2,530 | 74 | 2,600 |
| March 14..... | do..... | 4.40 | 1,210 | 74 | 1,280 |
| March 17..... | do..... | 5.28 | 2,190 | 78 | 2,270 |
| March 17..... | do..... | 5.15 | 2,140 | 78 | 2,220 |
| March 18..... | do..... | 4.70 | 1,440 | 78 | 1,520 |
| March 21..... | do..... | 4.00 | 666 | 72 | 738 |
| March 21..... | do..... | 4.00 | 688 | 72 | 760 |
| March 30..... | do..... | 5.10 | 1,380 | 76 | 1,460 |
| April 4..... | do..... | 4.50 | 757 | 76 | 833 |
| April 18..... | do..... | 3.80 | 394 | 76 | 470 |
| April 18..... | do..... | 3.80 | 436 | 76 | 512 |
| May 11..... | do..... | 3.30 | 209 | 76 | 285 |
| May 11..... | do..... | 3.30 | 212 | 76 | 288 |
| June 1..... | do..... | 3.55 | 292 | 54 | 346 |
| June 1..... | do..... | 3.55 | 273 | 54 | 327 |
| June 29..... | C. H. Lee..... | 2.90 | 157 | 76 | 233 |
| July 30..... | W. B. Clapp..... | 2.20 | 25 | 76 | 101 |
| December 28..... | W. B. Clapp and R. S. Hawley..... | 5.20 | 1,500 | 76 | 1,580 |

Daily gage height, in feet, of San Gabriel River near Azusa, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Dec. |
|---------|------|------|------|-------|------|-------|-------|-------|-------|
| 1..... | | | | 4.8 | 3.4 | 3.6 | 2.8 | 2.1 | ..... |
| 2..... | | | | 4.7 | 3.4 | 3.6 | 2.8 | 2.0 | ..... |
| 3..... | | | | 4.7 | 3.4 | 3.5 | 2.8 | 1.9 | ..... |
| 4..... | | | 2.6 | 4.5 | 3.4 | 3.5 | 2.75 | 1.9 | ..... |
| 5..... | | | 2.7 | 4.7 | 3.45 | 3.4 | 2.75 | 1.85 | ..... |
| 6..... | | | | 4.4 | 3.45 | 3.4 | 2.7 | 1.8 | ..... |
| 7..... | | | | 4.2 | 3.4 | 3.4 | 2.75 | 1.7 | ..... |
| 8..... | | | | 4.2 | 3.4 | 3.3 | 2.7 | 1.7 | ..... |
| 9..... | | | | 4.2 | 3.4 | 3.3 | 2.7 | 1.65 | ..... |
| 10..... | | | | 4.2 | 3.4 | 3.2 | 2.7 | 1.6 | ..... |
| 11..... | | | | 4.2 | 3.4 | 3.2 | 2.6 | 1.6 | ..... |
| 12..... | | | 7.9 | 4.1 | 3.3 | 3.2 | 2.6 | 1.55 | 4.0 |
| 13..... | | 2.7 | 7.2 | 4.0 | 3.3 | 3.1 | 2.6 | 1.5 | 3.8 |
| 14..... | | 2.7 | 4.35 | 4.0 | 3.3 | 3.1 | 2.6 | 1.4 | 3.5 |
| 15..... | | 2.7 | 4.5 | 4.0 | 3.3 | 3.1 | 2.6 | 1.3 | 3.0 |
| 16..... | | 2.7 | 4.8 | 3.9 | 3.3 | 3.05 | 2.6 | ..... | 2.3 |
| 17..... | | 2.6 | 5.2 | 3.8 | 3.3 | 3.0 | 2.55 | ..... | 2.1 |
| 18..... | | 2.1 | 4.8 | 3.8 | 3.2 | 3.0 | 2.55 | ..... | 2.1 |
| 19..... | 3.9 | 2.0 | 4.8 | 3.8 | 3.2 | 3.0 | 2.55 | ..... | 2.1 |
| 20..... | 2.9 | 2.0 | 4.6 | 3.8 | 3.2 | 3.0 | 2.55 | ..... | 1.8 |
| 21..... | 2.7 | 1.9 | 4.3 | 3.7 | 3.2 | 2.95 | 2.55 | ..... | ..... |
| 22..... | 2.3 | 2.3 | 4.1 | 3.6 | 3.2 | 2.95 | 2.5 | ..... | ..... |
| 23..... | 2.0 | 2.0 | 4.1 | 3.6 | 3.2 | 2.9 | 2.5 | ..... | ..... |
| 24..... | 1.75 | 1.9 | 5.15 | 3.6 | 3.1 | 2.9 | 2.4 | ..... | ..... |
| 25..... | 1.6 | 1.9 | 7.55 | 3.6 | 3.1 | 3.0 | 2.4 | ..... | ..... |
| 26..... | | 1.8 | 8.45 | 3.5 | 3.4 | 2.9 | 2.35 | ..... | ..... |
| 27..... | | | 7.45 | 3.5 | 3.3 | 2.95 | 2.35 | ..... | 2.0 |
| 28..... | | | 6.7 | 3.7 | 4.8 | 2.95 | 2.3 | ..... | 5.2 |
| 29..... | | | 6.05 | 3.5 | 4.1 | 2.9 | 2.25 | ..... | 3.8 |
| 30..... | | | 5.1 | 3.4 | 3.75 | 2.85 | 2.2 | ..... | 3.5 |
| 31..... | | | 5.1 | ..... | 3.7 | ..... | 2.15 | ..... | 3.2 |

NOTE.—The river was dry January 1 to 18, January 26 to February 12, February 27 to March 3, March 11, August 16 to December 11, and December 21 to 26.

Daily discharge in second-feet of San Gabriel Canals near Azusa, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|
| 1..... | 37 | 50 | 75 | 78 | 76 | 54 | 76 | 76 | 54 | 42 | 38 |
| 2..... | 37 | 50 | 68 | 52 | 76 | 52 | 76 | 76 | 55 | 42 | 38 |
| 3..... | 37 | 49 | 65 | 58 | 76 | 54 | 76 | 76 | 53 | 42 | 38 |
| 4..... | 37 | 50 | 20 | 76 | 76 | 65 | 76 | 76 | 52 | 42 | 38 |
| 5..... | 37 | 63 | 20 | 74 | 76 | 76 | 76 | 76 | 52 | 41 | 38 |
| 6..... | 37 | 63 | 74 | 76 | 76 | 76 | 76 | 76 | 50 | 40 | 39 |
| 7..... | 37 | 56 | 70 | 78 | 76 | 76 | 76 | 76 | 50 | 40 | 39 |
| 8..... | 37 | 47 | 70 | 78 | 76 | 76 | 76 | 76 | 49 | 40 | 39 |
| 9..... | 37 | 47 | 71 | 77 | 76 | 76 | 76 | 76 | 49 | 40 | 38 |
| 10..... | 36 | 57 | 64 | 76 | 76 | 76 | 76 | 76 | 49 | 40 | 38 |
| 11..... | 36 | 72 | 56 | 65 | 76 | 76 | 76 | 76 | 49 | 40 | 38 |
| 12..... | 37 | 69 | 74 | 74 | 76 | 76 | 76 | 76 | 49 | 40 | 38 |
| 13..... | 37 | 15 | 74 | 78 | 76 | 76 | 76 | 76 | 50 | 40 | 38 |
| 14..... | 49 | 15 | 74 | 76 | 76 | 76 | 76 | 76 | 50 | 39 | 38 |
| 15..... | 52 | 15 | 77 | 76 | 76 | 76 | 76 | 76 | 52 | 38 | 38 |
| 16..... | 41 | 15 | 78 | 76 | 76 | 76 | 76 | 76 | 51 | 38 | 38 |
| 17..... | 41 | 40 | 78 | 72 | 76 | 76 | 76 | 76 | 50 | 39 | 38 |
| 18..... | 42 | 74 | 78 | 76 | 76 | 76 | 76 | 72 | 46 | 39 | 37 |
| 19..... | 0 | 74 | 77 | 76 | 76 | 76 | 76 | 68 | 45 | 40 | 37 |
| 20..... | 76 | 74 | 75 | 76 | 76 | 76 | 76 | 68 | 45 | 41 | 38 |
| 21..... | 76 | 75 | 72 | 76 | 76 | 76 | 76 | 68 | 44 | 40 | 41 |
| 22..... | 76 | 74 | 71 | 76 | 76 | 76 | 76 | 68 | 44 | 40 | 45 |
| 23..... | 76 | 74 | 65 | 76 | 76 | 76 | 76 | 68 | 43 | 40 | 47 |
| 24..... | 76 | 74 | 78 | 76 | 76 | 76 | 76 | 66 | 43 | 40 | 45 |
| 25..... | 66 | 70 | 76 | 76 | 76 | 76 | 76 | 64 | 43 | 40 | 45 |
| 26..... | 66 | 70 | 78 | 76 | 76 | 76 | 76 | 60 | 43 | 40 | 46 |
| 27..... | 61 | 73 | 78 | 76 | 76 | 76 | 76 | 60 | 43 | 39 | 46 |
| 28..... | 57 | 76 | 78 | 76 | 76 | 76 | 76 | 59 | 43 | 38 | 45 |
| 29..... | 58 | | 76 | 76 | 53 | 76 | 76 | 59 | 42 | 38 | 45 |
| 30..... | 54 | | 76 | 76 | 48 | 76 | 76 | 58 | 42 | 38 | 45 |
| 31..... | 52 | | 78 | | 60 | | 76 | 57 | | 38 | |

Monthly discharge of San Gabriel River near Azusa, Cal., for 1906.

[Drainage area, 222 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|-----------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Dep. inc. |
| January..... | 441 | 36 | 68.1 | 4,190 | 0.307 | |
| February..... | 92 | 47 | 68.1 | 3,780 | .307 | |
| March..... | 9,430 | 56 | 2,160 | 133,000 | 9.73 | |
| April..... | 1,110 | 321 | 578 | 34,400 | 2.60 | |
| May..... | 1,110 | 251 | 342 | 21,000 | 1.54 | |
| June..... | 364 | 204 | 262 | 15,600 | 1.18 | |
| July..... | 295 | 97 | 155 | 9,530 | .698 | |
| August..... | 93 | 57 | 72.8 | 4,480 | .328 | |
| September..... | 55 | 42 | 47.7 | 2,840 | .215 | |
| October..... | 42 | 38 | 39.8 | 2,450 | .179 | |
| November..... | 47 | 37 | 40.4 | 2,400 | .182 | |
| December..... | 1,600 | 45 | 188 | 11,600 | .847 | |
| The year..... | 9,430 | 36 | 335 | 245,000 | 1.51 | |

NOTE.—These discharges include the water in the canals. The discharge of the river has been obtained from rating tables covering short periods of time, on account of the constant change in channel. Values are fair.

LOS ANGELES RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Los Angeles River is formed by Tujunga, Pacoima, and other streams and creeks which have their source in the Sierra Madre Range of mountains to the northeast of the city of Los Angeles. These streams le

the mountains at a point about 25 miles above the city and enter the comparatively flat country of the San Fernando Valley, where, except in times of excessive flood, the waters disappear in the sand and gravel washes, to reappear at the lower end of this valley, where a secondary range of hills, extending from east to west, forces them to the surface to form what is known as Los Angeles River. Below this point the river discharges through the flat country of the Los Angeles Valley, finally entering the Pacific Ocean near the town of Long Beach, Cal. During the summer months the entire flow of Los Angeles River is diverted at a point about 5 miles above Los Angeles for the supply of the city, only a small amount of water passing this point except during flood discharges. The topography is rough in the upper reaches of this drainage basin, the streams flowing in deep, narrow canyons. In this portion of the basin the formation is of granite, with good soil covering and light timber and heavy brush growth. There is a considerable area of foothill country within this basin, lying between the base of the Sierra Madre Range and the Los Angeles Valley, which has a light covering of brush and grass. The soil of the San Fernando Valley consists, principally, of river wash, coarse sand, and gravel, except along the base of the mountains and foothills, where the soil is of good depth and is under a high state of cultivation. The soil of the Los Angeles Valley, below the city of Los Angeles, consists of a light sandy loam and is under a high state of cultivation. The mean precipitation throughout the basin is from 15 to 30 inches and falls in the form of rain, except on small areas on the higher mountain elevations.

MISCELLANEOUS MEASUREMENTS IN LOS ANGELES RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in Los Angeles River drainage basin during 1906:

Arroyo Seco near Pasadena, Cal.—This stream is a tributary of Los Angeles River. The following measurements were made on this stream during 1906:

April 18, at mouth of canyon, 5 miles above Pasadena, Cal.: Width, 16.5 feet; area, 11.6 square feet; discharge, 20 second-feet.

April 18, at Devils Gate, 3 miles above Pasadena, Cal.: Width, 11 feet; area, 5.9 square feet; discharge, 9.2 second-feet.

April 18, at submerged dam of Pasadena Land and Water Company at Pasadena, Cal.: Discharge, 0.0 second-feet.

Los Angeles River at Seventh Street Bridge, Los Angeles, Cal.—The following measurements were made on Los Angeles River:

March 13, a. m.: Width, 80 feet; area, 166 square feet; discharge, 850 second-feet.

March 13, p. m.: Width, 80 feet; area, 136 square feet; discharge, 555 second-feet.

March 16: Width, 58 feet; area, 43 square feet; discharge, 75 second-feet.

March 17, a. m.: Width, 80 feet; area, 194 square feet; discharge, 1,200 second-feet.

March 17, p. m.: Width, 73 feet; area, 103 square feet; discharge, 420 second-feet.

Diversions from Los Angeles River.—During the summer of 1906 measurements were made to determine the amount of water diverted by the city of Los Angeles for domestic supply, this being ascertained by measurements made in the 44-inch conduit and in the main supply conduit. The supply is taken from the river near Burbank and includes both surface and underground diversions and constitutes the entire flow of the river at this point during the summer months. Some return seepage water again appears in the river channel near Huron street, Los Angeles, near which point the city has an underground gallery or tunnel for collecting an auxiliary supply which is pumped to the reservoir and used in the general distributing system. The following measurements were made of these diversions during 1906:

Measurements of flow, in second-feet, of diversions from Los Angeles River by the city of Los Angeles in 1906.

| Date. | 44-inch conduit discharge. | Main-supply conduit discharge. | Total |
|-------------------|----------------------------|--------------------------------|-------|
| February 24..... | 26.59 | 6.58 | 33.17 |
| April 20..... | 36.23 | 7.67 | 43.90 |
| June 23..... | 31.76 | 15.86 | 47.62 |
| July 17..... | 34.73 | 9.43 | 44.16 |
| July 20..... | 33.95 | 10.23 | 44.18 |
| August 22..... | 30.49 | 13.67 | 44.16 |
| August 31..... | 32.86 | 11.30 | 44.16 |
| September 21..... | 38.11 | 4.43 | 42.54 |
| September 23..... | 29.48 | 13.20 | 42.68 |
| November 22..... | 32.73 | 13.50 | 46.23 |
| December 18..... | 33.61 | 15.66 | 49.27 |

NOTE.—On February 24, 23.9 second-feet was passing intake and is not included in above total. April 20, 7.4 second-feet was passing intake and is not included in above total.

MALIBU CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Malibu Creek rises in the Santa Monica Mountains and enters the Pacific Ocean about 15 miles above the town of Santa Monica. The stream is formed by Triunfo and Las Virgenes creeks, which drain the northern portion of the Santa Monica Range and the lower foothill country to the north. The formation throughout this basin is shale, sandstone, and conglomerate, with good soil covering. There is a sparse growth of timber on the higher elevations, but the greater portion of this area has a covering of brush and grass and is used extensively for pasturage, with limited areas of cultivated land for the raising of grain. A reservoir has been constructed on the upper reaches of the Triunfo Creek and the waters are used for irrigation within the basin during the summer months. This reservoir covers an area of about 300 acres when filled. The mean precipitation is about 25 inches and falls wholly in the form of rain.

MALIBU CREEK NEAR CALABASAS, CAL.

This station was established November 29, 1901, by S. G. Bennett. It is located at Chapman's ranch, 40 miles from Los Angeles by wagon road and 8 miles southwest of Calabasas, about one-fourth mile below the mouth of Las Virgenes Creek. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 111, where are given also references to publications that contain data for previous years.

Discharge measurements of Malibu Creek near Calabasas, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Dis-charge. |
|-------------------------|----------------|--------------|------------------|--------------|-----------------|
| | | <i>Fect.</i> | <i>Sq. ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> |
| March 11..... | C. H. Lee..... | 6 | 1.2 | 0.85 | 1.0 |
| March 12..... | do..... | 33 | 45 | 2.30 | 122 |
| March 25 <i>a</i> | do..... | | 94 | 2.80 | 406 |
| April 18..... | do..... | 20 | 11.1 | 1.30 | 19 |
| May 24..... | do..... | 16 | 6.4 | 1.00 | 7.1 |

a Measured by floats.

Daily gage height, in feet, of Malibu Creek near Calabasas, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|------|--------------|--------------|--------------|-------|-------|------|--------------|-------------|--------------|------|
| 1..... | 0.6 | 0.6 | 1.0 | 1.85 | 1.1 | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 | <i>a</i> 0.9 | 0.9 |
| 2..... | .6 | .6 | 1.0 | 1.8 | 1.1 | 1.0 | 1.0 | .9 | .9 | .9 | <i>a</i> .9 | .9 |
| 3..... | .6 | .6 | 1.0 | 1.7 | 1.1 | 1.0 | 1.0 | .9 | .9 | .9 | <i>a</i> .9 | .9 |
| 4..... | .6 | .7 | 0.8 | 1.6 | 1.1 | 1.0 | 1.0 | .9 | .9 | .9 | <i>a</i> .9 | .9 |
| 5..... | .6 | .7 | .8 | 1.5 | 1.1 | 1.0 | .95 | .9 | .9 | .9 | <i>a</i> .9 | .9 |
| 6..... | .6 | .7 | .8 | 1.4 | 1.1 | 1.0 | .9 | .9 | .9 | .9 | <i>a</i> .9 | .9 |
| 7..... | .6 | .7 | .7 | 1.35 | 1.1 | 1.0 | .9 | .9 | .9 | .9 | <i>a</i> .9 | .9 |
| 8..... | .6 | .7 | .7 | 1.4 | 1.1 | 1.0 | .9 | .9 | .9 | .9 | <i>a</i> .9 | .9 |
| 9..... | .6 | .7 | .8 | 1.4 | 1.1 | 1.0 | .9 | .9 | <i>a</i> .9 | .9 | <i>a</i> .9 | .9 |
| 10..... | .6 | .7 | .8 | 1.4 | 1.05 | 1.0 | .9 | .9 | <i>a</i> .9 | .9 | <i>a</i> .9 | 1.0 |
| 11..... | .6 | .6 | .9 | <i>a</i> 1.4 | 1.05 | 1.0 | .9 | .9 | <i>a</i> .9 | .9 | .9 | 1.05 |
| 12..... | .6 | .6 | 2.55 | 1.4 | 1.05 | 1.0 | .9 | .9 | <i>a</i> .9 | .9 | .9 | 1.4 |
| 13..... | .6 | .6 | 2.2 | 1.25 | 1.05 | 1.0 | .9 | .9 | <i>a</i> .9 | .9 | .9 | 1.0 |
| 14..... | .7 | 1.1 | 1.55 | 1.25 | 1.05 | 1.0 | .9 | .9 | <i>a</i> .9 | .9 | .9 | 1.0 |
| 15..... | .7 | 1.25 | 1.2 | 1.2 | 1.05 | 1.0 | .9 | .9 | <i>a</i> .9 | .9 | .9 | 0.9 |
| 16..... | .7 | .7 | 2.6 | 1.2 | 1.05 | 1.0 | .9 | .9 | <i>a</i> .85 | .9 | .9 | .85 |
| 17..... | .7 | .7 | 2.1 | 1.2 | 1.0 | 1.0 | .9 | .9 | <i>a</i> .85 | .9 | .9 | .85 |
| 18..... | .7 | .7 | <i>a</i> 1.8 | 1.3 | 1.0 | 1.0 | .9 | .9 | <i>a</i> .85 | .9 | .9 | .8 |
| 19..... | .7 | .7 | <i>a</i> 1.6 | 1.3 | 1.0 | 1.0 | .9 | .9 | <i>a</i> .85 | .9 | .9 | .8 |
| 20..... | .7 | .7 | 1.45 | 1.3 | 1.0 | 1.0 | .9 | .9 | <i>a</i> .85 | .9 | .9 | .8 |
| 21..... | 1.0 | .7 | 1.68 | 1.3 | 1.0 | 1.0 | .9 | .9 | <i>a</i> .85 | .9 | .9 | .8 |
| 22..... | 1.0 | .7 | 1.55 | 1.05 | 1.0 | 1.0 | .9 | .9 | .8 | .9 | .9 | .8 |
| 23..... | 1.0 | .7 | 1.5 | 1.05 | 1.0 | 1.0 | .9 | .9 | <i>a</i> .8 | .9 | .9 | .8 |
| 24..... | 1.0 | .7 | 3.4 | 1.05 | <i>a</i> 1.0 | 1.0 | .9 | .9 | <i>a</i> .8 | .9 | .9 | .8 |
| 25..... | 1.0 | 1.0 | 2.92 | 1.05 | <i>a</i> 1.1 | 1.0 | .9 | .9 | <i>a</i> .8 | .9 | .9 | .8 |
| 26..... | 1.0 | 1.0 | 5.55 | 1.05 | 1.1 | 1.0 | .9 | .9 | <i>a</i> .8 | <i>a</i> .9 | .9 | .85 |
| 27..... | 1.0 | 1.0 | 3.35 | 1.1 | 1.2 | 1.0 | .9 | .9 | <i>a</i> .85 | <i>a</i> .9 | .9 | 1.85 |
| 28..... | 0.6 | 1.0 | 2.9 | 1.1 | 1.2 | 1.0 | .9 | .9 | <i>a</i> .85 | <i>a</i> .9 | .9 | 2.6 |
| 29..... | .6 | | 2.1 | 1.1 | 1.1 | 1.0 | .9 | .9 | <i>a</i> .85 | <i>a</i> .9 | .9 | 1.45 |
| 30..... | .6 | | 1.98 | 1.1 | 1.0 | 1.0 | .9 | .9 | <i>a</i> .85 | <i>a</i> .9 | .9 | 1.2 |
| 31..... | .6 | | 1.9 | | 1.0 | | .9 | .9 | | <i>a</i> .9 | | 2.2 |

a Estimated.

Monthly discharge of Malibu Creek near Calabasas, Cal., for 1906.

[Drainage area, 97 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|------------------------|---------------------------|-------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inch. |
| January..... | 3 | 0.8 | 1.3 | 80 | 0.013 | |
| February..... | 12 | .8 | 1.8 | 100 | .019 | |
| March..... | 2,600 | .9 | 223 | 13,700 | 2.30 | |
| April..... | 62 | 9 | 22.1 | 1,320 | .228 | |
| May..... | 15 | 7 | 9.1 | 560 | .094 | |
| June..... | 7 | 7 | 7.1 | 422 | .073 | |
| July..... | 7 | 4 | 4.8 | 295 | .049 | |
| August..... | 4.4 | 4.4 | 4.4 | 271 | .045 | |
| September..... | 4.4 | 2 | 3.6 | 214 | .037 | |
| October..... | 4.4 | 4.4 | 4.4 | 271 | .045 | |
| November..... | 4.4 | 4.4 | 4.4 | 262 | .045 | |
| December..... | 275 | 2 | 19.8 | 1,220 | .204 | |
| The year..... | 2,600 | .8 | 25.5 | 18,700 | .261 | |

NOTE.—Discharges were obtained by the indirect method for shifting channels. Owing to small number of measurements and the shifting conditions, these values are only roughly approximate.

TRIUNFO CREEK, NEAR CALABASAS, CAL.

This station is located 8 miles southwest of Calabasas, Cal., about one-half mile above the mouth of Las Virgenes Creek. The conditions and the bench marks are described in Water-Supply Paper No. 177, page 113, where are given also references to publications that contain data for previous years.

Discharge measurements on Triunfo Creek near Calabasas, Cal., by C. H. Lee, in 1906.

| Date. | Width. | Area of section. | Gage height. | Dis- charge. | Date. | Width. | Area of section. | Gage height. | Dis- charge. |
|---------------|--------------|---------------------|-----------------|-----------------|-----------------------------|--------------|---------------------|-----------------|-----------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| March 11..... | 5.5 | 1.16 | 1.25 | 0.8 | March 25..... | 114 | 100 | 3.00 | 3 |
| March 11..... | 6.0 | 1.5 | 1.38 | 1.8 | March 26 ^a | | 318 | 4.50 | 2.3 |
| March 12..... | 34 | 29 | 2.25 | 98 | April 18..... | 22 | 10.5 | 2.00 | |
| March 25..... | 120 | 114 | 2.95 | 459 | May 24..... | 11 | 5 | 2.05 | |
| March 25..... | 64 | 81 | 2.79 | 313 | | | | | |

^a Measured by floats.

Monthly discharge of Triunfo Creek near Calabasas, Cal., for 1906.

[Drainage area, 72 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|------------------------|---------------------------|-------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inch. |
| January..... | 0.7 | 0 | 0.2 | 12 | 0.0028 | 0 |
| February..... | 10 | 0 | 1.1 | 61 | .015 | |
| March..... | 2,000 | 6 | 155 | 9,530 | 2.15 | 2 |
| April..... | 55 | 8 | 19.3 | 1,150 | .268 | |
| May..... | 12 | 5 | 6.9 | 424 | .096 | |
| June..... | 6 | 6 | 6.0 | 357 | .083 | |
| July..... | 6 | 3 | 3.6 | 221 | .050 | |
| August..... | 3 | 0 | 1.7 | 105 | .024 | |
| September..... | 0 | 0 | 0.0 | 0 | .00 | |
| October..... | 0 | 0 | 0.0 | 0 | .00 | |
| November..... | 4 | 0 | 1.5 | 89 | .021 | |
| December..... | 100 | 2 | 10.8 | 664 | .150 | |
| The year..... | 2,000 | 0 | 17.2 | 11,600 | 0.238 | 3 |

NOTE.—The above values are based on very meager data and are only approximate.

VENTURA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Ventura River rises in the Santa Ynez Mountains (a portion of the Coast Range), in Ventura County. It flows in a southerly direction, discharging its waters into the Pacific Ocean at Ventura, Cal. Above the Ojai Valley this stream is known as Matilija Creek. The drainage basin is not large, but heavy floods of short duration are of frequent occurrence during the winter months. Owing to the heavy grade of the stream and the rough and broken character of the topography throughout the basin, its flood waters quickly reach the ocean. Its principal tributaries other than Matilija Creek are San Antonio Creek, which drains a considerable mountain area to the east of Matilija Creek, and Coyote Creek with a small drainage area at a lower elevation to the west. Water is diverted from the main river and its tributaries during the summer months for irrigation and domestic supply in the Ojai Valley and at Ventura.

MISCELLANEOUS MEASUREMENTS IN VENTURA RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in the Ventura River drainage basin during 1906:

Matilija Creek near Matilija, Cal.—This stream is the principal tributary of the Ventura River. A measurement was made October 24 at the road crossing below Matilija Hot Springs Hotel and above junction of North Fork:

Width, 7 feet; area, 4 square feet; discharge, 7.7 second-feet.

North Fork Matilija Creek near Matilija, Cal.—This stream is a tributary of Matilija Creek. A measurement was made October 24 at point 500 feet above its junction with Matilija Creek and above the flume diversion:

Width, 5 feet; area, 1.9 square feet; discharge, 2.2 second-feet.

San Antonio Creek near Nordhoff, Cal.—This stream is one of the principal tributaries of Ventura River. A measurement was made October 24 near the crossing of the Nordhoff-Ventura road, $1\frac{1}{2}$ miles below Nordhoff and above the canal diversion:

Width, 8 feet; area, 3.8 square feet; discharge, 4.4 second-feet.

SANTA YNEZ RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Santa Ynez River rises in the mountains of Santa Barbara and Ventura counties and flows westerly with a flat grade to the Pacific Ocean, having a length of approximately 75 miles. The Santa Ynez Range of mountains, varying in elevation from 3,000 to 4,000 feet, forms

the southern boundary of this drainage basin. The northern divide ranges from 4,500 to 5,500 feet in elevation, culminating in Mono Pinos, the elevation of which is 8,826 feet. The northern part of watershed is drained by streams running in a southerly direction and uniting with Santa Ynez River proper, which runs close to northerly base of the Santa Ynez Mountains, flowing westerly and paralleling the Coast Range. The principal tributary, Mono Creek enters from the north. There are several reservoir sites on Santa Ynez and its tributaries which have been surveyed.

The formation throughout the entire drainage basin consists chiefly of shale and sandstone, the strike being parallel to the coast and dip nearly vertical, inclining somewhat to the south. The greater portion of the drainage is sparsely covered with brush and small trees, only a small area on the higher elevations having any considerable growth of timber. The mean annual precipitation is estimated at 20 inches for the entire area and falls almost entirely in the form of rain.

SANTA YNEZ RIVER NEAR SANTA BARBARA, CAL.

This station was established November 1, 1903. It is located at Gibraltar dam site, 5 miles below the original station, and is below mouth of Mono Creek. It is 9 miles above the San Marcus ranch and halfway between the old quicksilver mines. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, p. 117, where are given also references to publications that contain data for previous years.

Discharge measurements of Santa Ynez River near Santa Barbara, Cal., by L. M. Hill in 1906.

| Date. | Width. | Area of section. | Gage height. | Discharge. | Date. | Width. | Area of section. | Gage height. | Discharge. |
|-----------------------------|--------------|------------------|--------------|-----------------|-----------------------------|--------------|------------------|--------------|-----------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| January 12..... | 16 | 9.0 | 2.10 | 4.7 | March 17 ^a | 72 | 216 | 4.30 | 9.0 |
| January 26..... | 20 | 7.7 | 2.18 | 10.1 | March 17 ^a | 72 | 201 | 4.10 | 7.7 |
| February 7..... | 18 | 10.0 | 2.21 | 10.1 | March 17 ^a | 72 | 216 | 4.30 | 9.0 |
| February 10..... | 18 | 18.3 | 2.40 | 37 | March 17 ^a | 72 | 201 | 4.10 | 7.7 |
| February 11..... | 42 | 38 | 2.61 | 63 | March 18 ^a | 72 | 172 | 3.74 | 3.7 |
| February 15..... | 75 | 80 | 2.94 | 144 | March 18 ^a | 72 | 172 | 3.74 | 3.7 |
| February 16..... | 46 | 38 | 2.53 | 59 | April 17 ^a | 62 | 77 | 2.80 | 2.8 |
| February 24..... | 20 | 18 | 2.30 | 24 | June 1..... | 32 | 39 | 2.50 | 2.5 |
| March 14..... | 82 | 114 | 3.37 | 291 | June 29..... | 25 | 25 | 2.21 | 2.2 |
| March 15..... | 48 | 72 | 3.10 | 189 | July 9..... | 13.3 | 11.7 | 2.10 | 2.1 |
| March 16 ^a | 80 | 296 | 5.30 | 2,440 | July 27..... | 7 | 3.2 | 1.95 | 1.9 |
| March 16 ^a | 80 | 414 | 6.70 | 4,170 | August 17..... | 6.2 | 1.7 | 1.82 | 1.8 |
| March 16 ^a | 80 | 503 | 7.65 | 5,440 | September 24..... | 6.5 | 1.7 | 1.82 | 1.8 |
| March 16 ^a | 85 | 605 | 8.65 | 6,700 | December 27..... | 74 | 150 | 3.90 | 3.9 |

^a Measured by floats.

Daily gage height, in feet, of Santa Ynez River near Santa Barbara, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1..... | 2.0 | 2.15 | 2.25 | 3.6 | 2.55 | 2.5 | 2.2 | 1.95 | 1.8 | 1.8 | 1.8 | 1.9 |
| 2..... | 2.0 | 2.1 | 2.25 | 3.55 | 2.5 | 2.5 | 2.2 | 1.95 | 1.8 | 1.8 | 1.8 | 1.9 |
| 3..... | 2.05 | 2.1 | 2.25 | 3.5 | 2.5 | 2.45 | 2.2 | 1.9 | 1.8 | 1.8 | 1.8 | 1.9 |
| 4..... | 2.05 | 2.1 | 2.8 | 3.4 | 2.5 | 2.45 | 2.15 | 1.9 | 1.8 | 1.8 | 1.8 | 1.9 |
| 5..... | 2.05 | 2.1 | 2.5 | 3.3 | 2.5 | 2.4 | 2.15 | 1.9 | 1.8 | 1.8 | 1.8 | 1.9 |
| 6..... | 2.05 | 2.2 | 2.4 | 3.3 | 2.45 | 2.4 | 2.15 | 1.9 | 1.8 | 1.8 | 1.8 | 1.9 |
| 7..... | 2.05 | 2.2 | 2.35 | 3.2 | 2.45 | 2.4 | 2.1 | 1.9 | 1.8 | 1.8 | 1.85 | 1.9 |
| 8..... | 2.05 | 2.2 | 2.3 | 3.1 | 2.45 | 2.35 | 2.1 | 1.9 | 1.8 | 1.8 | 1.85 | 1.9 |
| 9..... | 2.05 | 2.15 | 2.3 | 3.1 | 2.45 | 2.35 | 2.1 | 1.9 | 1.8 | 1.8 | 1.85 | 1.95 |
| 10..... | 2.05 | 2.3 | 2.3 | 3.05 | 2.45 | 2.35 | 2.1 | 1.85 | 1.8 | 1.8 | 1.85 | 2.1 |
| 11..... | 2.05 | 2.6 | 2.3 | 3.05 | 2.4 | 2.3 | 2.1 | 1.85 | 1.8 | 1.8 | 1.85 | 2.25 |
| 12..... | 2.1 | 2.4 | 6.4 | 3.0 | 2.4 | 2.3 | 2.1 | 1.85 | 1.8 | 1.8 | 1.85 | 3.85 |
| 13..... | 2.15 | 2.2 | 6.0 | 3.0 | 2.4 | 2.3 | 2.1 | 1.85 | 1.8 | 1.8 | 1.85 | 2.5 |
| 14..... | 2.25 | 2.4 | 3.7 | 2.9 | 2.4 | 2.3 | 2.1 | 1.85 | 1.8 | 1.8 | 1.85 | 2.4 |
| 15..... | 2.25 | 3.05 | 3.05 | 2.8 | 2.4 | 2.3 | 2.1 | 1.85 | 1.8 | 1.8 | 1.85 | 2.3 |
| 16..... | 2.25 | 2.5 | 7.2 | 2.8 | 2.4 | 2.3 | 2.1 | 1.8 | 1.8 | 1.8 | 1.85 | 2.2 |
| 17..... | 2.25 | 2.4 | 4.2 | 2.8 | 2.4 | 2.25 | 2.1 | 1.8 | 1.8 | 1.8 | 1.85 | 2.2 |
| 18..... | 2.25 | 2.35 | 3.65 | 2.75 | 2.35 | 2.25 | 2.1 | 1.8 | 1.8 | 1.8 | 1.85 | 2.15 |
| 19..... | 2.8 | 2.3 | 3.35 | 2.75 | 2.35 | 2.25 | 2.1 | 1.8 | 1.8 | 1.8 | 1.85 | 2.1 |
| 20..... | 2.5 | 2.3 | 3.15 | 2.7 | 2.35 | 2.25 | 2.05 | 1.8 | 1.8 | 1.8 | 1.85 | 2.1 |
| 21..... | 2.35 | 2.4 | 3.1 | 2.7 | 2.35 | 2.25 | 2.05 | 1.8 | 1.8 | 1.8 | 1.85 | 2.1 |
| 22..... | 2.3 | 2.4 | 3.0 | 2.7 | 2.35 | 2.25 | 2.05 | 1.8 | 1.8 | 1.8 | 1.85 | 2.05 |
| 23..... | 2.3 | 2.3 | 3.85 | 2.7 | 2.35 | 2.25 | 2.0 | 1.8 | 1.8 | 1.8 | 1.85 | 2.05 |
| 24..... | 2.25 | 2.3 | 6.6 | 2.7 | 2.35 | 2.25 | 2.0 | 1.8 | 1.8 | 1.8 | 1.85 | 2.05 |
| 25..... | 2.25 | 2.3 | 6.75 | 2.65 | 2.35 | 2.25 | 2.0 | 1.8 | 1.8 | 1.8 | 1.85 | 2.05 |
| 26..... | 2.2 | 2.3 | 7.1 | 2.65 | 2.5 | 2.2 | 2.0 | 1.8 | 1.8 | 1.8 | 1.85 | 2.6 |
| 27..... | 2.15 | 2.25 | 4.9 | 2.6 | 3.15 | 2.2 | 2.0 | 1.8 | 1.8 | 1.8 | 1.85 | 3.35 |
| 28..... | 2.15 | 2.25 | 4.4 | 2.6 | 3.9 | 2.2 | 1.95 | 1.8 | 1.8 | 1.8 | 1.85 | 2.8 |
| 29..... | 2.15 | | 4.0 | 2.6 | 2.9 | 2.2 | 1.95 | 1.8 | 1.8 | 1.8 | 1.95 | 2.75 |
| 30..... | 2.15 | | 3.8 | 2.6 | 2.7 | 2.2 | 1.95 | 1.8 | 1.8 | 1.8 | 1.9 | 2.75 |
| 31..... | 2.15 | | 3.7 | | 2.55 | | 1.95 | 1.8 | | 1.8 | | 3.0 |

Rating table for Santa Ynez River near Santa Barbara, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1.80 | 1 | 2.60 | 65 | 3.40 | 315 | 4.40 | 1,065 | 6.00 | 2,070 |
| 1.90 | 2 | 2.70 | 83 | 3.50 | 370 | 4.60 | 1,285 | 6.20 | 3,360 |
| 2.00 | 3 | 2.80 | 104 | 3.60 | 430 | 4.80 | 1,510 | 6.40 | 3,650 |
| 2.10 | 6 | 2.90 | 129 | 3.70 | 495 | 5.00 | 1,750 | 6.60 | 3,940 |
| 2.20 | 12 | 3.00 | 156 | 3.80 | 565 | 5.20 | 1,990 | 6.80 | 4,230 |
| 2.30 | 22 | 3.10 | 186 | 3.90 | 635 | 5.40 | 2,250 | 7.00 | 4,520 |
| 2.40 | 35 | 3.20 | 223 | 4.00 | 710 | 5.60 | 2,510 | 7.20 | 4,810 |
| 2.50 | 49 | 3.30 | 265 | 4.20 | 875 | 5.80 | 2,790 | | |

NOTE.—This table is based on discharge measurements made during 1906 and is fairly well defined.

Monthly discharge of Santa Ynez River near Santa Barbara, Cal., for 1906.

[Drainage area, 207 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 104 | 3 | 14.8 | 910 | 0.071 | 0.08 |
| February..... | 171 | 6 | 27.4 | 1,520 | .132 | .14 |
| March..... | 4,810 | 17 | 1,050 | 64,600 | 5.07 | 5.84 |
| April..... | 430 | 65 | 158 | 9,400 | .763 | .85 |
| May..... | 635 | 28 | 67.4 | 4,140 | .326 | .38 |
| June..... | 49 | 12 | 23.9 | 1,420 | .115 | .13 |
| July..... | 12 | 2.5 | 5.7 | 350 | .028 | .03 |
| August..... | 2.5 | 1.0 | 1.4 | 86 | .0068 | .008 |
| September..... | 1 | 1 | 1 | 60 | .0048 | .005 |
| October..... | 1 | 1 | 1 | 61 | .0048 | .006 |
| November..... | 2.5 | 1 | 1.4 | 83 | .0068 | .008 |
| December..... | 600 | 2 | 52.1 | 3,200 | .252 | .29 |
| The year..... | 4,810 | 1 | 117 | 85,800 | .565 | 7.76 |

NOTE.—The above values are fair.

MISCELLANEOUS MEASUREMENTS IN SANTA YNEZ RIVER DRAINAGE BASIN.

The following miscellaneous discharge measurements were made in the Santa Ynez River drainage basin during 1905 and 1906:

Santa Ynez River near Lompoc, Cal.—At the old headworks of the Southern Pacific Milling Company's canal (not in use), $2\frac{1}{2}$ miles above Lompoc, Cal.:

1905—September 25: Width, 21 feet; area, 7.7 square feet; discharge, 8.8 second-feet.

1906—April 19: Width, 97 feet; area, 135 square feet; discharge, 358 second-feet.

July 25: Width, 28 feet; area, 15 square feet; discharge, 21 second-feet.

September 25: Width, 14 feet; area, 6.1 square feet; discharge, 7.1 second-feet.

At the wagon bridge, $1\frac{1}{2}$ miles above Lompoc, Cal.:

1906—November 10: Width, 36 feet; area, 12.8 square feet; discharge, 10 second-feet.

December 12: Width, 107 feet; area, 144 square feet; discharge, 259 second-feet.

SANTA MARIA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Santa Maria River drains the northern slope of the San Rafael Mountains and a limited area of foothill country to the north of the range. It flows in a westerly direction, finally discharging its waters into the Pacific Ocean at Guadalupe, about 25 miles south of San Luis Obispo. Its flow is torrential in character, subject to floods of short duration during the rainy period, but being practically dry during summer months. It has numerous tributaries, the most important of which is the Sisquoc, which enters it about 12 miles above the town of Santa Maria. The gaging station is located about 25 miles above the town of Santa Maria and above most of its important tributaries. The country throughout this basin consists of rolling foothills, with the exception of the higher elevations of the San Rafael Mountains which reach an elevation of 6,000 to 8,000 feet. The river flows from the foothills at the point where it is joined by the Sisquoc through the flat country of the Santa Maria Valley for a distance of about 25 miles until it joins the Pacific Ocean at Guadalupe. The formation throughout this basin is of shale, sandstone, and conglomerate, with a good covering of heavy clay soil. There is considerable growth of timber on the higher elevations of the San Rafael Mountains, but over most of the area the growth of timber is limited with large areas of brush and grass. The pasturage of stock is carried on extensively throughout the basin. There are no diversions of this stream for irrigation, although tunnel work has been attempted above Santa Maria for the development of underground water,

poor results. There are numerous wells in the vicinity of Santa Maria which produce considerable water for the irrigation of land in that locality, the soil being very deep and of exceptional quality, susceptible to the highest state of cultivation. The mean precipitation in this drainage basin is probably about 25 inches. The greatest rainfall occurs on the lower elevations near the coast. The higher elevations receive some snowfall, which melts early in the spring and does not tend to keep up the flow of the stream through the summer.

SANTA MARIA RIVER NEAR SANTA MARIA, CAL.

This station was established October 22, 1903, by W. B. Clapp. It is located near the ranch house on Dutard's ranch, 21 miles above Santa Maria, Cal., a station on the Pacific Coast Railway. It is reached by driving from Santa Maria. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 120, where are given also references to publications that contain data for previous years.

Gage heights observed at this station in 1906 are of no value, therefore no discharges can be computed.

Discharge measurements of Santa Maria River near Santa Maria, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|-------------------|--------------|------------------|-------------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| February 23..... | R. S. Hawley..... | 28 | 14.8 | 0.90 | 17.9 |
| June 6..... |do..... | 24 | 12.8 | ^a 2.20 | 11.9 |
| November 7..... |do..... | 20 | 7.0 | 1.70 | 4.9 |

^a Zero of gage lowered 2 feet.

SALINAS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Arroyo Seco is the most northern tributary of any size of Salinas River and rises on the slopes of the highest portion of the Santa Lucia Range, one of the ranges that go to make up the Coast Range of California, extending in a general southeast direction from San Francisco Bay. The upper valleys of this stream are far back in the range, surrounded by high mountains.

The drainage area of the Arroyo Seco is almost entirely made up of sharp ridges and V-shaped canyons. The western portion is well covered with brush and trees of medium size. Toward the east this growth decreases until at the Salinas Valley the country is bare. The stream beds of this area fall rapidly, the Arroyo Seco rising at an elevation of nearly 6,000 feet and discharging into the Salinas at an elevation of 170 feet.

Below the gaging station several canals divert water from the stream before it reaches the broad wash of sand and gravel on the floor of the Salinas Valley, into which it sinks during the dry season and from which it receives its name, "Arroyo Seco."

On the stream and its tributaries five reservoir sites of more or less value for possible storage have already been surveyed.

This portion of the range undoubtedly receives as great rainfall as any other locality in this region; it is estimated that the average annual precipitation is from 30 to 50 inches and falls almost entirely in the form of rain.

ARROYO SECO NEAR SOLEDAD, CAL.

The original gaging station on this stream was established by W. W. Cockins, jr., in December, 1900, at Foster's ranch, near Pine Cal. High water of January, 1901, enlarged an old side channel dividing the stream into two channels. The gaging station was then removed to Pettitt's ranch, 4 miles below the old station. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 123, where are given also references to publications that contain data for previous years.

Discharge measurements of Arroyo Seco near Soledad, Cal., by Hawley and Pettitt, in 1906.

| Date. | Width. | Area of section. | Gage height. | Dis-charge. | Date. | Width. | Area of section. | Gage height. | Dis-charge. |
|------------------|--------------|------------------|--------------|-----------------|-------------------|--------------|------------------|--------------|-------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.</i> |
| February 24..... | 124 | 181 | 6.52 | 396 | April 22..... | 122 | 165 | 6.15 | 33 |
| March 6..... | 123 | 186 | 6.22 | 436 | April 29..... | 121 | 154 | 6.00 | 28 |
| March 9..... | 123 | 169 | 6.30 | 388 | May 5..... | 120 | 141 | 5.81 | 22 |
| March 11..... | 122 | 157 | 6.15 | 328 | May 13..... | 120 | 133 | 5.72 | 19 |
| March 13..... | 140 | 882 | 11.90 | 5,700 | May 21..... | 119 | 121 | 5.00 | 16 |
| March 13..... | 130 | 389 | 8.20 | 1,530 | May 28..... | 124 | 287 | 7.40 | 1,01 |
| March 15..... | 137 | 562 | 10.10 | 3,330 | June 4..... | 121 | 154 | 6.00 | 29 |
| March 16..... | 136 | 466 | 9.32 | 2,440 | June 5..... | 62 | 65 | 5.93 | 26 |
| March 17..... | 134 | 405 | 8.45 | 1,790 | June 24..... | 75 | 56 | 5.50 | 12 |
| March 18..... | 132 | 349 | 7.88 | 1,240 | July 4..... | 47 | 67 | 5.35 | 8 |
| March 20..... | 128 | 285 | 7.38 | 853 | July 13..... | 40 | 47 | 5.25 | 5 |
| March 23..... | 135 | 680 | 11.40 | 3,920 | July 29..... | 34 | 37 | 5.13 | 2 |
| March 24..... | 135 | 446 | 8.75 | 1,900 | August 12..... | 31 | 29 | 5.05 | 1 |
| March 25..... | 133 | 475 | 8.93 | 2,430 | August 26..... | 31 | 29 | 5.02 | 1 |
| March 30..... | 129 | 353 | 8.10 | 1,410 | September 18..... | 31 | 28 | 4.90 | 1 |
| March 31..... | 133 | 496 | 9.25 | 2,510 | October 27..... | 18 | 18.8 | 5.01 | 1 |
| April 8..... | 124 | 244 | 6.95 | 633 | December 31..... | 124 | 275 | 7.20 | 8 |
| April 15..... | 122 | 187 | 6.35 | 414 | | | | | |

Daily gage height, in feet, of Arroyo Seco near Soledad, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|------|-------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1 | 5.55 | 5.65 | 6.2 | 8.3 | 5.95 | 6.1 | 5.4 | 5.1 | 4.5 | 5.0 | 5.05 | 5.2 |
| 2 | 5.52 | 5.6 | 6.15 | 8.0 | 5.9 | 6.05 | 5.4 | 5.1 | 4.5 | 5.0 | 5.05 | 5.15 |
| 3 | 5.52 | 5.58 | 6.6 | 7.75 | 5.9 | 6.0 | 5.4 | 5.1 | 4.7 | 5.0 | 5.05 | 5.15 |
| 4 | 5.55 | 5.55 | 8.45 | 7.55 | 5.9 | 6.0 | 5.35 | 5.1 | 4.6 | 5.0 | 5.25 | 5.15 |
| 5 | 5.52 | 5.52 | 6.9 | 7.35 | 5.8 | 5.9 | 5.35 | 5.1 | 4.6 | 5.0 | 5.5 | 5.15 |
| 6 | | | | | | | | | | | | |
| 7 | 5.52 | 5.6 | 6.65 | 7.2 | 5.8 | 5.9 | 5.35 | 5.1 | 4.6 | 5.0 | 5.25 | 5.15 |
| 8 | 5.52 | 5.5 | 6.5 | 7.0 | 5.8 | 5.85 | 5.3 | 5.1 | 4.6 | 4.9 | 5.15 | 5.15 |
| 9 | 5.52 | 5.49 | 6.39 | 6.95 | 5.75 | 5.8 | 5.3 | 5.1 | 4.6 | 4.8 | 5.15 | 5.15 |
| 10 | 5.51 | 5.45 | 6.3 | 6.8 | 5.7 | 5.8 | 5.3 | 5.1 | 4.5 | 4.8 | 5.1 | 5.3 |
| 11 | 5.51 | 5.41 | 6.21 | 6.7 | 5.7 | 5.75 | 5.3 | 5.1 | 4.6 | 4.8 | 5.1 | 5.3 |
| 12 | | | | | | | | | | | | |
| 13 | 5.52 | 5.7 | 6.28 | 6.6 | 5.8 | 5.7 | 5.3 | 5.05 | 4.6 | 4.8 | 5.1 | 13.0 |
| 14 | 6.85 | 5.51 | 11.3 | 6.5 | 5.75 | 5.7 | 5.25 | 5.05 | 4.6 | 4.9 | 5.1 | 7.95 |
| 15 | 8.18 | 5.8 | 8.15 | 6.5 | 5.7 | 5.7 | 5.25 | 5.05 | 4.6 | 5.0 | 5.1 | 7.2 |
| 16 | 7.48 | 5.92 | 7.8 | 6.4 | 5.7 | 5.65 | 5.25 | 5.05 | 4.6 | 5.0 | 5.1 | 6.6 |
| 17 | 7.30 | 7.05 | 10.1 | 6.35 | 5.7 | 5.65 | 5.2 | 5.0 | 4.7 | 5.0 | 5.1 | 6.2 |
| 18 | | | | | | | | | | | | |
| 19 | 6.75 | 6.45 | 9.25 | 6.3 | 5.7 | 5.6 | 5.2 | 5.0 | 4.7 | 5.0 | 5.1 | 6.1 |
| 20 | 7.98 | 6.3 | 8.4 | 6.3 | 5.65 | 5.6 | 5.2 | 5.0 | 4.8 | 5.0 | 5.1 | 5.85 |
| 21 | 7.98 | 6.28 | 7.88 | 6.2 | 5.6 | 5.6 | 5.2 | 5.0 | 4.9 | 5.0 | 5.1 | 5.8 |
| 22 | 10.12 | 6.18 | 7.6 | 6.2 | 5.6 | 5.55 | 5.2 | 5.0 | 4.9 | 5.0 | 5.1 | 5.7 |
| 23 | 8.0 | 6.1 | 7.3 | 6.2 | 5.6 | 5.5 | 5.2 | 5.0 | 5.0 | 5.0 | 5.1 | 5.6 |
| 24 | | | | | | | | | | | | |
| 25 | 7.2 | 6.3 | 7.95 | 6.2 | 5.6 | 5.5 | 5.2 | 5.0 | 5.0 | 5.0 | 5.1 | 5.55 |
| 26 | 6.8 | 6.85 | 7.48 | 6.2 | 5.6 | 5.5 | 5.2 | 5.05 | 5.0 | 5.05 | 5.15 | 5.5 |
| 27 | 6.5 | 6.6 | 8.94 | 6.2 | 5.6 | 5.5 | 5.2 | 5.05 | 5.0 | 5.05 | 5.15 | 5.5 |
| 28 | 6.3 | 6.59 | 8.85 | 6.2 | 5.6 | 5.5 | 5.2 | 5.05 | 5.0 | 5.05 | 5.1 | 5.5 |
| 29 | 6.15 | 6.49 | 8.7 | 6.2 | 5.6 | 5.5 | 5.2 | 5.05 | 5.05 | 5.05 | 5.15 | 5.5 |
| 30 | | | | | | | | | | | | |
| 31 | 6.0 | 6.39 | 9.0 | 6.05 | 6.55 | 5.5 | 5.15 | 5.0 | 5.05 | 5.05 | 5.15 | 7.45 |
| 1 | 5.95 | 6.3 | 8.35 | 6.05 | 8.3 | 5.5 | 5.1 | 5.0 | 5.05 | 5.05 | 5.15 | 7.2 |
| 2 | 5.9 | 6.3 | 8.0 | 6.0 | 7.3 | 5.5 | 5.1 | 4.9 | 5.05 | 5.05 | 5.15 | 6.7 |
| 3 | 5.85 | | 7.7 | 6.0 | 6.75 | 5.45 | 5.15 | 4.8 | 5.0 | 5.05 | 5.2 | 6.35 |
| 4 | 5.75 | | 8.12 | 6.0 | 6.45 | 5.4 | 5.1 | 4.7 | 5.0 | 5.05 | 5.2 | 6.25 |
| 5 | 5.7 | | 9.08 | | 6.4 | | 5.1 | 4.6 | | 5.05 | | 7.2 |

a Estimated.

Rating table for Arroyo Seco near Soledad, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 4.50 | 0 | 5.60 | 153 | 6.70 | 553 | 7.80 | 1,195 | 9.80 | 2,980 |
| 4.60 | 1 | 5.70 | 185 | 6.80 | 599 | 7.90 | 1,265 | 10.00 | 3,180 |
| 4.70 | 3 | 5.80 | 218 | 6.90 | 648 | 8.00 | 1,340 | 10.20 | 3,380 |
| 4.80 | 5 | 5.90 | 252 | 7.00 | 700 | 8.20 | 1,495 | 10.40 | 3,580 |
| 4.90 | 8 | 6.00 | 286 | 7.10 | 754 | 8.40 | 1,660 | 10.60 | 3,780 |
| 5.00 | 14 | 6.10 | 320 | 7.20 | 810 | 8.60 | 1,840 | 10.80 | 3,980 |
| 5.10 | 24 | 6.20 | 356 | 7.30 | 868 | 8.80 | 2,020 | 11.00 | 4,180 |
| 5.20 | 40 | 6.30 | 393 | 7.40 | 928 | 9.00 | 2,200 | 12.00 | 5,180 |
| 5.30 | 63 | 6.40 | 431 | 7.50 | 990 | 9.20 | 2,390 | 13.00 | 6,250 |
| 5.40 | 91 | 6.50 | 470 | 7.60 | 1,055 | 9.40 | 2,580 | | |
| 5.50 | 121 | 6.60 | 510 | 7.70 | 1,125 | 9.60 | 2,780 | | |

NOTE.—This table is based on 35 discharge measurements made during 1906 and is well defined between gage heights 5 feet and 10 feet.

Monthly discharge of Arroyo Seco near Soledad, Cal., for 1906.

[Drainage area, 215 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|-------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | De in |
| January..... | 3,300 | 124 | 556 | 34,200 | 2.59 | |
| February..... | 727 | 94 | 302 | 16,800 | 1.41 | |
| March..... | 4,480 | 338 | 1,360 | 83,600 | 6.32 | |
| April..... | 1,580 | 286 | 558 | 33,200 | 2.60 | |
| May..... | 1,580 | 153 | 297 | 18,300 | 1.38 | |
| June..... | 320 | 91 | 178 | 10,600 | .828 | |
| July..... | 91 | 24 | 50.8 | 3,120 | .236 | |
| August..... | 24 | 1 | 17.3 | 1,060 | .080 | |
| September..... | 19 | 0 | 7.1 | 422 | .033 | |
| October..... | 19 | 5 | 14.1 | 867 | .066 | |
| November..... | 121 | 19 | 31.8 | 1,890 | .148 | |
| December..... | 6,250 | 32 | 492 | 30,300 | 2.29 | |
| The year..... | 6,250 | 0 | 322 | 234,000 | 1.49 | |

NOTE.—Values are rated as follows: January to June, excellent; July and December, good; August to November, fair.

SAN FRANCISCO BAY DRAINAGE BASIN.

GENERAL FEATURES.

Sacramento River, rising in northern California and flowing south, and San Joaquin River, rising in the southern Sierras and flowing north, drain the western slope of the Sierra Nevada and the eastern slope of the Coast Range north of San Francisco. They meet at Suisun Bay, finally discharging their waters into the Pacific Ocean through San Francisco Bay.

SACRAMENTO RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Sacramento River is the principal river of California, and drains all of the territory south of Mount Shasta and between the Coast Range and Trinity Range on the west and the Sierra Nevada on the east. The portion of the drainage basin above Red Bluff, extends from the Trinity Mountains on the west to Warner Mountain near the California-Nevada State line on the east. The watershed on the west from the Trinity Mountains is comparatively narrow, being only from 10 to 35 miles in width, and furnishes a very small proportion of the discharge of this river, but from the east Pit River, which is the most important tributary, drains a large area extending about 120 miles east from Sacramento River between Mount Shasta on the north and Lassen Peak on the south. The greater portion of this basin is composed of lava and shows other evidences of volcanic activity, such as volcanic cones and craters. Nearly all the streams tributary to Pit River have their origin in large springs, many of which discharge several hundred second-feet. The r

important tributary of the Pit is McCloud River, draining the southeastern slope of Mount Shasta. It derives its waters principally from the melting of the snow on the high elevations of this mountain. The western portion of the watershed extending along the Trinity Range is well timbered, as is also that portion of the drainage area in the Sierra Nevada lying between Mount Shasta and Lassen Peak. Farther east, however, there is little or no forest covering, and the country is used extensively for pasturage. The rainfall is very unequally distributed, varying from less than 10 inches in the eastern portion of the basin to 50 inches along the northern and western portion. Below the gaging station the river enters the Sacramento Valley, through which it flows on a comparatively light grade until it reaches Suisun Bay. During the winter months, when the Sacramento and its tributaries are in flood, large areas of the Sacramento Valley are overflowed. The floods that occur in the latter part of the rainy season, after the large overflow areas or basins are filled, cause great damage in the lower portion of the valley.

MAIN SACRAMENTO RIVER.

SACRAMENTO RIVER NEAR RED BLUFF, CAL.

The gaging station at Jellys Ferry, which is located about 12 miles above the town of Red Bluff, was established April 30, 1895. The right bank of the river is high, but the left bank is liable to overflow when the river rises above the 25-foot mark. The river has been known to reach the 35-foot mark. Because of the liability to overflow it was deemed advisable to select a new gaging station, where the water at flood stage could be more confined. A point in Iron Canyon, where the river had been gaged by the State engineering department in 1879 and by commissioner of public works in 1893-94, was chosen as a new gaging station. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, p. 128, where are given also references to publications that contain data for previous years.

Discharge measurements of Sacramento River near Red Bluff, Cal., by R. S. Hawley, in 1906.

| Date. | Width. | Area of section. | Gage height. | Discharge. | Date. | Width. | Area of section. | Gage height. | Discharge. |
|-----------------------------|--------------|------------------|--------------|-----------------|----------------|--------------|------------------|--------------|-----------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| February 27..... | 550 | 8,230 | 10.30 | 41,600 | May 16..... | 529 | 5,290 | 4.64 | 15,700 |
| February 27..... | 546 | 7,850 | 9.45 | 36,000 | May 18..... | 527 | 4,980 | 4.14 | 13,800 |
| March 13..... | 550 | 7,920 | 9.60 | 38,200 | June 12..... | 534 | 6,270 | 6.50 | 23,900 |
| March 14..... | 550 | 7,780 | 9.30 | 36,900 | June 13..... | 532 | 5,890 | 5.68 | 19,600 |
| March 26 ^a | 590 | 12,900 | 18.30 | 92,900 | July 7..... | 520 | 4,360 | 2.90 | 9,900 |
| April 11..... | 536 | 6,550 | 7.00 | 24,500 | September 6... | 496 | 3,330 | 1.63 | 5,470 |
| May 3..... | 531 | 5,570 | 5.25 | 18,500 | December 11... | 538 | 6,570 | 7.60 | 26,900 |

^a Measured by floats.

Daily gage height, in feet, of Sacramento River near Red Bluff, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|-------|-------|-------|------|-------|-------|------|-------|------|-------|
| 1..... | 1.5 | 2.9 | 7.65 | 15.5 | 5.5 | 5.6 | 3.3 | 1.9 | 1.7 | 1.6 | 1.6 |
| 2..... | 1.4 | 2.8 | 6.95 | 12.55 | 5.4 | 5.5 | 3.25 | 1.9 | 1.65 | 1.6 | 1.6 |
| 3..... | 1.4 | 2.7 | 10.65 | 10.75 | 5.3 | 5.5 | 3.2 | 1.9 | 1.65 | 1.6 | 1.8 |
| 4..... | 1.4 | 2.7 | 10.75 | 9.6 | 5.2 | 8.85 | 3.1 | 1.9 | 1.65 | 1.55 | 2.4 |
| 5..... | 1.4 | 2.6 | 8.2 | 8.55 | 5.3 | 7.75 | 3.0 | 1.9 | 1.65 | 1.55 | 3.25 |
| 6..... | 1.45 | 2.55 | 7.3 | 7.9 | 5.15 | 7.8 | 2.95 | 1.8 | 1.65 | 1.55 | 2.2 |
| 7..... | 1.45 | 2.5 | 6.9 | 7.5 | 5.0 | 6.85 | 2.9 | 1.8 | 1.6 | 1.55 | 2.0 |
| 8..... | 1.45 | 2.5 | 6.6 | 7.3 | 4.9 | 6.2 | 2.8 | 1.8 | 1.6 | 1.55 | 1.9 |
| 9..... | 1.5 | 2.6 | 6.6 | 7.25 | 4.8 | 6.0 | 2.8 | 1.8 | 1.6 | 1.55 | 1.8 |
| 10..... | 1.8 | 2.7 | 6.5 | 7.1 | 4.9 | 5.6 | 2.7 | 1.75 | 1.6 | 1.55 | 1.8 |
| 11..... | 1.75 | 3.25 | 6.45 | 6.9 | 4.8 | 5.35 | 2.7 | 1.75 | 1.6 | 1.55 | 1.8 |
| 12..... | 3.3 | 3.9 | 14.85 | 6.55 | 4.7 | 6.35 | 2.6 | 1.75 | 1.6 | 1.55 | 1.75 |
| 13..... | 4.65 | ..... | 9.9 | 6.2 | 4.55 | 5.6 | 2.6 | 1.7 | 1.6 | 1.55 | 1.75 |
| 14..... | 4.3 | 3.35 | 9.55 | 6.5 | 4.55 | 5.25 | 2.5 | 1.7 | 1.75 | 1.55 | 1.75 |
| 15..... | 4.35 | 10.95 | 7.75 | 5.9 | 4.9 | 5.0 | 2.5 | 1.7 | 1.7 | 1.6 | 1.8 |
| 16..... | 12.8 | 7.45 | 7.0 | 5.8 | 4.6 | 5.9 | 2.4 | 1.7 | 1.7 | 1.6 | 1.8 |
| 17..... | 9.85 | 7.3 | 6.6 | 5.8 | 4.3 | 5.4 | 2.4 | 1.7 | 1.65 | 1.6 | 1.8 |
| 18..... | 12.7 | 6.75 | 5.95 | 5.75 | 4.2 | 5.0 | 2.4 | 1.65 | 1.65 | 1.6 | 1.75 |
| 19..... | 22.6 | 10.6 | 5.35 | 5.6 | 4.1 | 4.05 | 2.3 | 1.7 | 1.6 | 1.6 | 1.7 |
| 20..... | 9.1 | 8.5 | 5.85 | 5.6 | 4.0 | 4.5 | 2.3 | 1.7 | 1.6 | 1.6 | 1.7 |
| 21..... | 5.8 | 9.9 | 8.3 | 5.7 | 4.0 | 4.3 | 2.25 | 1.7 | 1.6 | 1.55 | 1.7 |
| 22..... | 4.7 | 10.0 | 12.95 | 5.75 | 3.9 | 4.1 | 2.2 | 1.75 | 1.6 | 1.6 | 1.7 |
| 23..... | 4.3 | 12.75 | 10.7 | 6.0 | 3.8 | 3.95 | 2.2 | 1.75 | 1.65 | 1.6 | 1.7 |
| 24..... | 4.0 | 11.5 | 14.85 | 5.8 | 3.7 | 3.75 | 2.1 | 1.7 | 1.7 | 1.6 | 1.7 |
| 25..... | 3.75 | 10.35 | 16.6 | 6.1 | 4.4 | 3.7 | 2.1 | 1.7 | 1.7 | 1.6 | 1.7 |
| 26..... | 3.55 | 8.4 | 17.95 | 5.5 | 9.6 | 3.6 | 2.1 | 1.7 | 1.6 | 1.6 | 1.7 |
| 27..... | 3.4 | 9.1 | 15.45 | 6.0 | 11.0 | 3.75 | 2.0 | 1.7 | 1.6 | 1.6 | 1.7 |
| 28..... | 3.4 | 8.5 | 12.6 | 6.2 | 10.6 | 3.7 | 2.0 | 1.7 | 1.6 | 1.6 | 1.65 |
| 29..... | 3.25 | ..... | 10.8 | 5.6 | 8.95 | 3.5 | 2.0 | 1.7 | 1.6 | 1.6 | 1.7 |
| 30..... | 3.2 | ..... | 12.85 | 5.55 | 7.35 | 3.35 | 2.0 | 1.7 | 1.6 | 1.6 | 1.7 |
| 31..... | 3.05 | ..... | 23.35 | ..... | 6.5 | ..... | 1.9 | 1.7 | ..... | 1.6 | ..... |

Rating table for Sacramento River near Red Bluff, Cal., for 1904-1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1.40 | 5,410 | 2.60 | 8,810 | 3.80 | 12,720 | 6.00 | 21,100 | 14.00 | 61,700 |
| 1.50 | 5,650 | 2.70 | 9,120 | 3.90 | 13,060 | 6.20 | 21,940 | 15.00 | 68,200 |
| 1.60 | 5,920 | 2.80 | 9,430 | 4.00 | 13,400 | 6.40 | 22,780 | 16.00 | 75,100 |
| 1.70 | 6,190 | 2.90 | 9,740 | 4.20 | 14,120 | 6.60 | 23,620 | 17.00 | 82,500 |
| 1.80 | 6,460 | 3.00 | 10,050 | 4.40 | 14,840 | 6.80 | 24,460 | 18.00 | 89,700 |
| 1.90 | 6,730 | 3.10 | 10,380 | 4.60 | 15,580 | 7.00 | 25,300 | 19.00 | 97,000 |
| 2.00 | 7,000 | 3.20 | 10,710 | 4.80 | 16,340 | 8.00 | 29,700 | 20.00 | 105,900 |
| 2.10 | 7,300 | 3.30 | 11,040 | 5.00 | 17,100 | 9.00 | 34,300 | 21.00 | 114,000 |
| 2.20 | 7,600 | 3.40 | 11,370 | 5.20 | 17,900 | 10.00 | 39,100 | 22.00 | 123,700 |
| 2.30 | 7,900 | 3.50 | 11,700 | 5.40 | 18,700 | 11.00 | 44,200 | 23.00 | 133,200 |
| 2.40 | 8,200 | 3.60 | 12,040 | 5.60 | 19,500 | 12.00 | 49,700 | 24.00 | 143,100 |
| 2.50 | 8,500 | 3.70 | 12,380 | 5.80 | 20,300 | 13.00 | 55,600 | | |

NOTE.—This table is based on discharge measurements made during 1902-1906 and is well defined.

Monthly discharge of Sacramento River near Red Bluff, Cal., for 1906.

[Drainage area, 9,300 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off | |
|----------------|---------------------------|----------|--------|---------------------|------------------------|-------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Feet. |
| January..... | 129,000 | 5,410 | 14,700 | 904,000 | 1.58 | |
| February..... | 54,100 | 8,500 | 23,200 | 1,290,000 | 2.49 | |
| March..... | 137,000 | 18,500 | 42,500 | 2,610,000 | 4.57 | |
| April..... | 71,000 | 19,100 | 26,300 | 1,560,000 | 2.83 | |
| May..... | 44,200 | 12,400 | 19,400 | 1,190,000 | 2.09 | |
| June..... | 33,000 | 11,200 | 18,100 | 1,080,000 | 1.95 | |
| July..... | 11,000 | 6,730 | 8,550 | 524,000 | .917 | |
| August..... | 6,730 | 6,060 | 6,330 | 389,000 | .681 | |
| September..... | 6,320 | 5,920 | 6,020 | 358,000 | .647 | |
| October..... | 5,920 | 5,780 | 5,870 | 361,000 | .631 | |
| November..... | 10,900 | 5,920 | 6,570 | 391,000 | .706 | |
| December..... | 59,500 | 6,060 | 15,400 | 947,000 | 1.66 | |
| The year..... | 137,000 | 5,410 | 16,100 | 11,600,000 | 1.73 | |

NOTE.—These values are excellent.

MISCELLANEOUS MEASUREMENT IN SACRAMENTO RIVER DRAINAGE BASIN.

The following measurement was made of Sacramento River at Baird station, on the Southern Pacific Railway, near Gregory, Cal., October 9, 1906:

Width, 115 feet; area, 300 square feet; discharge, 315 second-feet.

PIT RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Pit River has its source in the Warner Mountains in the extreme northeast part of California. It flows in a southwesterly direction, discharging its waters into Sacramento River a few miles above Redding, Cal. It has numerous tributaries, the larger of which have their source in large springs, which discharge from crevices in the lava formation. About 50 per cent of the area of this drainage basin is barren of timber and composed principally of lava with a light soil covering, being used extensively for pasturage and the raising of stock. There are numerous small valleys with light grades, which hold the water throughout the summer months principally in the state of swamps. These areas are used mainly as meadow land and for the raising of stock feed. Pit River does not discharge in any great volume until it reaches a point near Fall River Mills, which lies about midway between the point where the Pit River enters the Sacramento and its source. Fall River, which is the principal tributary of the Pit from the north, receives its water supply from large perennial springs which discharge 1,500 second-feet. Hat Creek and Burney Creek are also large tributaries from the south and drain the northern slope of Lassen Peak. Their principal sources are also from large perennial springs in the lava formation.

West Valley Creek is a tributary of South Fork of Pit River. Ash Creek flows into Clear Creek, through which it enters Pit River from the south. There is considerable timber scattered throughout this drainage basin, the principal growth lying in the southern portion of the basin and also in that section lying north of Pit River and between Fall River and the upper Sacramento. There are numerous reservoir sites on the upper reaches of this stream, all of which have been or are being surveyed. Several gaging stations are maintained on Pit River and tributaries at points where surveys have been made for the construction of storage reservoirs. The rainfall throughout this basin is very unevenly distributed, ranging from 10 inches in the eastern portion to 50 to 75 inches in the western and northwestern portion. About 50 per cent of the precipitation falls in the form of snow, but does not remain any length of time except on the higher elevation of Mount Shasta and Lassen Peak.

McCloud River drains the southeastern slope of Mount Shasta. Its drainage area is comparatively small, covering 676 square miles. It is long and narrow, extending from north to south. There are few tributaries. Its main water supply comes from Mount Shasta, on which the snow remains during the entire year. It is also fed by numerous large springs scattered throughout the drainage basin. The precipitation is very heavy and is principally in the form of rain, except on the higher elevations of Mount Shasta. The discharge of this stream seldom falls below 1,200 second-feet. It discharges into the Pit River a few miles above the junction of the Pit with the Sacramento. The entire basin is well timbered.

PIT RIVER NEAR BIEBER, CAL.

This station was established January 22, 1904. It is located 2 miles below Bieber, Cal., near Muck Valley. The conditions at this station and the bench marks are described in *Water-Supply Paper No. 177*, page 136, where are given also references to publications that contain data for previous years.

Discharge measurements of Pit River near Bieber, Cal., by F. H. Holabird, in 1904.

| Date. | Width. | Area of section. | Gage height. | Discharge. | Date. | Width. | Area of section. | Gage height. | Discharge. |
|------------------------------|--------------|------------------|--------------|-----------------|-------------------|--------------|------------------|--------------|-----------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| January 29 ^a ... | 213 | 870 | 5.90 | 1,820 | April 9..... | 224 | 1,100 | 6.90 | 3,310 |
| February 3 ^a ... | 209 | 680 | 5.00 | 1,320 | April 12..... | 220 | 986 | 6.40 | 3,180 |
| February 5 ^a ... | 209 | 680 | 5.00 | 1,180 | April 13..... | 219 | 942 | 6.20 | 2,870 |
| February 8 ^a ... | 207 | 615 | 4.70 | 938 | April 14..... | 219 | 917 | 6.10 | 2,870 |
| February 10 ^a ... | 207 | 615 | 4.70 | 877 | April 15..... | 214 | 870 | 5.90 | 2,870 |
| February 12..... | 205 | 637 | 4.80 | 983 | April 17..... | 217 | 853 | 5.80 | 2,870 |
| February 14..... | 207 | 723 | 5.20 | 1,310 | April 19..... | 214 | 826 | 5.70 | 2,870 |
| February 16..... | 220 | 962 | 6.30 | 2,660 | April 20..... | 210 | 807 | 5.60 | 2,870 |
| February 17..... | 219 | 942 | 6.20 | 2,430 | April 27..... | 207 | 740 | 5.32 | 2,870 |
| February 19..... | 220 | 987 | 6.40 | 2,690 | May 5..... | 207 | 616 | 4.70 | 2,870 |
| February 21..... | 220 | 1,050 | 6.70 | 3,190 | May 12..... | 207 | 616 | 4.70 | 2,870 |
| February 23..... | 224 | 1,100 | 6.90 | 3,530 | May 19..... | 207 | 660 | 4.90 | 2,870 |
| February 26..... | 220 | 942 | 6.20 | 2,420 | May 26..... | 207 | 596 | 4.60 | 2,870 |
| February 28..... | 224 | 1,120 | 7.04 | 3,680 | June 2..... | 207 | 573 | 4.50 | 2,870 |
| March 8..... | 215 | 892 | 6.00 | 2,090 | June 9..... | 193 | 512 | 4.35 | 2,870 |
| March 12..... | 224 | 1,150 | 7.10 | 3,640 | June 16..... | 193 | 473 | 4.10 | 2,870 |
| March 13..... | 230 | 1,270 | 7.65 | 4,610 | August 11..... | 98 | 176 | 2.30 | 2,870 |
| March 18..... | 219 | 942 | 6.25 | 2,380 | August 25..... | 68 | 128 | 1.80 | 2,870 |
| March 20..... | 219 | 942 | 6.20 | 2,390 | September 1..... | 68 | 128 | 1.80 | 2,870 |
| March 21..... | 222 | 985 | 6.50 | 2,760 | September 8..... | 68 | 128 | 1.80 | 2,870 |
| March 22..... | 224 | 1,210 | 7.52 | 4,340 | September 15..... | 68 | 132 | 1.90 | 2,870 |
| March 23 ^b | 224 | 1,680 | 9.50 | 9,500 | September 23..... | 68 | 137 | 2.00 | 2,870 |
| April 4..... | 224 | 1,190 | 7.30 | 3,930 | September 29..... | 68 | 128 | 1.85 | 2,870 |
| April 5..... | 224 | 1,100 | 6.90 | 3,330 | October 7..... | 68 | 130 | 1.90 | 2,870 |
| April 6..... | 224 | 1,080 | 6.85 | 3,260 | October 14..... | 68 | 141 | 2.00 | 2,870 |
| April 7..... | 224 | 1,100 | 6.90 | 3,280 | October 26..... | 98 | 208 | 2.60 | 2,870 |
| April 8..... | 224 | 1,100 | 6.95 | 3,310 | | | | | |

^a Measured by Toler and Holabird.

^b Velocities not measured in entire cross section; discharge probably too great.

Daily gage height, in feet, of Pit River near Bieber, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. |
|------|------|------|------|------|------|-------|-------|------|-------|------|
| 1 | | 5.5 | 6.7 | 9.1 | 5.1 | 4.5 | 4.1 | 2.6 | 1.8 | 1.85 |
| 2 | | 5.0 | 6.5 | 8.3 | 5.1 | 4.5 | 4.0 | 2.6 | 1.8 | 1.85 |
| 3 | | 5.0 | 6.3 | 7.8 | 4.9 | 4.5 | 4.0 | 2.6 | 1.8 | 1.9 |
| 4 | | 5.0 | 6.05 | 7.3 | 4.8 | 4.5 | 3.8 | 2.6 | 1.8 | 1.9 |
| 5 | | 5.0 | 6.1 | 6.9 | 4.7 | 4.5 | 3.8 | 2.6 | 1.8 | 1.9 |
| 6 | | 4.8 | 6.0 | 6.85 | 4.7 | 4.4 | 3.8 | 2.6 | 1.8 | 1.9 |
| 7 | | 4.7 | 6.0 | 6.9 | 4.7 | 4.4 | 3.8 | 2.5 | 1.8 | 1.9 |
| 8 | | 4.7 | 6.0 | 6.95 | 4.7 | 4.4 | 3.85 | 2.5 | 1.8 | 1.9 |
| 9 | | 4.7 | 6.4 | 6.9 | 4.7 | 4.35 | 3.85 | 2.4 | | 1.9 |
| 10 | | 4.7 | 6.8 | 6.8 | 4.7 | 4.3 | 3.7 | 2.3 | | 2.0 |
| 11 | | 4.7 | 7.0 | 6.5 | 4.7 | 4.3 | 3.7 | 2.3 | | 2.0 |
| 12 | | 4.8 | 7.1 | 6.4 | 4.7 | 4.2 | 3.7 | 2.3 | | 2.0 |
| 13 | | 5.1 | 7.6 | 6.2 | 4.8 | 4.2 | 3.7 | 2.3 | | 2.0 |
| 14 | | 5.2 | 7.1 | 6.1 | 4.9 | 4.2 | 3.5 | 2.9 | | |
| 15 | 3.45 | 5.8 | 6.8 | 6.0 | 4.9 | 4.2 | 3.5 | 2.9 | 1.9 | |
| 16 | 4.35 | 6.3 | 6.3 | 5.9 | 4.8 | 4.1 | 3.5 | 2.6 | 1.9 | |
| 17 | 4.25 | 6.2 | 6.1 | 5.8 | 4.8 | 4.1 | 3.4 | 2.4 | 2.0 | |
| 18 | 4.6 | 6.2 | 6.2 | 5.8 | 4.8 | 4.0 | 3.4 | 2.2 | 2.0 | |
| 19 | 5.8 | 6.4 | 6.4 | 5.7 | 4.9 | 4.0 | 3.35 | 2.2 | 2.0 | |
| 20 | 6.4 | 6.4 | 6.2 | 5.6 | 4.9 | 3.5 | 3.35 | | 1.9 | |
| 21 | 6.4 | 6.7 | 6.4 | 5.5 | 4.9 | 3.4 | 3.3 | | 1.9 | |
| 22 | 6.8 | 7.2 | 7.4 | 5.5 | 4.8 | 3.35 | | | 1.9 | |
| 23 | 7.3 | 6.9 | 9.5 | 5.4 | 4.65 | 3.55 | | | 2.0 | |
| 24 | 7.8 | 6.7 | 10.5 | 5.4 | 4.65 | 3.55 | | | 2.0 | |
| 25 | 6.0 | 6.5 | 11.5 | 5.2 | 4.6 | 4.2 | | 1.8 | 2.0 | |
| 26 | 6.0 | 6.2 | 11.0 | 5.2 | 4.6 | 4.2 | | 1.8 | 1.9 | |
| 27 | 6.1 | 6.4 | 10.2 | 5.3 | 4.6 | 4.2 | | 1.8 | 1.9 | |
| 28 | 6.1 | 7.0 | 9.3 | 5.3 | 4.6 | 4.2 | | 1.8 | 1.9 | |
| 29 | 6.1 | | 8.6 | 5.2 | 4.6 | 4.2 | | 1.8 | 1.85 | |
| 30 | 6.0 | | 8.2 | 5.15 | 4.6 | 4.1 | | 1.8 | 1.85 | |
| 31 | 5.8 | | 8.4 | | 4.6 | | | 1.8 | | |

Rating table for Pit River near Bieber, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| Feet. | Sec.-ft. | Feet. | Sec.-ft. | Feet. | Sec.-ft. | Feet. | Sec.-ft. | Feet. | Sec.-ft. |
| 1.80 | 21 | 2.90 | 108 | 4.00 | 450 | 5.00 | 1,140 | 7.00 | 3,520 |
| 1.90 | 24 | 3.00 | 120 | 4.10 | 500 | 5.20 | 1,320 | 7.20 | 3,840 |
| 2.00 | 29 | 3.10 | 135 | 4.20 | 560 | 5.40 | 1,500 | 7.40 | 4,160 |
| 2.10 | 35 | 3.20 | 154 | 4.30 | 620 | 5.60 | 1,700 | 7.60 | 4,480 |
| 2.20 | 41 | 3.30 | 177 | 4.40 | 685 | 5.80 | 1,900 | 7.80 | 4,820 |
| 2.30 | 49 | 3.40 | 205 | 4.50 | 755 | 6.00 | 2,120 | 8.00 | 5,180 |
| 2.40 | 57 | 3.50 | 240 | 4.60 | 825 | 6.20 | 2,360 | 9.00 | 7,140 |
| 2.50 | 66 | 3.60 | 276 | 4.70 | 900 | 6.40 | 2,630 | 10.00 | 9,600 |
| 2.60 | 76 | 3.70 | 316 | 4.80 | 980 | 6.60 | 2,920 | 11.00 | 12,400 |
| 2.70 | 86 | 3.80 | 356 | 4.90 | 1,060 | 6.80 | 3,220 | 12.00 | 15,200 |
| 2.80 | 96 | 3.90 | 400 | | | | | | |

NOTE.—This table is based on 53 discharge measurements made during 1906 and is well defined below gage height 7.5 feet.

Monthly discharge of Pit River near Bieber, Cal., for 1906.

[Drainage area, 2,950 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|-----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January (15-31) | 4,820 | 222 | 2,150 | 72,500 | 0.728 | 0.46 |
| February | 3,840 | 900 | 1,930 | 107,000 | .654 | .68 |
| March | 13,800 | 2,120 | 4,640 | 285,000 | 1.57 | 1.81 |
| April | 7,360 | 1,280 | 2,590 | 154,000 | .878 | .98 |
| May | 1,230 | 825 | 948 | 58,300 | .321 | .37 |
| June | 755 | 190 | 544 | 32,400 | .184 | .21 |
| July (1-21) | 500 | 177 | 311 | 13,000 | .105 | .08 |
| August | 108 | 21 | a 51 | 3,140 | .017 | .02 |
| September | 29 | 21 | a 24 | 1,430 | .008 | .009 |
| October (1-13) | 29 | 22 | 25 | 645 | .008 | .004 |
| The period | | | | 727,000 | | |

a Discharges interpolated for days when gage was not read.

NOTE.—Values are rated as follows: January to June, excellent; July, good; August to October, fair.

M'CLOUD RIVER NEAR GREGORY, CAL.

This station was established March 23, 1902, in cooperation with the McCloud River Electric Company. It is located at Johns Creek near Hirze Mountain, 14 miles east of Gregory post-office, Cal. Station, on the Southern Pacific Railroad, is just across Sacramento River from Gregory. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 147, and are given also references to publications that contain data for previous years.

Discharge measurements of McCloud River near Gregory, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-------------------------------|----------------------|--------------|------------------|--------------|-------------------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Cu. ft. per sec.</i> |
| January 16 ^a | F. P. Ackerson | 143 | 1,080 | 6.05 | 1,080 |
| January 16 ^a | do | 152 | 1,330 | 7.40 | 1,330 |
| February 12 | R. S. Hawley | 104 | 556 | 1.90 | 556 |
| April 12 | do | 105 | 685 | 3.07 | 685 |
| May 17 | do | 104 | 637 | 2.45 | 637 |
| October 10 | do | 100 | 576 | 1.56 | 576 |

^a Measured by floats.

Daily gage height, in feet, of McCloud River near Gregory, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|-------|------|-------|------|------------------|-------|------|-------|------|-------|
| 1..... | 1.6 | 1.85 | 3.3 | 5.6 | 2.85 | 3.6 | 2.3 | 1.8 | 1.6 | 1.6 | 1.55 |
| 2..... | 1.6 | 1.85 | 3.3 | 4.6 | 2.8 | 3.6 | 2.25 | 1.8 | 1.6 | 1.6 | 1.6 |
| 3..... | 1.55 | 1.85 | 3.55 | 4.15 | 2.8 | 4.65 | 2.25 | 1.8 | 1.6 | 1.6 | 1.7 |
| 4..... | 1.55 | 1.8 | 3.3 | 3.75 | 2.8 | 6.5 | 2.2 | 1.8 | 1.6 | 1.6 | 2.35 |
| 5..... | 1.55 | 1.8 | 3.0 | 3.5 | 2.75 | 5.65 | 2.2 | 1.8 | 1.6 | 1.6 | 1.75 |
| 6..... | 1.55 | 1.8 | 2.75 | 3.4 | 2.7 | 5.35 | 2.15 | 1.8 | 1.6 | 1.6 | 1.6 |
| 7..... | 1.55 | 1.75 | 2.8 | 3.3 | 2.7 | 4.6 | 2.2 | 1.8 | 1.6 | 1.6 | 1.6 |
| 8..... | 1.55 | 1.75 | 2.85 | 3.3 | 2.7 | 4.1 | 2.15 | 1.8 | 1.6 | 1.6 | 1.55 |
| 9..... | 1.55 | 1.8 | 2.9 | 3.3 | 2.65 | 3.9 | 2.1 | 1.75 | 1.6 | 1.6 | 1.55 |
| 10..... | 1.6 | 1.9 | 2.85 | 3.3 | 2.65 | 3.8 | 2.1 | 1.75 | 1.6 | 1.55 | 1.55 |
| 11..... | 1.7 | 1.9 | 2.9 | 3.2 | 2.65 | 3.6 | 2.05 | 1.7 | 1.6 | 1.55 | 1.55 |
| 12..... | 2.8 | 1.9 | 3.9 | 3.05 | 2.6 | 3.45 | 2.0 | 1.7 | 1.6 | 1.55 | 1.55 |
| 13..... | 2.25 | 2.0 | 3.5 | 2.95 | 2.5 | 3.3 | 2.0 | 1.7 | 1.6 | 1.55 | 1.55 |
| 14..... | 2.1 | 3.2 | 3.15 | 2.9 | 2.75 | 3.15 | 2.0 | 1.7 | 1.6 | 1.55 | 1.55 |
| 15..... | 2.55 | 3.95 | 2.95 | 2.9 | 2.85 | 3.15 | 2.0 | 1.7 | 1.6 | 1.55 | 1.55 |
| 16..... | 6.15 | 3.35 | 2.7 | 2.9 | 2.6 | 3.1 ^c | 1.95 | 1.7 | 1.6 | 1.55 | 1.55 |
| 17..... | 3.1 | 2.85 | 2.6 | 2.9 | 2.5 | 2.95 | 1.95 | 1.7 | 1.6 | 1.55 | 1.55 |
| 18..... | 5.95 | 3.2 | 2.55 | 2.9 | 2.4 | 2.85 | 1.95 | 1.7 | 1.6 | 1.55 | 1.55 |
| 19..... | 5.35 | 3.6 | 2.5 | 2.9 | 2.4 | 2.8 | 1.9 | 1.7 | 1.6 | 1.55 | 1.55 |
| 20..... | 3.35 | 3.55 | 2.5 | 2.9 | 2.35 | 2.65 | 1.9 | 1.7 | 1.6 | 1.55 | 1.55 |
| 21..... | 3.15 | 4.45 | 3.4 | 2.9 | 2.3 | 2.6 | 1.9 | 1.7 | 1.6 | 1.55 | 1.55 |
| 22..... | 3.1 | 3.95 | 4.4 | 2.9 | 2.3 | 2.55 | 1.85 | 1.7 | 1.6 | 1.55 | 1.55 |
| 23..... | 3.0 | 3.65 | 4.15 | 3.05 | 2.25 | 2.5 | 1.85 | 1.7 | 1.6 | 1.55 | 1.55 |
| 24..... | 2.9 | 3.8 | 5.5 | 3.05 | 2.2 | 2.4 | 1.85 | 1.7 | 1.6 | 1.55 | 1.55 |
| 25..... | 2.7 | 3.4 | 6.45 | 3.1 | 2.25 | 2.4 | 1.85 | 1.65 | 1.6 | 1.55 | 1.55 |
| 26..... | 2.6 | 3.2 | 6.3 | 3.0 | 6.6 | 2.4 | 1.85 | 1.65 | 1.6 | 1.55 | 1.55 |
| 27..... | 2.4 | 3.6 | 5.2 | 2.95 | 6.25 | 2.45 | 1.8 | 1.65 | 1.6 | 1.55 | 1.55 |
| 28..... | 2.2 | 3.4 | 4.4 | 2.95 | 5.3 | 2.4 | 1.8 | 1.65 | 1.6 | 1.55 | 1.55 |
| 29..... | 2.1 | ..... | 4.0 | 2.9 | 4.5 | 2.35 | 1.8 | 1.65 | 1.6 | 1.55 | 1.55 |
| 30..... | 2.0 | ..... | 5.25 | 2.9 | 4.1 | 2.3 | 1.8 | 1.65 | 1.6 | 1.55 | 1.55 |
| 31..... | 1.9 | ..... | 7.4 | ..... | 3.7 | ..... | 1.8 | 1.65 | ..... | 1.55 | ..... |

Rating table for McCloud River near Gregory, Cal., for 1902-1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1.50 | 1,340 | 2.40 | 2,042 | 3.30 | 3,090 | 4.40 | 4,990 | 6.20 | 9,120 |
| 1.60 | 1,402 | 2.50 | 2,140 | 3.40 | 3,230 | 4.60 | 5,410 | 6.40 | 9,650 |
| 1.70 | 1,463 | 2.60 | 2,242 | 3.50 | 3,380 | 4.80 | 5,840 | 6.60 | 10,190 |
| 1.80 | 1,538 | 2.70 | 2,349 | 3.60 | 3,535 | 5.00 | 6,280 | 6.80 | 10,740 |
| 1.90 | 1,612 | 2.80 | 2,461 | 3.70 | 3,695 | 5.20 | 6,720 | 7.00 | 11,300 |
| 2.00 | 1,690 | 2.90 | 2,578 | 3.80 | 3,860 | 5.40 | 7,170 | 8.00 | 14,250 |
| 2.10 | 1,772 | 3.00 | 2,700 | 3.90 | 4,030 | 5.60 | 7,630 | | |
| 2.20 | 1,858 | 3.10 | 2,825 | 4.00 | 4,210 | 5.80 | 8,110 | | |
| 2.30 | 1,948 | 3.20 | 2,955 | 4.20 | 4,585 | 6.00 | 8,600 | | |

NOTE.—This table is based on discharge measurements made during 1902-1906 and is well defined.

Monthly discharge of McCloud River near Gregory, Cal., for 1906.

[Drainage area, 608 square miles.]

| Month. | Discharge in second-feet | | | Total in acre-feet. | Run-off. | |
|----------------|--------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 8,990 | 1,370 | 2,540 | 156,000 | 4.18 | 4.82 |
| February..... | 5,100 | 1,500 | 2,600 | 144,000 | 4.28 | 4.46 |
| March..... | 12,400 | 2,140 | 4,160 | 256,000 | 6.84 | 7.89 |
| April..... | 7,630 | 2,580 | 3,110 | 185,000 | 5.12 | 5.71 |
| May..... | 10,200 | 1,860 | 3,070 | 189,000 | 5.05 | 5.82 |
| June..... | 9,920 | 1,950 | 3,480 | 207,000 | 5.72 | 6.38 |
| July..... | 1,950 | 1,540 | 1,690 | 104,000 | 2.78 | 3.20 |
| August..... | 1,540 | 1,440 | 1,480 | 91,000 | 2.43 | 2.80 |
| September..... | 1,400 | 1,400 | 1,400 | 83,300 | 2.30 | 2.57 |
| October..... | 1,400 | 1,370 | 1,380 | 84,800 | 2.27 | 2.62 |
| November..... | 2,000 | 1,370 | 1,400 | 83,300 | 2.30 | 2.57 |
| December..... | 5,620 | 1,340 | 2,070 | 127,000 | 3.40 | 3.92 |
| The year..... | 12,400 | 1,340 | 2,360 | 1,710,000 | 3.89 | 52.76 |

NOTE.—These values are excellent.

STONY CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Stony Creek drains a portion of the Coast Range. It flows in a northerly direction and discharges its waters into the Sacramento River near Orland, Cal. It has numerous tributaries, all of which are torrential in their character. The formation on the higher elevations is of granite, with good soil covering, and is heavily timbered. In the lower portion of the drainage basin the formation is shale, sandstone, and conglomerate, with heavy growth of brush and grass. This portion of the basin is used extensively for pasturage. The soil being heavy, it packs readily, causing a large per cent of run-off. The mean average rainfall on the higher elevation is about 40 inches, while on the lower reaches it is 20 inches. The precipitation is almost wholly in the form of rain, with some snow on the upper reaches, which soon melts and only adds to the flood discharge.

The gaging station on this stream is located near the point where it emerges from the foothills and enters the Sacramento Valley.

STONY CREEK NEAR FRUTO, CAL.

This station was established on January 30, 1901. It is located at Julian's ranch, 7 miles northwest of Fruto, and $1\frac{3}{4}$ miles above the proposed mill-site dam. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, 153, where are given also references to publications that contain data for previous years.

Discharge measurements of Stony Creek near Fruto, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | |
|---------------------------------|------------------------|--------------|------------------|--------------|----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sq. ft.</i> |
| February 8 ^a | R. S. Hawley..... | 137 | 216 | 5.70 | |
| February 24..... | F. R. S. Buttemer..... | 151 | 455 | 7.10 | |
| March 8..... | do..... | 146 | 412 | 6.40 | |
| March 16..... | do..... | 140 | 336 | 6.00 | |
| March 16..... | do..... | 140 | 336 | 6.00 | |
| May 2..... | R. S. Hawley..... | 136 | 271 | 5.52 | |
| May 18..... | do..... | 132 | 222 | 5.02 | |
| June 13..... | do..... | 132 | 218 | 5.03 | |
| September 20 ^b | S. G. Bennett..... | 27 | 24 | 3.65 | |
| October 5 ^b | R. S. Hawley..... | 22 | 17.6 | 3.62 | |
| October 14 ^b | S. G. Bennett..... | 26 | 25 | 3.65 | |

^a During the high water of January 18, 1906, the channel at the cable was raised by a deposit of gravel, which was gradually removed during the two or three months following. These measurements were made before the channel had assumed its normal condition.

^b Measurement made by wading at section below the gage.

Daily gage height, in feet, of Stony Creek near Fruto, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|------|-------|
| 1..... | 4.0 | 5.8 | 6.75 | 7.85 | 5.4 | 5.3 | 4.5 | 3.8 | 3.6 | 3.7 | 3.7 |
| 2..... | 4.0 | 5.8 | 6.55 | 7.4 | 5.4 | 5.3 | 4.5 | 3.8 | 3.6 | 3.7 | 3.7 |
| 3..... | 4.0 | 5.8 | 9.35 | 7.05 | 5.3 | 5.3 | 4.4 | 3.8 | 3.6 | 3.7 | 3.8 |
| 4..... | 4.0 | 5.8 | 7.25 | 6.75 | 5.3 | 5.4 | 4.4 | 3.8 | 3.6 | 3.7 | 3.8 |
| 5..... | 4.0 | 5.8 | 6.7 | 6.55 | 5.3 | 5.3 | 4.3 | 3.8 | 3.6 | 3.7 | 3.9 |
| 6..... | 4.0 | 5.7 | 6.5 | 6.4 | 5.2 | 5.3 | 4.3 | 3.8 | 3.6 | 3.7 | 3.9 |
| 7..... | 4.0 | 5.7 | 6.5 | 6.3 | 5.2 | 5.3 | 4.2 | 3.8 | 3.6 | 3.7 | 3.9 |
| 8..... | 4.0 | 5.7 | 6.4 | 6.2 | 5.2 | 5.2 | 4.2 | 3.8 | 3.6 | 3.7 | 3.9 |
| 9..... | 4.0 | 5.7 | 6.4 | 6.1 | 5.2 | 5.2 | 4.2 | 3.8 | 3.6 | 3.7 | 3.9 |
| 10..... | 4.0 | 5.8 | 6.3 | 6.1 | 5.2 | 5.1 | 4.2 | 3.8 | 3.6 | 3.7 | 3.9 |
| 11..... | 4.0 | 6.0 | 6.95 | 6.0 | 5.1 | 5.1 | 4.2 | 3.8 | 3.6 | 3.7 | 3.9 |
| 12..... | 6.2 | 6.1 | 6.65 | 6.0 | 5.1 | 5.0 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 13..... | 6.65 | 6.0 | 6.45 | 6.0 | 5.1 | 5.0 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 14..... | 7.25 | 7.85 | 6.25 | 5.9 | 5.1 | 5.0 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 15..... | 8.0 | 7.35 | 6.05 | 5.9 | 5.1 | 5.0 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 16..... | 12.5 | 6.9 | 6.0 | 5.8 | 5.1 | 5.1 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 17..... | 7.6 | 7.25 | 6.0 | 5.7 | 5.0 | 5.0 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 18..... | 14.5 | 7.05 | 5.9 | 5.6 | 5.0 | 5.0 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 19..... | 11.0 | 8.0 | 5.8 | 5.6 | 5.0 | 5.0 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 20..... | 8.65 | 7.5 | 5.8 | 5.5 | 5.0 | 4.9 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 21..... | 7.65 | 7.45 | 6.9 | 5.5 | 5.0 | 4.9 | 4.1 | 3.7 | 3.6 | 3.7 | 3.9 |
| 22..... | 7.1 | 7.25 | 6.65 | 5.4 | 5.0 | 4.9 | 4.0 | 3.7 | 3.6 | 3.7 | 3.9 |
| 23..... | 6.75 | 7.15 | 8.0 | 5.5 | 5.0 | 4.8 | 4.0 | 3.7 | 3.7 | 3.7 | 3.9 |
| 24..... | 6.55 | 7.1 | 7.6 | 5.5 | 5.1 | 4.8 | 4.0 | 3.7 | 3.7 | 3.7 | 3.9 |
| 25..... | 6.35 | 7.0 | 8.25 | 5.5 | 5.2 | 4.8 | 3.9 | 3.7 | 3.7 | 3.7 | 3.8 |
| 26..... | 6.25 | 6.8 | 7.65 | 5.4 | 5.3 | 4.8 | 3.9 | 3.6 | 3.7 | 3.7 | 3.8 |
| 27..... | 6.1 | 7.15 | 7.45 | 5.4 | 5.5 | 4.8 | 3.9 | 3.6 | 3.7 | 3.7 | 3.8 |
| 28..... | 6.1 | 7.05 | 7.25 | 5.5 | 5.95 | 4.8 | 3.9 | 3.6 | 3.7 | 3.7 | 3.8 |
| 29..... | 6.0 | ..... | 7.05 | 5.5 | 5.65 | 4.7 | 3.8 | 3.6 | 3.7 | 3.7 | 3.8 |
| 30..... | 5.9 | ..... | 11.0 | 5.5 | 5.5 | 4.6 | 3.8 | 3.6 | 3.7 | 3.7 | 3.8 |
| 31..... | 5.8 | ..... | 8.35 | ..... | 5.4 | ..... | 3.8 | 3.6 | ..... | 3.7 | ..... |

Rating table for Stony Creek near Fruto, Cal., from March 8, 1906, to December 31, 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 3.60 | 13 | 4.40 | 213 | 5.20 | 580 | 6.00 | 1,250 | 7.60 | 3,150 |
| 3.70 | 29 | 4.50 | 250 | 5.30 | 640 | 6.20 | 1,460 | 7.80 | 3,410 |
| 3.80 | 48 | 4.60 | 290 | 5.40 | 705 | 6.40 | 1,680 | 8.00 | 3,690 |
| 3.90 | 70 | 4.70 | 335 | 5.50 | 780 | 6.60 | 1,905 | 9.00 | 5,270 |
| 4.00 | 93 | 4.80 | 380 | 5.60 | 865 | 6.80 | 2,140 | 10.00 | 7,280 |
| 4.10 | 119 | 4.90 | 430 | 5.70 | 955 | 7.00 | 2,390 | 11.00 | 10,200 |
| 4.20 | 149 | 5.00 | 480 | 5.80 | 1,050 | 7.20 | 2,640 | | |
| 4.30 | 179 | 5.10 | 530 | 5.90 | 1,150 | 7.40 | 2,890 | | |

NOTE.—This table is based on 9 discharge measurements made during 1906 and 3 during 1904, and is well defined below gage height 6.4 feet.

Monthly discharge of Stony Creek near Fruto, Cal., for 1906.

[Drainage area, 760 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 22,200 | 150 | 2,230 | 137,000 | 2.93 | 3.38 |
| February..... | 3,320 | 480 | 1,540 | 85,500 | 2.03 | 2.11 |
| March..... | 40,200 | 1,050 | 2,500 | 154,000 | 3.29 | 3.79 |
| April..... | 3,480 | 705 | 1,280 | 76,200 | 1.68 | 1.87 |
| May..... | 1,200 | 480 | 610 | 37,500 | .803 | .93 |
| June..... | 705 | 290 | 495 | 29,500 | .651 | .73 |
| July..... | 250 | 48 | 127 | 7,800 | .167 | .19 |
| August..... | 48 | 13 | 32.6 | 2,000 | .043 | .05 |
| September..... | 29 | 13 | 17.3 | 1,030 | .023 | .03 |
| October..... | 29 | 29 | 29.0 | 1,780 | .038 | .04 |
| November..... | 70 | 29 | 61.4 | 3,650 | .081 | .09 |
| December..... | 5,270 | 48 | 582 | 35,800 | .766 | .88 |
| The year..... | 22,200 | 13 | 792 | 572,000 | 1.04 | 14.10 |

NOTE.—Discharges were obtained from the 1905 table, January 1 to 15, and by the indirect method for shifting channels, January 16 to March 7. Values are rated as follows: March to July and December, good; remainder of 1906, fair.

MISCELLANEOUS MEASUREMENTS IN STONY CREEK DRAINAGE BASIN.

The following miscellaneous measurements were made of Stony Creek just above its junction with Little Stony Creek:

September 18: Width, 26 feet; area, 38 square feet; discharge, 26 second-feet.

October 13: Width, 26 feet; area, 34 square feet; discharge, 21 second-feet.

CACHE CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Cache Creek drains that portion of the eastern slope of the Coast Range directly north from the Puta Creek basin. This basin is long and narrow, extending from northwest to southeast; it has numerous tributaries, of which North Fork is the largest. Most of these tributaries are torrential in their character, but the flow of the main stream is regulated largely by its discharge from Clear Lake, which is fed by numerous creeks having their source in the higher portion of the drainage basin. The lake covers an area of 65 square miles, and

has a drainage area of 417 square miles. The streams that enter Cache Creek below Clear Lake are practically dry during the summer months. There are large cultivated areas on the west side of Clear Lake, a greater portion of which is meadow land used for stock raising. There are two gaging stations located on this stream—one at Lower Lake directly at the point where the stream discharges from the lake and one at Yolo a short distance below where it emerges from the foothills. There are numerous diversions above the gaging station at Yolo which take practically the entire flow during the summer months. This water is used for irrigation in the vicinity of Woodland and Yolo where the soil is rich and deep and susceptible of the highest state of cultivation.

CACHE CREEK AT LOWER LAKE, CAL.

This station was established January 1, 1900. It is located three-fourths mile from Lower Lake, Cal. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 169, where are given also references to publications that contain data for previous years. The following measurement was made March 7, 1906:

Width, 64 feet; area, 301 square feet; gage height, 6.80 feet; discharge, 999 second-feet.

Daily gage height, in feet, of Cache Creek at Lower Lake, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|------|-------|------|
| 1..... | 2.5 | 5.35 | 6.35 | 8.9 | 7.0 | 5.85 | 5.1 | 4.35 | 3.65 | 3.2 | 2.9 | 2.9 |
| 2..... | 2.5 | 5.3 | 6.25 | 8.9 | 6.9 | 5.85 | 5.1 | 4.3 | 3.6 | 3.25 | 2.85 | 2.9 |
| 3..... | 2.5 | 5.3 | 7.2 | 8.95 | 6.9 | 5.8 | 5.05 | 4.3 | 3.6 | 3.25 | 2.85 | 2.9 |
| 4..... | 2.5 | 5.3 | 6.75 | 8.9 | 6.8 | 5.8 | 5.05 | 4.3 | 3.6 | 3.2 | 2.85 | 2.9 |
| 5..... | 2.5 | 5.3 | 6.8 | 8.9 | 6.75 | 5.75 | 5.0 | 4.25 | 3.6 | 3.2 | 2.85 | 2.9 |
| 6..... | 2.5 | 5.3 | 6.8 | 8.85 | 6.65 | 5.75 | 5.0 | 4.25 | 3.55 | 3.15 | 2.9 | 2.9 |
| 7..... | 2.45 | 5.25 | 6.8 | 8.85 | 6.6 | 5.7 | 4.95 | 4.25 | 3.55 | 3.15 | 2.9 | 2.9 |
| 8..... | 2.5 | 5.25 | 6.8 | 8.8 | 6.55 | 5.7 | 4.95 | 4.25 | 3.55 | 3.15 | 2.9 | 2.9 |
| 9..... | 2.45 | 5.25 | 6.8 | 8.8 | 6.5 | 5.65 | 4.9 | 4.2 | 3.55 | 3.15 | 2.9 | 2.9 |
| 10..... | 2.5 | 5.25 | 6.8 | 8.75 | 6.45 | 5.6 | 4.85 | 4.2 | 3.4 | 3.15 | 2.9 | 3.0 |
| 11..... | 2.5 | 5.25 | 6.8 | 8.55 | 6.5 | 5.6 | 4.85 | 4.15 | 3.4 | 3.2 | 2.9 | 3.0 |
| 12..... | 2.75 | 5.2 | 7.1 | 8.45 | 6.35 | 5.55 | 4.8 | 4.15 | 3.45 | 3.2 | 2.95 | 3.0 |
| 13..... | 2.9 | 5.2 | 7.1 | 8.35 | 6.35 | 5.5 | 4.8 | 4.1 | 3.5 | 3.15 | 2.95 | 3.0 |
| 14..... | 3.05 | 6.1 | 7.3 | 8.3 | 6.5 | 5.5 | 4.8 | 4.1 | 3.45 | 3.1 | 2.95 | 3.0 |
| 15..... | 3.2 | 5.4 | 7.0 | 8.4 | 6.35 | 5.45 | 4.75 | 4.05 | 3.4 | 3.1 | 2.95 | 3.0 |
| 16..... | 4.75 | 5.4 | 7.0 | 8.2 | 6.3 | 5.45 | 4.7 | 4.0 | 3.35 | 3.15 | 2.9 | 3.0 |
| 17..... | 4.0 | 5.4 | 7.0 | 8.0 | 6.25 | 5.5 | 4.7 | 3.95 | 3.35 | 3.1 | 3.0 | 3.0 |
| 18..... | 5.18 | 5.5 | 6.9 | 7.9 | 6.2 | 5.4 | 4.65 | 3.95 | 3.35 | 3.1 | 2.9 | 3.0 |
| 19..... | 5.2 | 5.6 | 6.8 | 7.75 | 6.15 | 5.4 | 4.65 | 3.9 | 3.3 | 3.0 | 2.85 | 3.0 |
| 20..... | 5.3 | 5.9 | 7.2 | 7.65 | 6.1 | 5.45 | 4.6 | 3.85 | 3.3 | 3.0 | 2.85 | 3.0 |
| 21..... | 5.3 | 5.8 | 7.3 | 7.6 | 6.05 | 5.4 | 4.6 | 3.85 | 3.3 | 2.95 | 2.95 | 3.0 |
| 22..... | 5.4 | 5.9 | 7.2 | 7.4 | 6.0 | 5.35 | 4.55 | 3.85 | 3.25 | 2.9 | 2.8 | 3.0 |
| 23..... | 5.4 | 6.1 | 7.5 | 7.4 | 5.9 | 5.3 | 4.55 | 3.8 | 3.35 | 2.9 | 2.8 | 3.0 |
| 24..... | 5.4 | 6.2 | 7.6 | 7.35 | 5.85 | 5.3 | 4.4 | 3.8 | 3.35 | 2.9 | 2.85 | 3.0 |
| 25..... | 5.45 | 6.2 | 7.75 | 7.3 | 5.9 | 5.25 | 4.5 | 3.8 | 3.25 | 2.9 | 2.85 | 3.0 |
| 26..... | 5.4 | 6.2 | 8.05 | 7.25 | 5.95 | 5.25 | 4.45 | 3.75 | 3.25 | 2.9 | 2.8 | 3.0 |
| 27..... | 5.4 | 6.4 | 8.1 | 7.5 | 6.0 | 5.25 | 4.45 | 3.75 | 3.25 | 2.9 | 2.75 | 3.0 |
| 28..... | 5.4 | 6.5 | 8.1 | 7.2 | 5.95 | 5.2 | 4.4 | 3.7 | 3.25 | 2.9 | 2.75 | 3.0 |
| 29..... | 5.4 | ..... | 8.1 | 7.1 | 5.95 | 5.15 | 4.4 | 3.7 | 3.2 | 2.9 | 2.8 | 3.0 |
| 30..... | 5.4 | ..... | 8.8 | 7.0 | 5.9 | 5.1 | 4.4 | 3.7 | 3.2 | 2.9 | 2.75 | 3.0 |
| 31..... | 5.35 | ..... | 9.3 | ..... | 5.9 | ..... | 4.35 | 3.65 | ..... | 2.9 | ..... | 4.0 |

Rating table for Cache Creek at Lower Lake, Cal., for 1905-6.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 2.40 | 27 | 3.30 | 135 | 4.20 | 296 | 5.20 | 552 | 7.00 | 1,120 |
| 2.50 | 37 | 3.40 | 149 | 4.30 | 318 | 5.40 | 610 | 7.20 | 1,188 |
| 2.60 | 48 | 3.50 | 163 | 4.40 | 341 | 5.60 | 670 | 7.40 | 1,256 |
| 2.70 | 59 | 3.60 | 178 | 4.50 | 365 | 5.80 | 732 | 7.60 | 1,324 |
| 2.80 | 71 | 3.70 | 194 | 4.60 | 390 | 6.00 | 795 | 7.80 | 1,392 |
| 2.90 | 83 | 3.80 | 212 | 4.70 | 416 | 6.20 | 859 | 8.00 | 1,460 |
| 3.00 | 95 | 3.90 | 232 | 4.80 | 442 | 6.40 | 923 | 9.00 | 1,840 |
| 3.10 | 108 | 4.00 | 252 | 4.90 | 469 | 6.60 | 988 | | |
| 3.20 | 121 | 4.10 | 274 | 5.00 | 496 | 6.80 | 1,054 | | |

NOTE.—This table is based on discharge measurements made during 1904-6 and is well defined below gage height 7 feet.

Monthly discharge of Cache Creek at Lower Lake, Cal., for 1906.

[Drainage area, 500 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 625 | 32 | 316 | 19,400 | 0.632 | 0.73 |
| February..... | 955 | 552 | 676 | 37,500 | 1.35 | 1.41 |
| March..... | 1,960 | 875 | 1,220 | 75,000 | 2.44 | 2.81 |
| April..... | 1,820 | 1,120 | 1,510 | 89,800 | 3.02 | 3.37 |
| May..... | 1,120 | 748 | 894 | 55,000 | 1.79 | 2.06 |
| June..... | 748 | 524 | 639 | 38,000 | 1.28 | 1.43 |
| July..... | 524 | 330 | 423 | 26,000 | .846 | .98 |
| August..... | 330 | 186 | 256 | 15,700 | .512 | .59 |
| September..... | 186 | 121 | 150 | 8,930 | .300 | .33 |
| October..... | 128 | 83 | 103 | 6,330 | .206 | .24 |
| November..... | 95 | 65 | 79.4 | 4,720 | .159 | .18 |
| December..... | 252 | 59 | 133 | 8,180 | .266 | .31 |
| The year..... | 1,960 | 32 | 533 | 385,000 | 1.07 | 14.44 |

NOTE.—These values are excellent.

CACHE CREEK NEAR YOLO, CAL.

This station was established January 1, 1903. It is located at the wagon bridge on the road from Woodland to Yolo, about 1,000 feet above the Southern Pacific Railroad bridge. A new wagon bridge, which greatly improves the channel conditions, was erected during 1904. The station was reestablished on the new bridge December 4, 1904. Numerous diversions are made from Cache Creek above this station which take practically all of the summer flow. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 172, where are given also references to publications that contain data for previous years.

Discharge measurements of Cache Creek near Yolo, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | ch |
|--------------|--------------------|--------|------------------|--------------|----|
| | | Feet. | Sq. ft. | Feet. | S |
| February 5. | F. R. S. Buttemer. | 93 | 262 | 3.88 | |
| February 16. | do. | 97 | 445 | 5.15 | |
| February 20. | do. | 97 | 479 | 5.79 | |
| March 5. | do. | 102 | 578 | 6.60 | |
| March 13. | do. | 102 | 592 | 6.85 | |
| April 13. | R. S. Hawley. | 99 | 482 | 6.05 | |
| April 24. | W. C. Sawyer. | 97 | 428 | 5.36 | |
| May 1. | do. | 96 | 380 | 4.95 | |
| May 6. | do. | 83 | 127 | 2.25 | |
| May 7. | do. | 133 | 2,180 | 19.95 | 1 |
| May 7. | do. | 133 | 2,150 | 19.72 | 10 |
| May 7. | do. | 133 | 2,230 | 20.40 | 12 |
| May 7. | do. | 133 | 2,240 | 20.43 | 1 |
| May 7. | do. | 133 | 2,270 | 20.65 | 12 |
| May 8. | do. | 98 | 400 | 4.99 | |
| May 15. | do. | 96 | 338 | 4.49 | |
| July 13. | R. S. Hawley. | 92 | 160 | 2.50 | |
| July 30. | do. | 91 | 137 | 2.10 | |
| October 4. | do. | 10 | 28 | 1.00 | |

NOTE.—A landslide occurred in Cache Creek canyon, above the station, on May 2, damming the creek. This dam was overtopped on May 7, when the creek rose to a maximum gage height of 20.8 feet. Measurements of this date were made at the crest of the flood.

Daily gage height, in feet, of Cache Creek near Yolo, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|------|-------|------|-------|------|------|-------|-------|------|-------|------|------|
| 1. | | 4.05 | 5.5 | 10.0 | 5.0 | 4.3 | 3.1 | 2.15 | 1.65 | 1.1 | 0.85 |
| 2. | | 4.0 | 5.2 | 8.6 | 4.55 | 4.2 | 3.1 | 2.1 | 1.65 | 1.1 | .85 |
| 3. | | 3.95 | 5.55 | 8.0 | 2.95 | 4.15 | 3.05 | 2.0 | 1.6 | 1.95 | .85 |
| 4. | | 3.95 | 8.5 | 7.6 | 2.6 | 4.1 | 3.0 | 2.0 | 1.6 | 1.9 | .8 |
| 5. | | 3.9 | 6.7 | 7.3 | 2.25 | 4.1 | 3.0 | 2.0 | 1.6 | 1.05 | .8 |
| 6. | | 3.85 | 6.15 | 7.0 | 2.2 | 4.05 | 2.8 | 1.95 | 1.6 | 1.0 | .8 |
| 7. | | 3.85 | 5.85 | 6.8 | 12.1 | 4.0 | 2.65 | 1.95 | 1.5 | 1.0 | .8 |
| 8. | | 3.8 | 5.6 | 6.7 | 5.1 | 3.95 | 2.6 | 1.95 | 1.5 | 1.0 | .8 |
| 9. | | 3.75 | 5.5 | 6.6 | 4.7 | 3.9 | 2.6 | 1.95 | 1.5 | 1.0 | .8 |
| 10. | | 3.75 | 5.4 | 6.4 | 4.6 | 3.85 | 2.6 | 2.0 | 1.5 | 1.0 | .8 |
| 11. | | 3.7 | 5.3 | 6.35 | 4.6 | 3.8 | 2.5 | 2.0 | 1.5 | 1.0 | .8 |
| 12. | | 3.7 | 9.3 | 6.3 | 4.55 | 3.8 | 2.5 | 2.0 | 1.5 | 1.0 | .75 |
| 13. | 4.35 | 3.7 | 7.25 | 6.1 | 4.6 | 3.8 | 2.5 | 2.0 | 1.45 | 1.0 | .75 |
| 14. | 6.3 | 3.7 | 6.45 | 6.0 | 4.5 | 3.75 | 2.5 | 2.0 | 1.45 | .95 | .75 |
| 15. | 4.45 | 6.85 | 6.0 | 5.9 | 4.45 | 3.7 | 2.45 | 2.0 | 1.45 | .95 | .75 |
| 16. | 9.9 | 5.2 | 5.8 | 5.8 | 4.4 | 3.65 | 2.45 | 2.0 | 1.45 | .95 | .7 |
| 17. | 14.0 | 4.7 | 5.6 | 5.7 | 4.35 | 3.65 | 2.45 | 1.95 | 1.45 | 9 | |
| 18. | 14.05 | 5.45 | 5.5 | 5.75 | 4.3 | 3.65 | 2.4 | 1.95 | 1.45 | 9 | |
| 19. | 25.7 | 6.65 | 5.4 | 5.65 | 4.3 | 3.6 | 2.35 | 1.95 | 1.45 | 9 | |
| 20. | 10.25 | 5.8 | 5.3 | 5.55 | 4.25 | 3.5 | 2.3 | 1.8 | 1.35 | 9 | |
| 21. | 6.75 | 7.8 | 7.25 | 5.45 | 4.2 | 3.4 | 2.3 | 1.7 | 1.3 | .9 | |
| 22. | 5.8 | 7.25 | 7.0 | 5.4 | 4.15 | 3.4 | 2.3 | 1.7 | 1.3 | .9 | |
| 23. | 5.35 | 6.4 | 6.7 | 5.4 | 4.1 | 3.35 | 2.35 | 1.65 | 1.3 | .9 | |
| 24. | 5.05 | 8.3 | 10.7 | 5.3 | 4.05 | 3.3 | 2.3 | 1.7 | 1.25 | .9 | |
| 25. | 4.8 | 7.45 | 9.95 | 5.25 | 4.2 | 3.25 | 2.3 | 1.75 | 1.25 | .85 | |
| 26. | 5.6 | 6.0 | 11.0 | 5.2 | 4.55 | 3.2 | 2.25 | 1.75 | 1.2 | .85 | |
| 27. | 4.4 | 5.65 | 9.25 | 5.15 | 4.7 | 3.2 | 2.2 | 1.7 | 1.15 | .85 | |
| 28. | 4.3 | 5.8 | 7.95 | 5.3 | 4.85 | 3.2 | 2.2 | 1.7 | 1.15 | .85 | |
| 29. | 4.2 | | 7.3 | 5.2 | 4.7 | 3.2 | 2.2 | 1.65 | 1.1 | .85 | |
| 30. | 4.15 | | 9.65 | 5.1 | 4.45 | 3.15 | 2.15 | 1.65 | 1.1 | .85 | |
| 31. | 4.1 | | 15.85 | | 4.35 | | 2.15 | 1.65 | | .85 | |

NOTE.—The creek was dry January 1 to 12 and November 17 to December 10. The gage height May 7 is the mean of a large number of readings at short intervals.

Rating table for Cache Creek near Yolo, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 0.90 | 0 | 1.80 | 145 | 2.60 | 358 | 3.40 | 650 | 4.40 | 1,168 |
| 1.00 | 3 | 1.90 | 169 | 2.70 | 388 | 3.50 | 692 | 4.60 | 1,284 |
| 1.10 | 17 | 2.00 | 193 | 2.80 | 420 | 3.60 | 737 | 4.80 | 1,405 |
| 1.20 | 32 | 2.10 | 217 | 2.90 | 455 | 3.70 | 785 | 5.00 | 1,537 |
| 1.30 | 48 | 2.20 | 243 | 3.00 | 491 | 3.80 | 835 | 5.20 | 1,671 |
| 1.40 | 65 | 2.30 | 271 | 3.10 | 530 | 3.90 | 887 | 5.40 | 1,805 |
| 1.50 | 85 | 2.40 | 299 | 3.20 | 570 | 4.00 | 941 | 5.60 | 1,939 |
| 1.60 | 105 | 2.50 | 328 | 3.30 | 610 | 4.20 | 1,053 | 5.80 | 2,073 |
| 1.70 | 125 | | | | | | | | |

NOTE.—This table is based on discharge measurements made during 1906 and is well defined between gage heights 1 foot and 7 feet. Above gage height 5 feet the rating curve is a tangent, the difference being 67 per tenth.

Monthly discharge of Cache Creek near Yolo, Cal., for 1906.

[Drainage area, 1,280 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 15,400 | 0 | 2,000 | 123,000 | 1.56 | 1.80 |
| February..... | 3,750 | 785 | 1,660 | 92,200 | 1.30 | 1.35 |
| March..... | 8,810 | 1,670 | 3,040 | 187,000 | 2.38 | 2.74 |
| April..... | 4,890 | 1,600 | 2,360 | 140,000 | 1.84 | 2.05 |
| May..... | 6,290 | 243 | 1,270 | 78,100 | .992 | 1.14 |
| June..... | 1,110 | 550 | 784 | 46,700 | .613 | .68 |
| July..... | 530 | 229 | 333 | 20,500 | .260 | .30 |
| August..... | 229 | 115 | 166 | 10,200 | .130 | .15 |
| September..... | 115 | 17 | 69.4 | 4,130 | .054 | .06 |
| October..... | 181 | 0 | 13.6 | 836 | .011 | .01 |
| November..... | 0 | 0 | 0 | 0 | .00 | 1.00 |
| December..... | 3,250 | 0 | 435 | 26,700 | .340 | .39 |
| The year..... | 15,400 | 0 | 1,010 | 729,000 | .780 | 10.67 |

NOTE.—Values are rated as follows: January and September, good; October, fair; remainder of 1906, excellent.

PUTA CREEK DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Puta Creek drains a portion of the eastern slope of the Coast Range, its waters discharging into Sacramento River, through what is known as the Yolo basin, in the vicinity of Davis, Cal. This basin is rather long and narrow, extending from west to east; it has numerous tributaries which have a heavy flood discharge during the winter months, but are practically dry during the summer. This stream is torrential in its flow. It has a comparatively small drainage basin with an exceptionally heavy rainfall, especially on the higher elevations in the vicinity of Mount St. Helena. A five-year rainfall record at Helen Mine, on the northern slope of Mount St. Helena, gives an average of 99.52 inches. The precipitation is less at lower elevations. The upper reaches of the basin are well timbered, but the lower part is comparatively barren of timber, though it has a considerable growth of brush extending to a point where the stream leaves the foothills.

The areas in the lower portion of the basin are used principally for pasturage. The topography of the country is rough and precipitous. The underlying rock is an impervious slate and serpentine, with a thin soil covering. There is comparatively little tilled land in the basin above where the stream emerges from the foothills at Winona. Below this point the soil is deep and susceptible to high cultivation and at present is used for raising grain and fruit.

PUTA CREEK NEAR GUENOC, CAL.

This station was established February 12, 1904. It is located about 2 miles below the old town of Guenoc, near the Asbill ranch house and at the Guenoc dam site. The nearest post-office is Middletown, Cal. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 180, where are given also references to publications that contain data for previous years.

Discharge measurements of Puta Creek near Guenoc, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Channel height. |
|-----------------------------|-------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Feet.</i> |
| January 15 ^a ... | S. Asbill..... | 145 | 1,300 | 10.55 | 10.55 |
| January 16 ^a ... | do..... | 152 | 1,860 | 14.25 | 14.25 |
| January 23..... | do..... | 126 | 970 | 8.60 | 8.60 |
| January 23..... | do..... | 124 | 868 | 8.00 | 8.00 |
| January 24..... | do..... | 124 | 830 | 7.80 | 7.80 |
| January 24..... | do..... | 125 | 815 | 7.90 | 7.90 |
| February 15..... | do..... | 94 | 202 | 6.25 | 6.25 |
| February 15..... | do..... | 94 | 229 | 6.35 | 6.35 |
| March 6..... | R. S. Hawley..... | 93 | 153 | 5.59 | 5.59 |
| March 7..... | do..... | 93 | 136 | 5.50 | 5.50 |
| March 19..... | do..... | 82 | 167 | 5.48 | 5.48 |
| March 20..... | do..... | 114 | 420 | 7.00 | 7.00 |
| March 21..... | do..... | 174 | 320 | 6.52 | 6.52 |
| April 17..... | do..... | 82 | 78 | 5.00 | 5.00 |
| April 18..... | do..... | 82 | 78 | 4.99 | 4.99 |
| May 7..... | do..... | b 32 | a 39 | 4.84 | 4.84 |
| May 8..... | do..... | b 32 | b 37 | 4.82 | 4.82 |
| July 27..... | do..... | b 20 | b 13.2 | 4.29 | 4.29 |
| July 28..... | do..... | b 20 | b 13.2 | 4.28 | 4.28 |

^a Measured by floats.

^b Wading section.

Daily gage height, in feet, of Puta Creek, near Guenoc, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. |
|---------|------|------|------|------|------|-------|
| 1..... | 3.7 | 4.9 | 5.5 | 6.3 | 4.9 | 5.0 |
| 2..... | 3.7 | 4.9 | 6.0 | 6.1 | 4.9 | 5.2 |
| 3..... | 3.7 | 4.9 | 6.65 | 6.0 | 4.9 | 5.9 |
| 4..... | 3.7 | 4.9 | 6.35 | 5.8 | 4.8 | 5.4 |
| 5..... | 3.7 | 4.8 | 5.8 | 5.7 | 4.8 | 5.1 |
| 6..... | 3.7 | 4.8 | 5.4 | 5.6 | 4.8 | 5.1 |
| 7..... | 3.7 | 5.0 | 5.4 | 5.6 | 4.8 | 5.0 |
| 8..... | 3.7 | 4.9 | 5.3 | 5.6 | 4.8 | 5.0 |
| 9..... | 3.7 | 4.9 | 5.3 | 5.5 | 4.8 | 5.0 |
| 10..... | 3.7 | 4.8 | 5.3 | 5.5 | 4.8 | 5.0 |
| 11..... | 4.0 | 7.0 | 5.3 | 5.4 | 4.8 | 5.5 |
| 12..... | 8.5 | 6.9 | 5.2 | 5.4 | 4.8 | 5.3 |
| 13..... | 9.2 | 6.45 | 5.4 | 5.4 | 4.8 | 5.2 |
| 14..... | 10.5 | 6.35 | 5.6 | 5.3 | 4.8 | 5.1 |
| 15..... | 10.0 | 5.55 | 5.5 | 5.2 | 4.8 | 5.0 |

Daily gage height, in feet, of Puta Creek, near Guenoc, Cal., for 1906—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. |
|------|-------|-------|------|-------|-------|-------|-------|
| 16. | 11.05 | 5.4 | 5.4 | 5.1 | 4.8 | 5.0 | 4.3 |
| 17. | 9.55 | 5.7 | 5.4 | 5.0 | 4.8 | 4.9 | 4.3 |
| 18. | 13.25 | 6.2 | 5.5 | 4.9 | ..... | 4.9 | 4.3 |
| 19. | 8.25 | 6.5 | 5.5 | 4.9 | 4.8 | 4.8 | 4.3 |
| 20. | 6.15 | 6.6 | 6.4 | 4.9 | 4.8 | 4.8 | 4.3 |
| 21. | 5.7 | 6.45 | 6.35 | 4.8 | 4.8 | 4.8 | 4.3 |
| 22. | 5.6 | 6.6 | 6.35 | 4.9 | 4.8 | ..... | 4.3 |
| 23. | 5.45 | 7.15 | 7.4 | 5.1 | 4.8 | 4.7 | 4.3 |
| 24. | 5.35 | 7.4 | 8.1 | 5.1 | 4.8 | 4.7 | 4.3 |
| 25. | 5.25 | 6.5 | 7.8 | 5.0 | 6.8 | 4.7 | 4.3 |
| 26. | 5.2 | 6.1 | 7.5 | 5.0 | 6.6 | 4.7 | 4.2 |
| 27. | 5.2 | 5.8 | 6.3 | 5.0 | 5.65 | 4.7 | 4.2 |
| 28. | 5.1 | 5.65 | 6.3 | 5.0 | 5.4 | 4.6 | 4.2 |
| 29. | 5.05 | ..... | 6.3 | 4.9 | 5.25 | 4.6 | 4.2 |
| 30. | 5.0 | ..... | 6.4 | 4.9 | 5.1 | 4.6 | 4.2 |
| 31. | 5.0 | ..... | 7.8 | ..... | 5.0 | ..... | 4.2 |

Rating table for Puta Creek near Guenoc, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 4.00 | 1 | 5.00 | 155 | 6.00 | 680 | 7.00 | 1,720 | 9.00 | 4,640 |
| 4.10 | 4 | 5.10 | 190 | 6.10 | 760 | 7.20 | 1,960 | 9.20 | 5,000 |
| 4.20 | 9 | 5.20 | 230 | 6.20 | 850 | 7.40 | 2,200 | 9.40 | 5,360 |
| 4.30 | 19 | 5.30 | 270 | 6.30 | 940 | 7.60 | 2,480 | 9.60 | 5,720 |
| 4.40 | 29 | 5.40 | 315 | 6.40 | 1,035 | 7.80 | 2,760 | 9.80 | 6,080 |
| 4.50 | 43 | 5.50 | 365 | 6.50 | 1,135 | 8.00 | 3,040 | 10.00 | 6,440 |
| 4.60 | 63 | 5.60 | 420 | 6.60 | 1,240 | 8.20 | 3,340 | 11.00 | 8,240 |
| 4.70 | 83 | 5.70 | 480 | 6.70 | 1,360 | 8.40 | 3,660 | 12.00 | 10,040 |
| 4.80 | 105 | 5.80 | 540 | 6.80 | 1,480 | 8.60 | 3,970 | 13.00 | 11,840 |
| 4.90 | 129 | 5.90 | 610 | 6.90 | 1,600 | 8.80 | 4,300 | ..... | ..... |

NOTE.—This table is based on discharge measurements made during 1906, and is well defined between gage heights 4.3 feet and 8 feet.

Monthly discharge of Puta Creek near Guenoc, Cal., for 1906.

[Drainage area, 91 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|-----------------|---------------------------|----------|-------|---------------------|------------------------|--------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in in.-ches. |
| January..... | 12,300 | 0 | 1,800 | 111,000 | 19.78 | 22.81 |
| February..... | 2,200 | 105 | 727 | 40,400 | 7.99 | 8.32 |
| March..... | 3,190 | 230 | 916 | 56,300 | 10.07 | 11.61 |
| April..... | 940 | 105 | 302 | 18,000 | 3.32 | 3.70 |
| May..... | 1,480 | 105 | 215 | 13,200 | 2.36 | 2.72 |
| June..... | 365 | 63 | 165 | 9,820 | 1.81 | 2.02 |
| July..... | 63 | 9 | 26.8 | 1,650 | 0.294 | 0.34 |
| The period..... | ..... | ..... | ..... | 250,000 | ..... | ..... |

NOTE.—Discharges interpolated for days when gage was not read. Values are rated as follows: January and July, good; remainder of the period, excellent.

PUTA CREEK AT WINTERS, CAL.

This station was established September 26, 1905. It is located about 450 feet below the Southern Pacific Railroad bridge and about 800 feet southeast of the depot at Winters, Cal. The conditions at this station and the bench marks are described in Water-Supply Bulletin No. 177, pages 182-182.

Discharge measurements of Puta Creek at Winters, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Channel height. |
|------------------|------------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Feet.</i> |
| January 20..... | R. S. Hawley..... | 178 | 1,240 | 9.90 | 9.90 |
| February 3..... | F. R. S. Buttemer..... | 170 | 287 | 5.10 | 5.10 |
| February 15..... | do..... | 182 | 1,300 | 10.55 | 10.55 |
| February 22..... | do..... | 180 | 809 | 8.50 | 8.50 |
| March 6..... | do..... | 178 | 410 | 7.02 | 7.02 |
| March 14..... | do..... | 179 | 636 | 8.15 | 8.15 |
| May 4..... | R. S. Hawley..... | 128 | 160 | 6.00 | 6.00 |
| May 15..... | do..... | 123 | 146 | 5.80 | 5.80 |
| June 8..... | do..... | 150 | 134 | 5.78 | 5.78 |
| July 5..... | do..... | 80 | 75 | 4.90 | 4.90 |
| July 26..... | do..... | 50 | 44 | 4.75 | 4.75 |
| July 27..... | do..... | 50 | 46 | 4.75 | 4.75 |
| August 14..... | do..... | 50 | 26 | 4.62 | 4.62 |
| August 15..... | do..... | 50 | 24 | a 4.79 | a 4.79 |
| September 8..... | do..... | 50 | 20 | 4.70 | 4.70 |

a New gage; old gage reading 4.60 feet.

NOTE.—Measurements of May 4 and after were made by wading 200 feet above the cable.

Daily gage height, in feet, of Puta Creek at Winters, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|-------|--------|--------|--------|--------|-------|-------|--------|--------|--------|--------|
| 1..... | 4.60 | 5.28 | 6.58 | 10.00 | a 6.10 | 6.00 | 4.95 | 4.70 | 4.75 | 4.70 | 4.75 |
| 2..... | 4.61 | 5.20 | 6.35 | 8.85 | a 6.10 | 5.80 | 4.90 | 4.70 | 4.75 | 4.70 | 4.70 |
| 3..... | 4.62 | 5.10 | 11.20 | 8.00 | a 6.05 | 5.75 | 4.90 | 4.70 | 4.75 | 4.70 | 4.75 |
| 4..... | 4.62 | 5.05 | 10.10 | 7.80 | 6.00 | 5.80 | 4.85 | 4.75 | 4.80 | 4.65 | 4.85 |
| 5..... | 4.63 | 5.00 | 7.62 | 7.50 | a 6.00 | 6.00 | 4.80 | 4.75 | 4.75 | 4.65 | 4.90 |
| 6..... | 4.64 | 4.95 | 7.00 | 7.35 | 5.95 | 5.90 | 4.80 | 4.75 | 4.75 | 4.65 | 4.90 |
| 7..... | 4.64 | 4.93 | 6.88 | 7.15 | 5.90 | 5.80 | 4.75 | 4.80 | 4.70 | 4.65 | 4.90 |
| 8..... | 4.63 | 4.90 | 6.60 | 7.05 | 5.90 | 5.80 | 4.75 | 4.80 | 4.70 | 4.65 | 4.95 |
| 9..... | 4.64 | 4.87 | 6.45 | 6.95 | 5.85 | 5.70 | 4.65 | 4.80 | 4.70 | 4.65 | 4.95 |
| 10..... | 4.64 | 4.85 | a 6.30 | 6.85 | 5.80 | 5.60 | 4.65 | 4.80 | 4.70 | a 4.70 | 4.90 |
| 11..... | 4.66 | 4.90 | 6.20 | 6.75 | 5.80 | 5.60 | 4.65 | 4.75 | 4.70 | 4.70 | 4.90 |
| 12..... | 4.85 | 5.00 | 11.40 | 6.70 | 5.80 | 5.55 | 4.60 | 4.85 | 4.70 | 4.75 | 4.90 |
| 13..... | 10.76 | 4.90 | 9.05 | 6.60 | a 5.80 | 5.70 | 4.60 | 4.8 | a 4.70 | a 4.75 | 4.85 |
| 14..... | 13.00 | 4.90 | 8.28 | 6.50 | 5.80 | 5.55 | 4.60 | 4.75 | 4.70 | 4.75 | 4.85 |
| 15..... | 10.75 | 12.50 | 7.90 | 6.50 | 5.80 | 5.50 | 4.60 | b 4.80 | 4.70 | 4.70 | 4.85 |
| 16..... | 21.60 | 7.33 | 7.38 | 6.50 | 5.85 | 5.50 | 4.60 | 4.75 | 4.70 | 4.70 | 4.85 |
| 17..... | 12.20 | 6.00 | 7.12 | 6.40 | 5.80 | 5.45 | 4.55 | a 4.75 | 4.70 | 4.70 | 4.85 |
| 18..... | 22.85 | 7.15 | 6.85 | 6.30 | 5.70 | 5.40 | 4.55 | 4.70 | 4.65 | 4.70 | 4.85 |
| 19..... | 24.00 | 8.26 | 7.75 | 6.30 | 5.70 | 5.35 | 4.80 | 4.75 | 4.70 | 4.70 | 4.85 |
| 20..... | 10.80 | 7.10 | 7.60 | 6.30 | 5.70 | 5.20 | 4.70 | 4.75 | 4.65 | 4.70 | 4.85 |
| 21..... | 8.45 | 10.08 | 11.09 | 6.30 | 5.65 | 5.20 | 4.70 | 4.75 | a 4.70 | 4.65 | 4.85 |
| 22..... | 7.40 | 8.60 | 8.75 | 6.25 | 5.60 | 5.10 | 4.75 | 4.75 | 4.70 | 4.65 | 4.85 |
| 23..... | 6.91 | 7.55 | 9.65 | 6.30 | 5.60 | 5.10 | 4.75 | 4.70 | 4.70 | 4.70 | a 4.85 |
| 24..... | 6.70 | 8.90 | 13.50 | 6.30 | 5.60 | 5.15 | 4.7 | 4.70 | 4.70 | 4.70 | 4.85 |
| 25..... | 6.35 | a 8.00 | 11.80 | 6.25 | 5.60 | 5.20 | 4.75 | 4.70 | 4.70 | 4.70 | 4.85 |
| 26..... | 6.00 | 7.10 | 11.85 | 6.20 | 6.60 | 5.10 | 4.75 | 4.75 | 4.70 | 4.70 | 4.85 |
| 27..... | 5.82 | 6.75 | 9.70 | 6.20 | a 6.80 | 5.30 | 4.75 | 4.70 | 4.70 | a 4.70 | 4.90 |
| 28..... | 5.70 | 6.88 | 8.50 | 6.20 | 7.00 | 5.00 | 4.75 | 4.75 | a 4.70 | 4.70 | 4.90 |
| 29..... | 5.55 | ..... | 7.88 | a 6.15 | 6.50 | 5.10 | 4.75 | a 4.75 | 4.70 | 4.75 | 4.90 |
| 30..... | 5.45 | ..... | 8.50 | a 6.15 | 6.15 | 5.00 | 4.70 | 4.75 | 4.70 | 4.75 | 4.90 |
| 31..... | 5.35 | ..... | 15.50 | ..... | 6.05 | ..... | 4.70 | 4.70 | ..... | 4.75 | ..... |

a Gage height estimated.

b A new gage was put in August 15 and read after that date.

Daily discharge, in second-feet, of Puta Creek at Winters, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|--------|-------|--------|-------|-------|-------|-------|------|-------|------|-------|-------|
| 1..... | 22 | 360 | 1,080 | 4,140 | 480 | 450 | 139 | 29 | 18 | 14 | 18 | 40 |
| 2..... | 22 | 380 | 880 | 3,020 | 480 | 350 | 131 | 29 | 18 | 14 | 14 | 40 |
| 3..... | 22 | 330 | 5,540 | 2,210 | 435 | 315 | 123 | 28 | 18 | 14 | 18 | 40 |
| 4..... | 22 | 290 | 4,420 | 2,020 | 390 | 350 | 115 | 28 | 24 | 10 | 31 | 40 |
| 5..... | 25 | 250 | 2,020 | 1,740 | 390 | 450 | 107 | 27 | 18 | 10 | 40 | 40 |
| 6..... | 25 | 220 | 1,440 | 1,600 | 365 | 400 | 104 | 27 | 18 | 10 | 40 | 40 |
| 7..... | 25 | 200 | 1,300 | 1,420 | 340 | 350 | 101 | 26 | 14 | 10 | 40 | 52 |
| 8..... | 25 | 150 | 1,050 | 1,330 | 340 | 350 | 98 | 26 | 14 | 10 | 52 | 64 |
| 9..... | 25 | 120 | 920 | 1,240 | 315 | 301 | 95 | 25 | 14 | 10 | 52 | 40 |
| 10..... | 25 | 100 | 780 | 1,150 | 290 | 294 | 92 | 25 | 14 | 14 | 40 | 116 |
| 11..... | 25 | 100 | 680 | 1,060 | 290 | 287 | 89 | 24 | 14 | 14 | 40 | 4,790 |
| 12..... | 46 | 110 | 5,640 | 1,010 | 290 | 280 | 86 | 24 | 14 | 18 | 40 | 1,205 |
| 13..... | 4,840 | 80 | 3,280 | 920 | 290 | 273 | 83 | 23 | 14 | 18 | 31 | 640 |
| 14..... | 7,140 | 70 | 2,530 | 830 | 290 | 266 | 80 | 22 | 14 | 18 | 31 | 400 |
| 15..... | 4,840 | 6,620 | 2,170 | 830 | 290 | 259 | 76 | 24 | 14 | 14 | 31 | 290 |
| 16..... | 17,800 | 1,600 | 1,700 | 830 | 315 | 252 | 72 | 18 | 14 | 14 | 31 | 273 |
| 17..... | 6,300 | 980 | 1,430 | 750 | 290 | 245 | 68 | 18 | 14 | 14 | 31 | 239 |
| 18..... | 19,400 | 1,530 | 1,200 | 660 | 250 | 238 | 64 | 14 | 10 | 14 | 31 | 206 |
| 19..... | 20,900 | 2,610 | 2,010 | 660 | 250 | 231 | 60 | 18 | 14 | 14 | 31 | 175 |
| 20..... | 4,890 | 1,570 | 1,870 | 660 | 250 | 224 | 56 | 18 | 10 | 14 | 31 | 160 |
| 21..... | 2,480 | 4,440 | 5,160 | 660 | 230 | 217 | 52 | 18 | 14 | 10 | 31 | 145 |
| 22..... | 1,600 | 3,040 | 2,950 | 610 | 210 | 210 | 48 | 18 | 14 | 10 | 31 | 145 |
| 23..... | 1,160 | 2,040 | 3,810 | 660 | 210 | 203 | 44 | 14 | 14 | 14 | 31 | 160 |
| 24..... | 970 | 3,310 | 7,760 | 660 | 210 | 195 | 40 | 14 | 14 | 14 | 31 | 160 |
| 25..... | 800 | 2,440 | 5,950 | 610 | 210 | 187 | 36 | 14 | 14 | 14 | 31 | 160 |
| 26..... | 560 | 1,600 | 6,000 | 570 | 895 | 179 | 32 | 18 | 14 | 14 | 31 | 8,130 |
| 27..... | 470 | 1,240 | 3,850 | 570 | 1,070 | 171 | 32 | 14 | 14 | 14 | 40 | 4,090 |
| 28..... | 430 | 1,360 | 2,710 | 570 | 1,250 | 163 | 31 | 18 | 14 | 14 | 40 | 1,565 |
| 29..... | 400 | ..... | 2,130 | 525 | 810 | 155 | 31 | 18 | 14 | 18 | 40 | 1,025 |
| 30..... | 380 | ..... | 2,700 | 525 | 530 | 147 | 30 | 18 | 14 | 18 | 40 | 725 |
| 31..... | 360 | ..... | 10,040 | ..... | 480 | ..... | 30 | 14 | ..... | 18 | ..... | 725 |

NOTE.—These discharges were obtained by the indirect method for shifting channels, except for the high water in January, which are based on a rating table, using high-water measurements made in January, 1907.

Monthly discharge of Puta Creek at Winters, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|-------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 20,900 | 22 | 3,100 | 191,000 |
| February..... | 6,620 | 70 | 1,330 | 73,900 |
| March..... | 10,000 | 680 | 3,060 | 188,000 |
| April..... | 4,140 | 525 | 1,130 | 67,200 |
| May..... | 1,250 | 210 | 411 | 25,300 |
| June..... | 450 | 147 | 266 | 15,800 |
| July..... | 139 | 30 | 72.4 | 4,450 |
| August..... | 29 | 14 | 21.0 | 1,290 |
| September..... | 24 | 10 | 14.7 | 875 |
| October..... | 18 | 10 | 13.7 | 842 |
| November..... | 52 | 14 | 34.0 | 2,020 |
| December..... | 8,130 | 40 | 836 | 51,400 |
| The year..... | 20,900 | 10 | 857 | 622,000 |

NOTE.—The discharge for gage heights above 11 feet is based on measurements made in January, 1907. Values are rated fair.

FEATHER RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Feather River drains a portion of the western slope of the Sierrita Nevada extending east nearly to the Nevada State line, a distance of about 75 miles, and north and south for a distance of from 20 to 40 miles.

The greater portion of the watershed is rough and mountainous and has numerous tributaries which drain the slopes of the high mountains. The formation in the southern and eastern part of the basin is of granite, with a comparatively deep soil covering. There is also a considerable area composed of lava and other volcanic matter in the northern part of the basin. Numerous meadows and valleys also exist, which tend to maintain a steady flow during dry season. The soil is generally porous and absorbs the moisture readily. The entire watershed is well covered with a growth of brush and timber, much of which is large enough to make lumbering a profitable industry, with the exception of the meadow lands and valleys, which are used for stock ranges and grazing lands. There are numerous large springs, especially in the lava districts, which supply a more or less steady flow throughout the year. There are especially noticeable on North Fork, where there are perennial springs discharging from 50 to 100 second-feet. There is little artificial storage in the drainage area, and the water used for irrigation in the valleys is taken from the natural flow of the streams.

The mean annual precipitation is probably from 40 to 60 inches and is well distributed over the area. It falls largely in the form of snow, but disappears in the early part of the summer.

The drainage basin of North Fork of Feather River lies in high sierra almost wholly in the northwestern portion of Plumas County. The junction of North Fork with East Fork, or Feather River proper, is in the western part of Plumas County, about 20 miles north of Oroville and 15 miles south of Prattville. The entire length of the North Fork basin does not exceed 40 miles, and its area is probably less than 1,000 square miles. This basin is rough and mountainous, though there are many large valley meadows above Prattville ranging in elevation from 4,000 to 6,000 feet. The formation consists of broken and porous lava and other volcanic matter, especially in the upper reaches, where numerous cones, craters, ashes, and lakes indicate recent volcanic activity. There is a good covering of porous soil, which absorbs moisture readily and equalizes the annual flow in the large number of tributaries in the basin. Except in the case of the highest peaks, like Lassen Peak with elevation of 10,437 feet, which are rocky and barren, there is a good growth of timber and brush, and on the higher slopes

growth becomes comparatively heavy and suitable for lumbering. A large per cent of the area, however, is meadow land, which permits profitable stock raising.

This basin has a mean annual precipitation of from 40 to 60 inches, a large percentage of which occurs as snow. A good portion of the rainfall and snow is collected and conserved in the numerous lakes on the higher elevations near the divide, but by far the greater percentage of the precipitation in this basin percolates through the porous surface soil into the vast beds of broken lava and volcanic gravels and sands beneath, where it is impounded in subterranean reservoirs. From the melting snows above and the perennial underground basins below a well-regulated flow issues from the highest reaches through the numerous mountain streams which gather into a few good-sized channels in the meadows below the higher elevations. These underground reservoirs also supply the many large perennial springs which issue from the borders of the meadows with discharges of from 50 to 100 second-feet. One of the largest of these springs is Dotta Spring, about 3 miles east of Prattville; it has a maximum discharge of 100 second-feet and a minimum of 70 second-feet.

As yet no irrigation or power developments of importance have been made, but the Great Western Power Company has carefully investigated the stream flow near Prattville and the storage possibilities in a portion of Big Meadows with a view to early development.

The watershed above Prattville is divided into two smaller basins of almost equal size, the eastern basin being drained by what is known as Hamilton Branch and its tributaries and the western basin by North Fork and its tributaries. The eastern basin ranges in elevation from 4,300 to 7,500 feet, has an area of 230 square miles, and includes the East Arm of Big Meadows and the large, level area called Mountain Meadows, but its run-off is only about half as large as that from the western basin, which has an area of 245 square miles varying in elevation from 4,300 to 10,000 feet and including the West Arm of Big Meadows and the higher elevations about Lassen Peak. Hamilton Branch and North Fork unite about 3 miles east of Prattville in the lower edge of Big Meadows. A gaging station is maintained on each stream a short distance above the point of confluence.

For the purpose of studying the water resources of North Fork of Feather River the Great Western Power Company has established and maintained a number of regular stations in the basin at which complete records are kept. These stations were established in the summer of 1905 by W. E. Spear under the direction of John R. Freeman, consulting engineer for the company. During 1906 they were maintained by L. J. Bevan under the direction of Vielé, Cooper & Blackwell, consulting engineers for the company.

FEATHER RIVER AT OROVILLE, CAL.

This station was established January 1, 1902. It is located at northeast edge of the town of Oroville, Cal., where Feather River breaks from the foothills on the western slope of the Sierra Nevada into Sacramento Valley. The drainage area is 3,640 square miles. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 155, where are given also references to publications that contain data for previous years.

Discharge measurements of Feather River at Oroville, Cal., by Hawley and Sawyer, 1906.

| Date. | Width. | Area of section. | Gage height. ^a | Discharge. | Date. | Width. | Area of section. | Gage height. ^a | Discharge. |
|------------------|--------------|------------------|---------------------------|-----------------|------------------|--------------|------------------|---------------------------|-----------------|
| | <i>Fect.</i> | <i>Sq. ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> | | <i>Fect.</i> | <i>Sq. ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> |
| February 16..... | 291 | 4,690 | 9.00 | 11,500 | May 2..... | 309 | 4,760 | 10.88 | 19,100 |
| February 28..... | 311 | 5,340 | 11.35 | 19,600 | May 11..... | 312 | 5,270 | 11.95 | 22,000 |
| March 15..... | 307 | 5,260 | 10.90 | 18,400 | May 17..... | 298 | 4,280 | 9.30 | 12,000 |
| March 22..... | 316 | 5,810 | 12.72 | 23,000 | July 6..... | 279 | 3,240 | 6.25 | 7,000 |
| March 25..... | 340 | 7,280 | 17.00 | 48,600 | July 26..... | 273 | 2,380 | 3.10 | 5,000 |
| April 11..... | 309 | 4,830 | 11.25 | 18,400 | September 5..... | 272 | 2,100 | 1.90 | 4,000 |
| April 16..... | 309 | 4,840 | 11.14 | 18,100 | October 12..... | 271 | 2,060 | 1.73 | 3,000 |
| April 25..... | 307 | 4,620 | 10.61 | 17,000 | November 1..... | 272 | 2,060 | 1.73 | 3,000 |
| April 25..... | 307 | 4,560 | 10.42 | 16,600 | December 10..... | 274 | 2,410 | 3.05 | 5,000 |

^a Gage heights refer to the gage at the station.

Daily gage height, in feet, of Feather River at Oroville, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|-------|
| 1..... | 0.95 | 5.45 | 10.4 | 14.7 | 10.65 | 10.7 | 6.1 | 2.95 | 2.05 | 1.8 | 1.8 | 1.8 |
| 2..... | .95 | 5.0 | 9.5 | 13.3 | 10.95 | 10.35 | 6.0 | 2.9 | 2.0 | 1.8 | 1.8 | 1.8 |
| 3..... | .9 | 4.7 | 9.5 | 13.1 | 11.85 | 11.1 | 6.8 | 2.9 | 2.0 | 1.8 | 2.5 | 2.5 |
| 4..... | .95 | 4.7 | 9.4 | 12.6 | 11.5 | 13.0 | 6.55 | 2.85 | 1.95 | 1.8 | 6.95 | 6.95 |
| 5..... | .85 | 4.75 | 9.6 | 12.1 | 12.0 | 11.7 | 6.45 | 2.8 | 1.9 | 1.8 | 5.25 | 5.25 |
| 6..... | .85 | 5.2 | 8.4 | 12.2 | 12.05 | 11.3 | 6.65 | 2.8 | 1.9 | 1.8 | 3.5 | 3.5 |
| 7..... | .85 | 5.3 | 8.3 | 10.35 | 12.2 | 10.6 | 6.55 | 2.75 | 1.9 | 1.8 | 2.5 | 2.5 |
| 8..... | .85 | 5.35 | 8.3 | 10.15 | 12.05 | 9.6 | 6.4 | 2.7 | 1.9 | 1.8 | 2.0 | 2.0 |
| 9..... | .9 | 5.45 | 8.15 | 10.15 | 12.1 | 10.45 | 6.3 | 2.7 | 1.85 | 1.8 | 2.0 | 2.0 |
| 10..... | 1.0 | 5.6 | 8.1 | 11.4 | 12.05 | 9.95 | 6.1 | 2.65 | 1.85 | 1.8 | 2.0 | 2.0 |
| 11..... | 1.3 | 5.65 | 8.3 | 11.1 | 11.7 | 10.25 | 6.1 | 2.6 | 1.85 | 1.8 | 2.0 | 2.0 |
| 12..... | 4.3 | 5.75 | 8.4 | 11.4 | 11.45 | 10.3 | 5.6 | 2.6 | 1.85 | 1.8 | 2.0 | 2.0 |
| 13..... | 8.2 | 5.85 | 11.2 | 10.75 | 10.75 | 11.1 | 5.45 | 2.55 | 1.85 | 1.8 | 2.0 | 2.0 |
| 14..... | 9.45 | 8.5 | 10.3 | 10.85 | 10.25 | 10.8 | 5.35 | 2.55 | 1.9 | 1.8 | 2.0 | 2.0 |
| 15..... | 9.35 | 9.9 | 10.85 | 11.1 | 11.55 | 9.75 | 5.6 | 2.5 | 1.9 | 1.8 | 2.0 | 2.0 |
| 16..... | 18.1 | 9.1 | 10.4 | 11.1 | 10.35 | 9.55 | 5.8 | 2.5 | 1.9 | 1.8 | 2.0 | 2.0 |
| 17..... | 13.4 | 8.35 | 9.6 | 11.15 | 9.45 | 10.5 | 5.9 | 2.45 | 1.9 | 1.8 | 2.0 | 2.0 |
| 18..... | 24.9 | 10.65 | 9.55 | 11.1 | 9.9 | 9.8 | 4.0 | 2.45 | 1.9 | 1.8 | 2.0 | 2.0 |
| 19..... | 21.7 | 11.4 | 9.4 | 11.15 | 9.4 | 9.6 | 4.2 | 2.4 | 1.9 | 1.8 | 2.0 | 2.0 |
| 20..... | 14.75 | 11.0 | 11.2 | 11.45 | 9.05 | 9.25 | 4.5 | 2.4 | 1.85 | 1.8 | 2.0 | 2.0 |
| 21..... | 12.2 | 11.05 | 11.3 | 11.4 | 9.4 | 9.75 | 4.5 | 2.35 | 1.8 | 1.8 | 2.0 | 2.0 |
| 22..... | 10.1 | 11.15 | 11.35 | 11.75 | 8.65 | 8.75 | 4.65 | 2.3 | 1.8 | 1.8 | 2.0 | 2.0 |
| 23..... | 8.9 | 10.9 | 13.0 | 12.05 | 8.65 | 8.7 | 4.8 | 2.3 | 1.8 | 1.8 | 2.0 | 2.0 |
| 24..... | 8.1 | 10.65 | 17.1 | 11.75 | 8.45 | 7.85 | 4.8 | 2.25 | 1.8 | 1.8 | 2.0 | 2.0 |
| 25..... | 7.4 | 10.9 | 17.1 | 11.0 | 9.0 | 7.8 | 3.95 | 2.25 | 1.85 | 1.8 | 2.0 | 2.0 |
| 26..... | 7.0 | 10.55 | 17.95 | 10.6 | 12.1 | 7.7 | 3.1 | 2.2 | 1.8 | 1.8 | 1.95 | 1.95 |
| 27..... | 6.2 | 11.2 | 15.55 | 10.1 | 12.25 | 7.6 | 3.1 | 2.2 | 1.8 | 1.8 | 1.95 | 1.95 |
| 28..... | 6.25 | 11.6 | 14.75 | 10.25 | 12.85 | 7.1 | 3.05 | 2.15 | 1.8 | 1.8 | 1.95 | 1.95 |
| 29..... | 6.2 | ..... | 13.6 | 9.95 | 11.7 | 6.9 | 3.05 | 2.15 | 1.8 | 1.8 | 1.95 | 1.95 |
| 30..... | 6.2 | ..... | 15.8 | 10.0 | 11.0 | 6.75 | 3.0 | 2.1 | 1.8 | 1.8 | 1.9 | 1.9 |
| 31..... | 6.0 | ..... | 17.65 | ..... | ..... | ..... | 3.0 | 2.1 | 1.8 | 1.8 | ..... | ..... |

^a Estimated.

NOTE.—These gage heights are for the station gage, 1,000 feet upstream from the bridge gage which readings were made during 1905. The gage at the station was read from March 1 to July 24, from January 1 to February 28 and from September 5 to December 31 the gage at the bridge was read. These readings have been reduced to equivalent readings at the station gage. From July 25 to September 4 no readings were made and the gage heights have been estimated.

Rating table for Feather River at Oroville, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 0.75 | 1,200 | 2.00 | 2,060 | 3.30 | 3,260 | 5.20 | 5,300 | 11.00 | 17,600 |
| .80 | 1,230 | 2.10 | 2,140 | 3.40 | 3,360 | 5.40 | 5,540 | 12.00 | 21,500 |
| .90 | 1,295 | 2.20 | 2,220 | 3.50 | 3,460 | 5.60 | 5,780 | 13.00 | 26,000 |
| 1.00 | 1,360 | 2.30 | 2,310 | 3.60 | 3,560 | 5.80 | 6,020 | 14.00 | 31,000 |
| 1.10 | 1,430 | 2.40 | 2,400 | 3.70 | 3,660 | 6.00 | 6,260 | 15.00 | 36,500 |
| 1.20 | 1,500 | 2.50 | 2,490 | 3.80 | 3,760 | 6.20 | 6,520 | 16.00 | 42,000 |
| 1.30 | 1,570 | 2.60 | 2,580 | 3.90 | 3,860 | 6.40 | 6,780 | 17.00 | 47,500 |
| 1.40 | 1,640 | 2.70 | 2,670 | 4.00 | 3,960 | 6.60 | 7,050 | 18.00 | 53,500 |
| 1.50 | 1,710 | 2.80 | 2,760 | 4.20 | 4,180 | 6.80 | 7,330 | 19.00 | 59,500 |
| 1.60 | 1,780 | 2.90 | 2,860 | 4.40 | 4,400 | 7.00 | 7,640 | 20.00 | 65,500 |
| 1.70 | 1,850 | 3.00 | 2,960 | 4.60 | 4,620 | 8.00 | 9,450 | 21.00 | 71,700 |
| 1.80 | 1,920 | 3.10 | 3,060 | 4.80 | 4,840 | 9.00 | 11,600 | | |
| 1.90 | 1,990 | 3.20 | 3,160 | 5.00 | 5,060 | 10.00 | 14,260 | | |

NOTE.—This table is based on discharge measurements made during 1904-1906, and is well defined below gage height 17 feet.

Monthly discharge of Feather River at Oroville, Cal., for 1906.

[Drainage area, 3,640 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|--------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 96,300 | 1,240 | 14,500 | 892,000 | 3.98 | 4.59 |
| February..... | 19,900 | 4,730 | 11,100 | 616,000 | 3.05 | 3.18 |
| March..... | 53,200 | 9,640 | 21,600 | 1,330,000 | 5.93 | 6.84 |
| April..... | 34,800 | 14,100 | 19,200 | 1,140,000 | 5.27 | 5.88 |
| May..... | 25,300 | 10,300 | 17,500 | 1,080,000 | 4.81 | 5.54 |
| June..... | 26,000 | 7,260 | 13,800 | 821,000 | 3.79 | 4.23 |
| July..... | 7,530 | 2,960 | 5,240 | 322,000 | 1.44 | 1.66 |
| August..... | 2,910 | 2,140 | 2,490 | 153,000 | .684 | .79 |
| September..... | 2,100 | 1,920 | 1,970 | 117,000 | .541 | .60 |
| October..... | 1,920 | 1,920 | 1,920 | 118,000 | .527 | .61 |
| November..... | 7,560 | 1,920 | 2,410 | 143,000 | .662 | .74 |
| December..... | 43,400 | 1,990 | 7,070 | 435,000 | 1.94 | 2.24 |
| The year..... | 96,300 | 1,240 | 9,900 | 7,170,000 | 2.72 | 36.90 |

NOTE.—Values are rated as follows: January to June, and September, good; remainder of 1906 fair, as gage heights may be liable to error.

GRIZZLY CREEK NEAR BECKWITH, CAL.

Grizzly Creek is tributary to the Middle Fork of Feather River from the north, and has a small drainage basin. There is a reservoir site in this basin which has already been surveyed by the Reclamation Service, and gagings on Grizzly Creek are of utility in determining storage possibilities.

This station was established December 17, 1905. It is located at Reno camp, about 4 miles west of Beckwith and 1 mile above Willow Glen Hotel. It is about 1,500 feet below the falls, the present terminus of the Boca and Loyaltan Railroad, and is reached by driving from Beckwith. The drainage area above the station is 51 square miles.

The channel is straight for about 200 feet above and below the measuring section. The current is rather sluggish at low water but swift at high stages. The right bank is high and rocky and can not be overflowed. The left bank is low and overgrown with cottonwoods near the water's edge, and may be overflowed at high water. The bed of the stream is rocky and not subject to material change.

Discharge measurements are made from a car on a cable. The cable is anchored to a pine stump on the right bank, while on the left bank it is supported by a tower and is anchored by means of a large rock buried in the ground at a depth of 4 feet. The instrument point for soundings is the near side of the pine stump supporting the cable.

The gage is 2 by 4 inches vertical timber, graduated to feet and tenths, and nailed securely to a large cottonwood tree about 800 feet above cable and 200 feet below the Reno camp boarding house. The bench mark is a spike in the root of the tree to which the cable is fastened; elevation, 4 feet above the zero of the gage.

Discharge measurements of Grizzly Creek at Beckwith, Cal.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Correction. |
|---------------------------------------|-----------------------|-------------------|-----------------------|----------------------|------------------------|
| 1905. December 17 ^a ... | R. S. Hawley..... | <i>Feet.</i> 4 | <i>Sq. ft.</i> 1.8 | <i>Feet.</i> 0.55 | <i>Sq. ft.</i> 0.00 |
| 1906. May 26..... | Hawley and Hardy..... | 37 | 70 | 2.50 | 0.00 |
| June 6..... | W. N. Hardy..... | 33 | 61 | 2.30 | 0.00 |
| June 14..... | do..... | 34 | 41 | 1.70 | 0.00 |
| June 22..... | do..... | 34 | 39 | 1.48 | 0.00 |
| June 28..... | do..... | 34 | 32 | 1.30 | 0.00 |
| July 7..... | do..... | 32 | 24 | .92 | 0.00 |
| July 16..... | do..... | b 6 | b 4.8 | .42 | 0.00 |
| July 25..... | do..... | b 2 | b 1.6 | .41 | 0.00 |
| August 8..... | do..... | b 1.6 | b 0.6 | .22 | 0.00 |
| August 12..... | do..... | b 2.0 | b 1.6 | .40 | 0.00 |

^a Ice 5 inches thick at the gage.

^b Wading section.

Daily gage height, in feet, of Grizzly Creek near Beckwith, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. |
|---------|------|-------|------|-------|-------|-------|-------|------|
| 1..... | 0.55 | 1.80 | 1.60 | 3.10 | ..... | ..... | 1.10 | 0.34 |
| 2..... | .55 | 2.10 | 1.60 | 2.80 | ..... | ..... | 1.10 | .33 |
| 3..... | .55 | 2.30 | 1.65 | 2.35 | ..... | ..... | 1.05 | .32 |
| 4..... | .55 | 1.65 | 1.65 | 2.45 | ..... | ..... | 1.00 | .30 |
| 5..... | .55 | 1.85 | 1.50 | 2.50 | ..... | ..... | 1.00 | .26 |
| 6..... | .55 | 1.85 | 1.50 | 2.50 | ..... | 2.20 | 1.00 | .26 |
| 7..... | .55 | 1.90 | 1.65 | 2.60 | ..... | 2.40 | 0.90 | .25 |
| 8..... | .55 | 2.00 | 1.65 | 3.00 | ..... | 1.80 | 0.90 | .25 |
| 9..... | .70 | 2.15 | 1.65 | 3.00 | ..... | 1.70 | 0.90 | .25 |
| 10..... | .70 | 2.10 | 1.65 | 3.85 | ..... | 1.70 | 0.80 | .25 |
| 11..... | .90 | 2.00 | 1.95 | 3.80 | ..... | 1.75 | 0.75 | .25 |
| 12..... | .80 | 2.00 | 2.45 | 3.80 | ..... | 1.70 | 0.70 | .20 |
| 13..... | 1.00 | 1.80 | 2.30 | 3.60 | ..... | 1.70 | 0.60 | .20 |
| 14..... | 1.00 | 1.80 | 2.15 | 4.10 | ..... | 1.70 | 0.50 | .20 |
| 15..... | .80 | 1.75 | 1.85 | 4.10 | ..... | 2.30 | 0.50 | .20 |
| 16..... | 1.00 | 1.80 | 1.85 | 4.20 | ..... | 1.60 | 0.50 | .20 |
| 17..... | 1.60 | 1.85 | 1.85 | 4.40 | ..... | 1.70 | 0.45 | .20 |
| 18..... | 1.80 | 1.85 | 1.80 | 4.10 | ..... | 1.65 | 0.42 | .20 |
| 19..... | 2.00 | 1.85 | 1.85 | 4.10 | ..... | 1.60 | 0.42 | .30 |
| 20..... | 1.40 | 1.85 | 1.85 | 4.00 | ..... | 1.50 | 0.42 | .20 |
| 21..... | 1.00 | 1.85 | 1.90 | 3.60 | ..... | 1.40 | 0.42 | .15 |
| 22..... | .70 | 1.75 | 2.15 | 3.60 | ..... | 1.40 | 0.42 | .15 |
| 23..... | .90 | 1.75 | 2.20 | 3.40 | ..... | 1.40 | 0.41 | .15 |
| 24..... | .90 | 1.85 | 2.65 | 3.40 | ..... | 1.40 | 0.41 | .15 |
| 25..... | 1.20 | 1.95 | 2.60 | 3.80 | ..... | 1.40 | 0.41 | .15 |
| 26..... | 1.10 | 1.80 | 2.60 | ..... | 2.50 | 1.35 | 0.41 | .15 |
| 27..... | 1.55 | 1.65 | 2.65 | ..... | ..... | 1.30 | 0.41 | .15 |
| 28..... | 1.40 | 1.65 | 2.70 | ..... | ..... | 1.20 | 0.40 | .15 |
| 29..... | 1.40 | ..... | 2.80 | ..... | ..... | 1.20 | 0.40 | .15 |
| 30..... | 1.90 | ..... | 2.85 | ..... | ..... | 1.15 | 0.36 | .15 |
| 31..... | 2.40 | ..... | 3.10 | ..... | ..... | ..... | 0.34 | .15 |

Rating table for Grizzly Creek near Beckwith, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 0.10 | 0 | 0.90 | 22 | 1.70 | 87 | 2.50 | 225 | 3.40 | 489 |
| 0.20 | 0.5 | 1.00 | 28 | 1.80 | 98 | 2.60 | 249 | 3.80 | 537 |
| 0.30 | 1.6 | 1.10 | 34 | 1.90 | 110 | 2.70 | 273 | 4.00 | 585 |
| 0.40 | 3.2 | 1.20 | 42 | 2.00 | 124 | 2.80 | 297 | 4.20 | 633 |
| 0.50 | 5.5 | 1.30 | 50 | 2.10 | 141 | 2.90 | 321 | 4.40 | 681 |
| 0.60 | 9 | 1.40 | 58 | 2.20 | 159 | 3.00 | 345 | 4.60 | 729 |
| 0.70 | 13 | 1.50 | 67 | 2.30 | 179 | 3.10 | 393 | 4.80 | 777 |
| 0.80 | 17 | 1.60 | 77 | 2.40 | 202 | 3.40 | 441 | 5.00 | 825 |

NOTE.—The above table is strictly applicable only for open-channel conditions. It is based on 10 discharge measurements made during 1906 and is well defined between gage heights 0.2 foot and 2.5 feet.

Monthly discharge of Grizzly Creek near Beckwith, Cal., for 1906.

[Drainage area, 51 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|-----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 202 | 7 | 40 | 2,460 | 0.784 | 0.90 |
| February..... | 179 | 82 | 110 | 6,110 | 2.16 | 2.24 |
| March..... | 369 | 67 | 153 | 9,410 | 3.00 | 3.46 |
| April 1-25..... | 681 | 190 | 469 | 23,300 | 9.20 | 8.55 |
| June 6-30..... | 202 | 38 | 83.6 | 4,150 | 1.64 | 1.52 |
| July..... | 34 | 2.2 | 11.9 | 732 | .234 | .27 |
| August..... | 2.2 | 0.2 | 0.73 | 45 | .014 | .02 |
| September..... | 1 | 0.2 | 0.51 | 30 | .010 | .01 |
| The period..... | | | | 46,200 | | |

NOTE.—Values are rated as fair, except January and February, which are liable to greater error on account of ice conditions.

INDIAN CREEK NEAR CRESCENT MILLS, CAL.

Indian Creek is a tributary from the east to North Fork of Feather River, entering below the Prattville station; it has a considerable drainage basin. A reservoir site has been surveyed by the Reclamation Service, and measurements are of utility in computing storage possibilities.

The station was established November 29, 1905. It is located about $1\frac{1}{4}$ miles from Crescent Mills on the Greenville-Quincy road, and is most easily reached by driving from Taylorsville, a distance of 5 miles. It is 2,000 feet below the Arlington Bridge and near E. Cook's residence.

The channel is straight for 1,000 feet above and 200 feet below, and the current is very sluggish. Both banks are high and not liable to overflow. They are covered by a thick growth of brush up to the high-water line and above this by oaks and pines. The bed of the stream is composed of silt and is not liable to change materially. At low water the maximum depth is about 12 feet. Discharge measurements are made from a car on a cable. The initial point for soundings is the oak stump to which the cable is fastened on the right bank.

The gage is a vertical 2 by 6 inch timber, graduated to feet tenths, and is in two sections. It is on the right bank about 5 feet above the cable. The lower section is about 5 feet long and fastened to an overhanging willow; the upper section is about 5 feet in length and is fastened to a cottonwood tree. The benchmark is a spike driven in the cottonwood tree to which the high-water mark is attached; elevation, 8.00 feet above the zero of the gage.

Discharge measurements of Indian Creek at Crescent Mills, Cal., by Hawley and Hawley, 1905-6.

| Date. | Width. | Area of section. | Gage height. | Discharge. | Date. | Width. | Area of section. | Gage height. |
|------------------|--------------|------------------|--------------|-----------------|-----------------|--------------|------------------|--------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> |
| 1905. | | | | | 1906. | | | |
| December 14..... | 45 | 66 | 1.35 | 76 | July 3..... | 180 | 1,570 | 3.32 |
| | | | | | July 11..... | 67 | 288 | 2.45 |
| 1906. | | | | | July 20..... | 65 | 211 | 1.70 |
| May 29..... | 190 | 2,080 | 6.25 | 1,940 | July 30..... | 65 | 184 | 1.35 |
| May 31..... | 186 | 1,960 | 5.56 | 1,580 | August 6..... | 65 | 172 | 1.12 |
| June 9..... | 182 | 1,850 | 4.87 | 1,120 | August 17..... | 64 | 176 | 1.20 |
| June 18..... | 182 | 1,810 | 4.69 | 1,020 | August 27..... | 64 | 171 | 1.05 |
| June 25..... | 181 | 1,680 | 3.80 | 608 | September 9.... | 64 | 171 | 1.10 |

NOTE.—These measurements were made at different sections.

Daily gage height, in feet, of Indian Creek at Crescent Mills, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|-------|------|------|------|------|-------|-------|------|-------|------|------|
| 1..... | 1.45 | 3.15 | 5.75 | 8.45 | 6.4 | 5.4 | 3.3 | 1.25 | 1.1 | 1.5 | 1.45 |
| 2..... | 1.5 | 3.0 | 5.15 | 7.35 | 6.5 | 5.4 | 3.3 | 1.15 | 1.1 | 1.5 | 1.45 |
| 3..... | 1.5 | 3.0 | 5.15 | 6.7 | 6.8 | 5.3 | 3.3 | 1.1 | 1.15 | 1.45 | 1.55 |
| 4..... | 1.5 | 2.95 | 4.95 | 6.3 | 6.95 | 5.5 | 3.25 | 1.1 | 1.15 | 1.45 | 2.2 |
| 5..... | 1.5 | 2.95 | 4.7 | 5.95 | 7.1 | 5.5 | 3.1 | 1.1 | 1.15 | 1.45 | 2.8 |
| 6..... | 1.5 | 2.95 | 4.45 | 6.0 | 7.0 | 5.35 | 3.0 | 1.1 | 1.15 | 1.45 | 2.35 |
| 7..... | 1.5 | 2.95 | 4.45 | 6.5 | 6.9 | 5.15 | 2.9 | 1.1 | 1.15 | 1.45 | 2.0 |
| 8..... | 1.45 | 2.95 | 4.6 | 7.0 | 6.8 | 4.95 | 2.8 | 1.4 | 1.15 | 1.45 | 1.85 |
| 9..... | 1.5 | 2.95 | 5.0 | 7.5 | 6.7 | 4.9 | 2.7 | 1.3 | 1.1 | 1.5 | 1.8 |
| 10..... | 1.5 | 3.0 | 5.3 | 7.7 | 6.75 | 4.9 | 2.6 | 1.2 | 1.1 | 1.5 | 1.7 |
| 11..... | 1.6 | 3.0 | 5.8 | 7.6 | 6.8 | 4.9 | 2.4 | 1.2 | 1.1 | 1.5 | 1.65 |
| 12..... | 2.3 | 3.0 | 7.8 | 7.3 | 6.8 | 4.95 | 2.3 | 1.15 | 1.15 | 1.5 | 1.65 |
| 13..... | 2.9 | 3.05 | 8.0 | 7.1 | 6.4 | 4.95 | 2.3 | 1.25 | 1.15 | 1.5 | 1.6 |
| 14..... | 3.95 | 3.4 | 6.9 | 7.1 | 6.2 | 4.8 | 2.2 | 1.35 | 1.15 | 1.5 | 1.6 |
| 15..... | 2.8 | 3.6 | 6.1 | 7.3 | 6.1 | 4.7 | 2.2 | 1.25 | 1.2 | 1.5 | 1.6 |
| 16..... | 7.1 | 4.6 | 5.6 | 7.5 | 5.8 | 4.75 | 2.0 | 1.2 | 1.25 | 1.5 | 1.7 |
| 17..... | 7.1 | 4.3 | 5.3 | 7.7 | 5.4 | 4.8 | 1.9 | 1.2 | 1.25 | 1.5 | 1.75 |
| 18..... | 9.22 | 4.35 | 5.0 | 7.6 | 5.1 | 4.65 | 1.9 | 1.2 | 1.25 | 1.5 | 1.7 |
| 19..... | 10.68 | 5.1 | 4.7 | 7.5 | 4.9 | 4.5 | 1.8 | 1.15 | 1.25 | 1.5 | 1.6 |
| 20..... | 7.5 | 5.5 | 4.6 | 7.6 | 4.9 | 4.4 | 1.7 | 1.15 | 1.2 | 1.5 | 1.6 |
| 21..... | 5.45 | 6.1 | 4.9 | 7.7 | 4.8 | 4.35 | 1.6 | 1.05 | 1.15 | 1.5 | 1.6 |
| 22..... | 4.5 | 5.7 | 5.9 | 7.8 | 4.7 | 4.25 | 1.55 | 1.05 | 1.15 | 1.5 | 1.6 |
| 23..... | 4.15 | 5.2 | 6.95 | 7.65 | 4.6 | 4.0 | 1.5 | 1.05 | 1.15 | 1.5 | 1.6 |
| 24..... | 3.8 | 4.9 | 8.1 | 7.25 | 4.5 | 3.85 | 1.5 | 1.05 | 1.2 | 1.5 | 1.55 |
| 25..... | 3.45 | 4.65 | 8.85 | 6.8 | 4.5 | 3.8 | 1.5 | 1.1 | 1.25 | 1.5 | 1.55 |
| 26..... | 3.4 | 4.5 | 8.9 | 6.35 | 5.1 | 3.75 | 1.45 | 1.2 | 1.3 | 1.45 | 1.55 |
| 27..... | 3.3 | 5.5 | 8.58 | 6.1 | 5.75 | 3.7 | 1.45 | 1.2 | 1.3 | 1.45 | 1.5 |
| 28..... | 3.3 | 6.6 | 7.85 | 6.1 | 6.25 | 3.6 | 1.4 | 1.05 | 1.35 | 1.45 | 1.5 |
| 29..... | 3.3 | | 7.35 | 6.15 | 6.15 | 3.5 | 1.35 | 1.05 | 1.4 | 1.45 | 1.5 |
| 30..... | 3.2 | | 7.25 | 6.3 | 5.75 | 3.4 | 1.35 | 1.1 | 1.4 | 1.4 | 1.5 |
| 31..... | 3.1 | | 8.58 | | 5.55 | | 1.35 | 1.1 | | 1.4 | |

Rating table for Indian Creek at Crescent Mills, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1.00 | 35 | 2.00 | 182 | 3.00 | 395 | 4.00 | 700 | 6.00 | 1,800 |
| 1.10 | 46 | 2.10 | 200 | 3.10 | 421 | 4.20 | 785 | 6.20 | 1,940 |
| 1.20 | 58 | 2.20 | 219 | 3.20 | 448 | 4.40 | 880 | 6.40 | 2,080 |
| 1.30 | 71 | 2.30 | 238 | 3.30 | 475 | 4.60 | 980 | 6.60 | 2,220 |
| 1.40 | 84 | 2.40 | 258 | 3.40 | 502 | 4.80 | 1,080 | 6.80 | 2,360 |
| 1.50 | 98 | 2.50 | 278 | 3.50 | 530 | 5.00 | 1,180 | 7.00 | 2,500 |
| 1.60 | 113 | 2.60 | 299 | 3.60 | 560 | 5.20 | 1,300 | 8.00 | 3,200 |
| 1.70 | 129 | 2.70 | 321 | 3.70 | 595 | 5.40 | 1,420 | 9.00 | 3,900 |
| 1.80 | 146 | 2.80 | 345 | 3.80 | 630 | 5.60 | 1,540 | 10.00 | 4,600 |
| 1.90 | 164 | 2.90 | 369 | 3.90 | 665 | 5.80 | 1,660 | 11.00 | 5,300 |

NOTE.—This table is based on 14 discharge measurements made during 1905-6, and is well defined below gage height 6.2 feet.

Monthly discharge of Indian Creek at Crescent Mills, Cal., for 1906.

[Drainage area, 740 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | Total in acre-feet. | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 5,080 | 91 | 868 | 53,400 | 1.17 | 1.35 |
| February..... | 2,220 | 382 | 824 | 45,800 | 1.11 | 1.16 |
| March..... | 3,830 | 905 | 2,000 | 123,000 | 2.70 | 3.11 |
| April..... | 3,520 | 1,760 | 2,550 | 152,000 | 3.45 | 3.85 |
| May..... | 2,570 | 930 | 1,790 | 110,000 | 2.42 | 2.79 |
| June..... | 1,480 | 502 | 1,010 | 60,100 | 1.36 | 1.52 |
| July..... | 475 | 78 | 226 | 13,900 | 0.305 | 0.35 |
| August..... | 84 | 40 | 53.1 | 3,260 | 0.072 | .08 |
| September..... | 84 | 46 | 57.9 | 3,450 | 0.078 | .09 |
| October..... | 98 | 84 | 94.8 | 5,830 | 0.128 | .15 |
| November..... | 345 | 91 | 132 | 7,800 | 0.178 | .20 |
| December..... | 2,430 | 91 | 534 | 32,800 | 0.722 | .83 |
| The year..... | 5,080 | 40 | 845 | 611,000 | 1.14 | 15.48 |

NOTE.—These values are excellent.

NORTH FORK OF FEATHER RIVER BELOW PRATTVILLE, CAL.

This station was established November 22, 1905. Previous to that date, however, the Great Western Power Company had installed a gage rod and maintained a daily record since June 13, 1905, making gagings by means of a boat. This station is located in the canyon at the proposed dam site of the Great Western Power Company, about 3 miles below the Meadow View bridge crossing on the Prattville-Greenville road, and about 5 miles southeast of Prattville. The drainage area above this point is only 506 square miles, but the run-off during the months of low flow is about half the total run-off at the Oroville station from a drainage area of 3,640 square miles.

The equipment for gaging at this station consists of a $\frac{5}{8}$ -inch cable anchored to a large rock on the left bank and to a spruce tree on the right, having a clear span of 155 feet and supporting a car with a lock box. Parallel to the cable and 35 feet upstream a guy wire spans the channel for staying the meter in the higher stages. The cable is marked with a ring of white paint every 5 feet for conven-

ience in sounding, and the initial point is an iron bolt in the rock the tree supporting the cable. The car is used for making measurements at all stages. The gage rod is inclosed in the clock register which is on the right bank about 700 feet above the cable. The register which protects the gage from the thin surface ice in winter, is covered on the inside with building paper to prevent freezing and is provided with a hinged door on the river side to permit easy access for reading direct and comparison with clock register. The reference bench mark is a point surrounded by a ring of white paint on a rock 8 feet south west of the gage; elevation, 7.62 feet above the zero of the gage.

The channel is straight for 400 feet above the cable and for 200 feet below. The bed is rocky and not liable to change materially. The banks are high and steep and not subject to overflow at any stage. There is a growth of small willows along the water's edge and for a short distance back of it, while higher up are found spruce and fir timber. The stream is in one channel at all stages and is swift in high water and has moderate velocity at other times. The cross section is regular and not subject to much change, the width of the stream being about 60 feet at low water with a maximum depth of 9 feet.

This station is maintained in cooperation with the Great Western Power Company, whose hydrographer, Mr. L. J. Bevan, has kept a gage-height record and made meter measurements since it was established in 1905. The data collected at this point indicates the quantity of water that could be impounded in the proposed Big Meadows reservoir, and the water thus stored would be available for power and irrigation and could be utilized in the control of Sacramento River.

Discharge measurements of North Fork of Feather River below Prattville, Cal., in 1906.

| Date. | Hydrographer. | Gage height. | Discharge. | Date. | Hydrographer. | Gage height. |
|--------------|------------------|--------------|-----------------|---------------|---------------|--------------|
| 1905. | | <i>Feet.</i> | <i>Sec.-ft.</i> | 1906. | | <i>Feet.</i> |
| June 13. | R. W. Armstrong. | 3.45 | 1,256 | June 2 a. | L. J. Bevan. | 5.17 |
| June 21. | W. E. Spear. | 3.00 | 1,061 | June 2. | do. | 5.17 |
| July 1. | do. | 2.58 | 869 | June 11. | W. V. Hardy. | 5.55 |
| July 10. | R. W. Armstrong. | 2.40 | 761 | June 19 a. | L. J. Bevan. | 5.73 |
| July 17. | W. E. Spear. | 2.32 | 739 | June 19. | do. | 5.73 |
| August 10. | do. | 2.10 | 668 | June 23 a. | do. | 4.82 |
| August 14. | L. J. Bevan. | 2.11 | 663 | June 23. | W. V. Hardy. | 4.82 |
| August 26. | do. | 2.06 | 649 | July 2. | do. | 4.26 |
| October 18. | do. | 2.01 | 621 | July 3. | L. J. Bevan. | 4.21 |
| November 25. | do. | 1.96 | 602 | July 9. | do. | 3.83 |
| Do. | Hawley & Bevan. | 1.96 | 601 | July 12. | W. V. Hardy. | 3.53 |
| | | | | July 21. | do. | 3.05 |
| 1906. | | | | July 24. | L. J. Bevan. | 2.93 |
| January 20. | L. J. Bevan. | 4.19 | 1,514 | July 31. | W. V. Hardy. | 2.75 |
| January 24. | do. | 3.12 | 1,057 | August 3. | L. J. Bevan. | 2.71 |
| February 22. | do. | 4.26 | 1,600 | August 4. | W. V. Hardy. | 2.65 |
| March 7. | do. | 2.97 | 1,007 | August 16. | do. | 2.50 |
| March 26. | do. | 6.50 | 2,852 | August 29. | do. | 2.25 |
| April 11. | do. | 5.47 | 2,125 | September 6. | do. | 2.15 |
| May 5. | do. | 6.87 | 3,137 | September 19. | L. J. Bevan. | 2.25 |
| May 30. | Hardy & Hawley. | 5.80 | 2,539 | October 21. | do. | 2.13 |

^a 45-pound boiler weight used as anchor for meter.

Daily gage height, in feet, of North Fork of Feather River below Prattville, Cal., for 1905-6.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1905. | | | | | | | | | | | | |
| 1 | | | | | | | 2.59 | | 2.06 | 2.02 | | 2.15 |
| 2 | | | | | | | 2.57 | 2.16 | | 2.01 | | |
| 3 | | | | | | | 2.55 | | 2.04 | 2.00 | | |
| 4 | | | | | | | 2.53 | 2.17 | | | 1.98 | |
| 5 | | | | | | | 2.48 | 2.17 | | 2.00 | 1.98 | 1.85 |
| 6 | | | | | | | 2.50 | 2.16 | | 2.00 | | |
| 7 | | | | | | | 2.49 | 2.17 | 2.04 | 2.04 | | |
| 8 | | | | | | | 2.43 | 2.14 | 2.04 | 2.03 | | |
| 9 | | | | | | | 2.42 | 2.14 | 2.05 | 2.02 | | |
| 10 | | | | | | | 2.42 | 2.09 | 2.03 | | | |
| 11 | | | | | | | 2.39 | 2.11 | 2.03 | 2.01 | | |
| 12 | | | | | | | 2.40 | 2.16 | 2.04 | 2.01 | | 1.83 |
| 13 | | | | | | 3.45 | 2.39 | | 2.04 | 2.01 | | |
| 14 | | | | | | | 2.38 | 2.11 | 2.05 | 2.01 | | 1.93 |
| 15 | | | | | | | 2.39 | 2.11 | 2.04 | 2.01 | | |
| 16 | | | | | | | 2.34 | 2.12 | 2.05 | 2.01 | 1.99 | 2.01 |
| 17 | | | | | | | 2.33 | 2.11 | 2.03 | 2.01 | | |
| 18 | | | | | | 3.17 | | 2.10 | 2.03 | | | |
| 19 | | | | | | 3.05 | 2.32 | 2.10 | 2.03 | | 1.99 | |
| 20 | | | | | | 3.01 | 2.31 | 2.09 | 2.01 | | | |
| 21 | | | | | | 3.01 | 2.32 | 2.11 | 2.01 | | 1.98 | 1.81 |
| 22 | | | | | | 2.90 | 2.28 | 2.14 | 2.00 | | 1.96 | |
| 23 | | | | | | 2.87 | 2.28 | 2.14 | 1.99 | | 1.98 | 1.84 |
| 24 | | | | | | 2.83 | 2.33 | 2.14 | 2.01 | | 1.97 | |
| 25 | | | | | | 2.78 | 2.29 | 2.11 | 2.01 | | 1.97 | 1.91 |
| 26 | | | | | | 2.77 | 2.26 | 2.06 | 2.00 | | | |
| 27 | | | | | | 2.69 | 2.24 | 2.08 | 2.02 | | | |
| 28 | | | | | | 2.66 | 2.22 | 2.07 | 2.16 | | 2.01 | |
| 29 | | | | | | 2.61 | 2.23 | 2.06 | 2.11 | 2.00 | | |
| 30 | | | | | | 2.58 | 2.22 | 2.05 | 2.06 | | | 2.00 |
| 31 | | | | | | | 2.21 | 2.06 | | | | |
| 1906. | | | | | | | | | | | | |
| 1 | | | 3.60 | 5.95 | 5.85 | 5.30 | 4.22 | 2.76 | 2.17 | 2.17 | 2.13 | 1.99 |
| 2 | | | 3.45 | 5.15 | 6.05 | 5.19 | 4.23 | 2.72 | | 2.17 | 2.15 | 2.00 |
| 3 | 1.91 | 2.98 | 3.35 | 4.70 | 6.23 | 5.29 | 4.22 | 2.68 | | 2.16 | 2.25 | 2.01 |
| 4 | | | 3.15 | 4.50 | 6.60 | 5.58 | 4.18 | 2.66 | | 2.16 | 2.62 | 2.01 |
| 5 | | | 3.12 | 4.40 | 6.93 | 6.00 | 4.14 | 2.63 | | 2.16 | 2.88 | 2.02 |
| 6 | 1.93 | 2.91 | 3.05 | 4.45 | 7.10 | 5.92 | 4.04 | 2.63 | | 2.16 | 2.65 | 2.05 |
| 7 | 1.92 | 2.87 | 3.01 | 4.60 | 7.20 | 5.59 | 3.98 | 2.62 | | 2.16 | 2.42 | 2.07 |
| 8 | 1.90 | 2.85 | 3.00 | 4.77 | 7.18 | 5.25 | 3.92 | 2.60 | 2.10 | 2.16 | 2.30 | 2.17 |
| 9 | 1.94 | 2.86 | 3.08 | 5.08 | 7.17 | 5.18 | 3.83 | 2.58 | | 2.15 | 2.24 | 2.25 |
| 10 | 1.94 | 2.90 | 3.24 | 5.46 | 7.27 | 5.37 | 3.73 | 2.56 | | 2.15 | 2.20 | 2.44 |
| 11 | 2.03 | 2.97 | 3.75 | 5.45 | 7.56 | 5.65 | 3.60 | 2.57 | | 2.15 | 2.18 | 2.18 |
| 12 | 2.11 | 3.07 | 4.35 | 5.38 | 7.68 | 5.60 | 3.52 | 2.59 | | 2.15 | 2.17 | 2.10 |
| 13 | 2.15 | 3.11 | | 5.12 | 7.15 | 5.52 | 3.50 | 2.56 | 2.08 | 2.15 | 2.16 | 2.18 |
| 14 | 2.35 | 3.58 | | 5.05 | 6.73 | 5.40 | 3.47 | 2.53 | | 2.15 | 2.15 | 2.24 |
| 15 | 2.20 | 3.85 | | 5.10 | 6.80 | 5.33 | 3.43 | 2.51 | 2.20 | | 2.16 | 2.29 |
| 16 | 2.80 | 3.79 | | 5.19 | 6.65 | 5.60 | 3.45 | 2.50 | | | 2.24 | 2.35 |
| 17 | 3.12 | 3.68 | 3.60 | 5.36 | 6.05 | 6.28 | 3.28 | 2.47 | | | 2.21 | 2.44 |
| 18 | 4.25 | 4.00 | 3.45 | 5.48 | 6.16 | 6.05 | 3.24 | 2.47 | | | 2.16 | 2.33 |
| 19 | 4.65 | 4.27 | 3.33 | 5.50 | 5.50 | 5.73 | 3.20 | | | | 2.10 | 2.33 |
| 20 | 4.30 | 4.31 | 3.30 | 5.58 | 5.45 | 5.58 | 3.13 | | 2.25 | 2.13 | 2.10 | 2.33 |
| 21 | 3.80 | 4.28 | 3.90 | 5.88 | 5.45 | 5.50 | 3.08 | | 2.22 | 2.13 | 2.11 | 2.31 |
| 22 | 3.54 | 4.15 | 4.65 | 6.18 | 5.40 | 5.40 | 3.01 | | 2.20 | 2.13 | 2.10 | 2.30 |
| 23 | 3.32 | 3.74 | 5.15 | 6.40 | 5.32 | 5.20 | 2.96 | | 2.21 | 2.13 | 2.02 | 2.38 |
| 24 | 3.28 | 3.70 | 5.85 | 6.35 | 5.18 | 5.02 | 2.94 | | 2.23 | 2.13 | 2.04 | 2.48 |
| 25 | 3.13 | 3.62 | 6.30 | 6.00 | 5.27 | 4.86 | 2.90 | 2.25 | 2.22 | 2.13 | 2.05 | 3.42 |
| 26 | 3.17 | 3.45 | 6.47 | 5.65 | 5.90 | 4.80 | 2.87 | | 2.20 | 2.12 | 2.04 | 4.40 |
| 27 | 3.32 | 3.65 | 5.90 | 5.50 | 6.36 | 4.68 | 2.84 | | 2.19 | 2.11 | 2.02 | 4.57 |
| 28 | | 3.80 | 5.25 | 5.60 | 6.33 | 4.52 | 2.83 | | 2.19 | 2.11 | 2.01 | 4.65 |
| 29 | | | 4.80 | 5.55 | 6.17 | 4.35 | 2.80 | | 2.18 | 2.10 | 1.97 | 4.35 |
| 30 | | | 5.15 | 5.69 | 5.78 | 4.25 | 2.78 | | 2.17 | 2.10 | 2.01 | 3.95 |
| 31 | | | 6.35 | | 5.48 | | 2.76 | | | 2.13 | | 3.60 |

Rating table for North Fork of Feather River below Prattville, Cal., for 1905-6

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1.80 | 570 | 2.50 | 805 | 3.20 | 1,090 | 3.90 | 1,410 | 4.60 | 1,770 |
| 1.90 | 600 | 2.60 | 845 | 3.30 | 1,135 | 4.00 | 1,460 | 4.70 | 1,825 |
| 2.00 | 630 | 2.70 | 885 | 3.40 | 1,180 | 4.10 | 1,510 | 4.80 | 1,880 |
| 2.10 | 665 | 2.80 | 925 | 3.50 | 1,225 | 4.20 | 1,560 | 4.90 | 1,935 |
| 2.20 | 700 | 2.90 | 965 | 3.60 | 1,270 | 4.30 | 1,610 | 5.00 | 1,990 |
| 2.30 | 735 | 3.00 | 1,005 | 3.70 | 1,315 | 4.40 | 1,660 | 5.10 | 2,045 |
| 2.40 | 770 | 3.10 | 1,045 | 3.80 | 1,360 | 4.50 | 1,715 | 5.20 | 2,100 |

NOTE.—This table is based on 40 discharge measurements made during 1905-6 and is well defined. Above gage height 5.2 feet the rating curve is a tangent, the difference being 60 per tenth.

Monthly discharge of North Fork of Feather River below Prattville, Cal., for 1905

[Drainage area, 506 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-of Sec.-ft. per sq. mile. | De in |
|------------------|---------------------------|----------|-------|------------------------|-------------------------------------|----------|
| | Maximum. | Minimum. | Mean. | | | |
| 1905. | | | | | | |
| July | 845 | 700 | 761 | 46,800 | 1.50 | |
| August | 700 | 647 | 670 | 42,000 | 1.32 | |
| September | 682 | 630 | 644 | 38,300 | 1.27 | |
| October | 647 | 630 | 631 | 38,800 | 1.25 | |
| November | 630 | 615 | 628 | 37,400 | 1.24 | |
| December | 682 | 570 | 607 | 37,300 | 1.20 | |
| The period | 845 | 570 | 657 | 241,000 | 1.30 | |
| 1906. | | | | | | |
| January | 1,800 | 600 | 937 | 57,600 | 1.85 | |
| February | 1,610 | 945 | 1,210 | 67,200 | 2.39 | |
| March | 2,850 | 1,000 | 1,590 | 97,800 | 3.14 | |
| April | 2,820 | 1,660 | 2,210 | 132,000 | 4.37 | |
| May | 3,600 | 2,100 | 2,770 | 170,000 | 5.47 | |
| June | 2,760 | 1,580 | 2,190 | 130,000 | 4.33 | |
| July | 1,580 | 905 | 1,200 | 73,800 | 2.37 | |
| August | 905 | 700 | 795 | 48,900 | 1.57 | |
| September | 717 | 665 | 688 | 40,900 | 1.36 | |
| October | 682 | 665 | 679 | 41,800 | 1.34 | |
| November | 965 | 615 | 698 | 41,500 | 1.38 | |
| December | 1,800 | 630 | 894 | 55,000 | 1.77 | |
| The year | 3,600 | 600 | 1,320 | 956,000 | 2.61 | |

NOTE.—Discharge estimated on days when gage heights are missing. Values are excellent.

NORTH FORK OF FEATHER RIVER ABOVE PRATTVILLE.

This station was established June 12, 1905. It is 3 miles east of Prattville and about $\frac{1}{4}$ mile above the junction with Ham Branch. The drainage area above the station is 245 square miles.

The channel of the stream is straight for 200 feet above and 300 feet below the measuring section and has a shale bottom subject to slight change. Gagings are made from a boat. The section is about 10 feet wide and 5 feet deep at low water; at very high water there is a diversion overflow around the station, leaving the main stream about $1\frac{1}{2}$ miles above the point of measurement.

The gage is nailed to a willow stump 15 feet above the measuring section. Up to October 15, during 1905, the gage was read daily; after this date, weekly.

Discharge measurements of North Fork of Feather River above Prattville, Cal., in 1905-6.

| Date. | Hydrographer. | Gage height. | Dis-charge. |
|------------------|----------------------|--------------|-----------------|
| 1905. | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| June 12..... | R. W. Armstrong..... | 2.33 | 890 |
| June 22..... | W. E. Spear..... | 1.79 | 620 |
| July 1..... | do..... | 1.48 | 520 |
| July 15..... | R. W. Armstrong..... | 1.23 | 407 |
| July 28..... | W. E. Spear..... | 1.09 | 399 |
| August 15..... | L. J. Bevan..... | .99 | 370 |
| September 4..... | do..... | .90 | 345 |
| December 17..... | do..... | .80 | 330 |
| 1906. | | | |
| February 28..... | L. J. Bevan..... | 1.82 | 669 |
| April 12..... | do..... | 2.77 | 1,046 |
| May 15..... | do..... | 3.83 | 1,524 |
| July 7..... | do..... | 2.48 | 929 |
| August 8..... | do..... | 1.34 | 502 |

Daily gage height, in feet, of North Fork of Feather River above Prattville, Cal., for 1905-6.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1905. | | | | | | | | | | | | |
| 1..... | | | | | | | 1.50 | 1.05 | 0.90 | 0.88 | | |
| 2..... | | | | | | | 1.48 | 1.06 | .91 | .85 | | |
| 3..... | | | | | | | 1.47 | | .90 | .84 | | |
| 4..... | | | | | | | 1.46 | 1.05 | .90 | .84 | 0.82 | |
| 5..... | | | | | | | 1.39 | 1.05 | .90 | .85 | | |
| 6..... | | | | | | | 1.40 | 1.04 | | .85 | | |
| 7..... | | | | | | | 1.35 | 1.02 | .88 | .90 | | |
| 8..... | | | | | | | 1.33 | 1.01 | .87 | .90 | | |
| 9..... | | | | | | | 1.32 | 1.02 | .90 | .88 | | |
| 10..... | | | | | | | 1.31 | 1.01 | .90 | | | |
| 11..... | | | | | | | 1.29 | 1.00 | .87 | .87 | | |
| 12..... | | | | | | | 1.27 | 0.99 | .86 | .87 | | 0.75 |
| 13..... | | | | | | | 1.26 | .99 | .86 | .86 | | |
| 14..... | | | | | | | 1.24 | .99 | .89 | .86 | | |
| 15..... | | | | | | | 1.23 | .99 | .89 | .87 | | |
| 16..... | | | | | | | 1.22 | .97 | .90 | .86 | 0.83 | |
| 17..... | | | | | | 2.08 | 1.20 | .95 | .88 | | | 0.80 |
| 18..... | | | | | | | | .95 | .87 | | | |
| 19..... | | | | | | 1.97 | 1.18 | .94 | .86 | | 0.82 | |
| 20..... | | | | | | 1.90 | 1.18 | .94 | .85 | | | |
| 21..... | | | | | | 1.86 | 1.16 | .95 | .84 | | | 0.81 |
| 22..... | | | | | | 1.80 | 1.15 | .97 | .82 | | | |
| 23..... | | | | | | 1.78 | 1.14 | .96 | .82 | | | |
| 24..... | | | | | | 1.76 | 1.16 | .98 | .84 | | | |
| 25..... | | | | | | 1.69 | 1.15 | .95 | .85 | | | |
| 26..... | | | | | | 1.67 | 1.14 | .90 | .84 | | | |
| 27..... | | | | | | 1.59 | 1.14 | .94 | .87 | | | |
| 28..... | | | | | | 1.55 | 1.09 | .92 | .90 | | 0.87 | |
| 29..... | | | | | | 1.53 | 1.10 | .91 | .95 | 0.85 | | |
| 30..... | | | | | | 1.51 | 1.07 | .90 | .90 | | | 0.87 |
| 31..... | | | | | | | 1.06 | .90 | | | | |
| 1906. | | | | | | | | | | | | |
| 1..... | | | | | | | | | 1.12 | | | |
| 2..... | | | | | | | | | | | | |
| 3..... | | | | | | 2.83 | | | | | 1.00 | |
| 4..... | | | | | | | | 1.40 | | | | |
| 5..... | | | | | 3.92 | | | | | | | |
| 6..... | 0.76 | 1.19 | | | | | | | | | | |
| 7..... | | | | 2.51 | | | 2.48 | | | 0.90 | | |
| 8..... | | | | | | | | 1.34 | 1.04 | | | 0.94 |
| 9..... | | | | | | | | | | | | |
| 10..... | | | | | | | | | | | | |
| 11..... | | | | | | | | 1.34 | | | 0.95 | |
| 12..... | | | | | 4.15 | | | | | | | |
| 13..... | 0.88 | | | | | | | | | | | |
| 14..... | | | | 2.60 | | | 2.06 | | | 0.89 | | |
| 15..... | | | | | 3.83 | | | | 1.06 | | | 0.95 |

*Daily gage height, in feet, of North Fork of Feather River above Prattville, Cal., for 1905-
Continued.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1906 | | | | | | | | | | | | |
| 16. | | | | | | 3.30 | | | | | | |
| 17. | | 1.55 | 1.55 | | | | | | | | 0.98 | |
| 18. | | | | | | | | 1.20 | | | | |
| 19. | 1.68 | | | | 2.90 | | | | | | | |
| 20. | | | | | | | | | 0.96 | | | |
| 21. | | | | | | | 1.80 | | | 0.88 | | |
| 22. | | | | | | | | | 0.96 | | | |
| 23. | | | | | | 3.32 | | | | | | |
| 24. | | 1.55 | 2.59 | | | | | | | | 0.96 | |
| 25. | | | | | | | | 1.18 | | | | |
| 26. | | | | | | | | | | | | |
| 27. | | | | | | | | | | | | |
| 28. | | 1.82 | | | | | 1.48 | | | 0.86 | | |
| 29. | | | | | 3.18 | | | | 0.94 | | | |
| 30. | | | | | | 2.57 | | | | | | |
| 31. | | | 2.04 | | | | | | | | | |

HAMILTON BRANCH NEAR PRATTVILLE, CAL.

This station was established June 12, 1905. It is located about 1 mile east of Prattville and $1\frac{1}{4}$ miles above the junction of Hamilton Branch and North Fork. The drainage area above the station is 5 square miles.

The channel is straight for 200 feet above and below the measuring section and has a shale bottom subject to a very slight change.

Discharge measurements are made from a boat at a section about 70 feet wide and 4 feet deep at low water. The stream never overflows.

The gage is in two parts, nailed to posts driven into the stream bed near a clump of willows. Up to October 15, during 1905, the gage was read daily; after that date, weekly.

Discharge measurements of Hamilton Branch near Prattville, Cal., in 1905-6.

| Date. | Hydrographer. | Gage height. | Discharge. |
|--------------|------------------|--------------|-------------|
| 1905. | | <i>Fect.</i> | <i>Sec.</i> |
| June 12. | R. W. Armstrong. | 3.08 | |
| June 23. | W. E. Spear. | 2.74 | |
| July 3. | do. | 2.62 | |
| July 28. | do. | 2.56 | |
| August 15. | L. J. Bevan. | 2.56 | |
| September 4. | do. | 2.55 | |
| December 17. | do. | 2.40 | |
| 1906. | | | |
| January 19. | L. J. Bevan. | 3.60 | |
| February 28. | do. | 3.92 | |
| April 12. | do. | 4.43 | |
| May 15. | do. | 5.21 | |
| July 7. | do. | 3.19 | |
| August 8. | do. | 2.77 | |

Daily gage height, in feet, of Butt Creek at Butte Valley, Cal., for 1905-6—(Continued.)

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1905. | | | | | | | | | | | | |
| 21 | | | | | | | | | | 2.38 | 2.42 | 2.76 |
| 22 | | | | | | | | | | 2.38 | 2.42 | 2.76 |
| 23 | | | | | | | | | | 2.38 | 2.44 | 2.73 |
| 24 | | | | | | | | | | 2.38 | 2.43 | 2.73 |
| 25 | | | | | | | | | | 2.38 | 2.43 | 2.73 |
| 26 | | | | | | | | | | 2.38 | 2.43 | 2.76 |
| 27 | | | | | | | | | | 2.38 | 2.44 | 2.71 |
| 28 | | | | | | | | | | 2.38 | 2.43 | 2.68 |
| 29 | | | | | | | | | | 2.38 | 2.43 | 2.68 |
| 30 | | | | | | | | | | 2.38 | 2.45 | 2.67 |
| 31 | | | | | | | | | | 2.38 | | 2.78 |
| 1906. | | | | | | | | | | | | |
| 1 | 2.85 | 2.70 | 3.42 | 5.15 | 4.30 | 3.94 | 3.06 | 2.61 | 2.57 | | | |
| 2 | 2.88 | 2.68 | 3.31 | 4.50 | 4.33 | 3.99 | 3.13 | 2.61 | | | | |
| 3 | 2.91 | 2.68 | 3.28 | 4.17 | 4.53 | 4.02 | 3.02 | 2.61 | | | | |
| 4 | 2.94 | 2.68 | 3.25 | 4.02 | 4.65 | 4.42 | 2.98 | 2.60 | | | | |
| 5 | 2.96 | 2.69 | 3.17 | 3.96 | 4.80 | 4.20 | 2.93 | 2.59 | | | 2.93 | |
| 6 | 2.99 | 2.69 | 3.15 | 4.06 | 4.72 | 4.22 | 2.90 | 2.59 | | 2.54 | | |
| 7 | 3.03 | 2.69 | 3.16 | 4.30 | 4.78 | 4.24 | 2.89 | 2.59 | | | 2.65 | |
| 8 | 3.03 | 2.71 | 3.24 | 4.38 | 4.70 | 3.87 | 2.87 | 2.59 | 2.57 | | | 2.43 |
| 9 | 3.07 | 2.71 | 3.34 | 4.70 | 4.72 | 3.83 | 2.83 | 2.59 | | | | |
| 10 | 3.10 | 2.94 | 3.46 | 4.72 | 4.76 | 3.83 | 2.81 | 2.58 | | | 2.61 | 2.63 |
| 11 | 2.76 | 2.95 | 3.73 | 4.35 | 4.65 | 3.79 | 2.79 | 2.60 | | | | 2.67 |
| 12 | 2.83 | 2.95 | 5.75 | 4.45 | 4.48 | 3.92 | 2.77 | 2.61 | | | | 3.13 |
| 13 | 2.85 | 2.97 | 5.15 | 4.42 | 4.33 | 3.75 | 2.80 | 2.61 | 2.63 | 2.55 | | 3.13 |
| 14 | 2.93 | 3.25 | 4.30 | 4.41 | 4.34 | 3.68 | 2.78 | 2.61 | 2.61 | | | 3.13 |
| 15 | 2.98 | 3.65 | 4.02 | 4.58 | 4.37 | 3.65 | 2.77 | | 2.62 | | | 3.10 |
| 16 | 4.66 | 3.30 | 3.78 | 4.70 | 4.00 | 4.18 | 2.75 | | | | | 3.10 |
| 17 | 5.14 | 3.24 | 3.47 | 4.57 | 3.83 | 3.87 | 2.74 | | | | 2.58 | 3.11 |
| 18 | 7.69 | 3.60 | 3.35 | 4.53 | 3.70 | 3.71 | 2.74 | | | | | 2.68 |
| 19 | 6.72 | 4.09 | 3.27 | 4.56 | 3.72 | 3.64 | 2.72 | | | | | 2.63 |
| 20 | 5.45 | 3.75 | 3.27 | 4.73 | 3.70 | 3.39 | 2.72 | | | 2.55 | | 2.63 |
| 21 | 5.15 | 3.95 | 3.42 | 4.88 | 3.71 | 3.55 | 2.71 | | | | | 2.61 |
| 22 | 5.53 | 3.65 | 4.22 | 4.87 | 3.68 | 3.47 | 2.71 | | 2.59 | | | 2.60 |
| 23 | 3.16 | 3.55 | 4.40 | 4.63 | 3.67 | 3.40 | 2.69 | | | | | 2.67 |
| 24 | 3.00 | 3.42 | 4.90 | 4.43 | 3.68 | 3.33 | 2.69 | | | | | 2.72 |
| 25 | 2.90 | 3.35 | 4.90 | 4.25 | 3.84 | 3.30 | 2.68 | 2.60 | | | | 3.28 |
| 26 | 2.82 | 3.30 | 4.56 | 4.13 | 4.55 | 3.27 | 2.68 | | | | | 4.43 |
| 27 | 2.81 | 4.09 | 5.54 | 4.12 | 4.50 | 3.22 | 2.67 | | | 2.55 | | 4.33 |
| 28 | 2.75 | 4.10 | 4.20 | 4.22 | 4.38 | 3.21 | 2.66 | | | | | 3.42 |
| 29 | 2.72 | | 4.10 | 4.20 | 4.20 | 3.12 | 2.64 | | 2.56 | | 2.45 | 3.10 |
| 30 | 2.70 | | 5.00 | 4.28 | 4.10 | 3.09 | 2.62 | | | | | |
| 31 | 2.70 | | 6.00 | | 3.97 | | 2.61 | | | | | |

NORTH FORK OF FEATHER RIVER NEAR BIG BEND, CAL.

This station was established June 13, 1905. It is located 300 feet above the head of the Big Bend tunnel, about 20 miles north of Oroville. The drainage area at this point is 1,940 square miles.

The channel is straight for 500 feet above and below the station, and is in rock, with little probability of change. A low-water gage graduated from 0.0 to 7.5 feet is bolted into rock on the west bank 10 feet below the measuring section, and a high-water gage graduated from 7 to 22 feet is nailed to a poplar tree on the west bank 100 feet above the measuring section. The zero of the gage is 870.22 feet above sea level and 7.89 feet below the reference bench mark, which is a knob on the top of the rock to which the low-water gage is fastened.

Discharge measurements are made by means of a boat when the gage is below 11 feet, and for higher stages float measurements only

are made at this point, while check measurements are made 2 miles downstream from the cable of the Golden State Power Company. At low water the stream at the station is about 85 feet wide and 19 feet deep, with a uniform but sluggish current. During 1905 and 1906 the gage was read every other day by Henry Turner.

Discharge measurements of North Fork of Feather River near Big Bend, Cal., by S. A. and Beran, in 1905-6.

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|-------------------|--------------|-----------------|-----------------|--------------|-------------|
| 1905. | <i>Feet.</i> | <i>Sec.-ft.</i> | 1906. | <i>Feet.</i> | <i>Sec.</i> |
| June 13..... | 4.15 | 3,750 | March 13..... | 12.25 | |
| July 13..... | 2.75 | 1,352 | April 18..... | 10.24 | |
| August 20..... | 2.14 | 1,048 | April 28..... | 8.98 | |
| September 16..... | 2.07 | 1,003 | June 6..... | 9.55 | |
| October 22..... | 2.15 | 1,038 | June 7..... | 9.08 | |
| December 5..... | 2.25 | 1,101 | July 13..... | 4.73 | |
| | | | August 12..... | 3.03 | |
| | | | October 11..... | 2.44 | |
| 1906. | | | | | |
| February 2..... | 4.79 | 3,017 | | | |

Daily gage height, in feet, of North Fork of Feather River near Big Bend, Cal., for 1905-6.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|------|------|-------|-------|-------|-------|------|-------|------|------|
| 1905. | | | | | | | | | | | |
| 1..... | | | | | | | | | | | 2.17 |
| 2..... | | | | | | | | 2.26 | 2.06 | 2.18 | |
| 3..... | | | | | | | | | | 2.15 | 2.17 |
| 4..... | | | | | | | | 2.06 | 2.06 | 2.10 | |
| 5..... | | | | | | | | | | 2.08 | 2.17 |
| 6..... | | | | | | | | 2.24 | 2.07 | | |
| 7..... | | | | | | | | | | 2.10 | 2.18 |
| 8..... | | | | | | | | 2.21 | 2.06 | | |
| 9..... | | | | | | | | | 2.06 | 2.12 | |
| 10..... | | | | | | | | 2.17 | | | |
| 11..... | | | | | | | | | 2.05 | 2.11 | 2.17 |
| 12..... | | | | | | | | 2.16 | | | |
| 13..... | | | | | | | 2.75 | 2.16 | 2.05 | 2.13 | 2.18 |
| 14..... | | | | | | | | | | | |
| 15..... | | | | | | | 2.66 | 2.17 | 2.08 | 2.12 | 2.17 |
| 16..... | | | | | | | | | 2.07 | | |
| 17..... | | | | | | | 2.62 | 2.15 | | 2.11 | 2.18 |
| 18..... | | | | | | | | | 2.06 | | |
| 19..... | | | | | | | 2.60 | 2.13 | | 2.10 | 2.18 |
| 20..... | | | | | | | | 2.10 | 2.06 | 2.12 | |
| 21..... | | | | | | | 2.55 | 2.13 | | | 2.27 |
| 22..... | | | | | | | | | | 2.15 | 2.37 |
| 23..... | | | | | | | 2.50 | 2.20 | | | 2.19 |
| 24..... | | | | | | | | | | | |
| 25..... | | | | | | | 2.46 | 2.14 | 2.05 | 2.18 | 2.18 |
| 26..... | | | | | | | | 2.11 | | | |
| 27..... | | | | | | | 2.35 | | 2.07 | 2.20 | 2.57 |
| 28..... | | | | | | | | 2.07 | | | |
| 29..... | | | | | | | 2.34 | | 2.35 | 2.19 | 2.37 |
| 30..... | | | | | | | | 2.06 | 2.25 | 2.18 | |
| 31..... | | | | | | | 2.28 | | | | |
| 1906. | | | | | | | | | | | |
| 1..... | 2.24 | | | | | 10.65 | | 3.25 | 2.62 | | |
| 2..... | | 4.80 | 7.65 | 11.80 | 9.85 | 8.95 | 6.25 | 3.20 | | | 2.40 |
| 3..... | 2.24 | | | | | | | | 2.58 | | 3.02 |
| 4..... | | 4.65 | 7.30 | 9.55 | 10.60 | | 6.23 | 3.12 | 2.58 | | 5.90 |
| 5..... | 2.30 | | | | | 11.20 | | | | | 4.60 |
| 6..... | 2.31 | 4.54 | 6.58 | 8.76 | 11.20 | 9.55 | 5.85 | 3.08 | 2.58 | | |
| 7..... | | | 6.50 | | | 9.15 | | | 2.58 | | 3.40 |
| 8..... | 2.35 | 4.50 | | 9.60 | 11.25 | | 5.50 | 3.00 | | | |
| 9..... | | | 6.46 | | | 9.05 | | | 2.55 | | 3.00 |
| 10..... | 2.30 | 4.65 | | 10.70 | 11.85 | | 5.25 | 2.97 | 2.53 | | |

Daily gage height, in feet, of North Fork of Feather River near Big Bend, Cal., for 1905-6—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|-------|-------|------|-------|-------|-------|-------|-------|------|-------|------|------|-------|
| 1906. | | | | | | | | | | | | |
| 11. | | | 7.35 | | | 9.00 | | | | 2.44 | 2.80 | 6.20 |
| 12. | 2.96 | 4.79 | 13.45 | 9.85 | 11.20 | | 4.85 | 3.03 | 2.52 | | | |
| 13. | | 4.81 | 12.25 | | | 8.90 | 4.73 | 3.01 | | | 2.75 | 5.10 |
| 14. | 2.46 | | 10.06 | 9.75 | 10.05 | 8.75 | 4.60 | | 2.60 | 2.44 | | |
| 15. | | 8.15 | 8.85 | | | | | 2.90 | | | 2.75 | 3.10 |
| 16. | 13.23 | | | 10.30 | 9.40 | 9.30 | 4.38 | | 2.58 | | | |
| 17. | | 6.51 | 7.85 | | | | | | | | 2.83 | 3.80 |
| 18. | 18.48 | | | 10.25 | 8.85 | 8.85 | 4.22 | 2.85 | 2.58 | | | |
| 19. | 19.90 | 7.75 | 6.74 | 10.22 | | | | | 2.56 | | 2.73 | 3.60 |
| 20. | 12.22 | 8.20 | | | 8.40 | 8.40 | 3.90 | 2.78 | 2.55 | | | |
| 21. | | | 7.54 | 10.85 | | | | | 2.53 | | 2.67 | 3.50 |
| 22. | 7.15 | 8.97 | 10.35 | | 8.00 | 7.90 | 3.68 | | | | | |
| 23. | | | | 11.10 | | | | 2.75 | | | 2.65 | 3.80 |
| 24. | 5.88 | 8.10 | 14.00 | | 7.50 | 7.30 | 3.60 | 2.73 | | | | |
| 25. | | | | 10.65 | | | | | | | 2.60 | 8.80 |
| 26. | 5.56 | 8.75 | 14.70 | | 7.90 | 6.95 | 3.53 | 2.66 | | | | 15.40 |
| 27. | | | | 9.35 | 8.40 | | | | | | 2.55 | 13.00 |
| 28. | 5.25 | 9.80 | 12.10 | | 11.05 | 6.68 | 3.45 | | | | | 9.55 |
| 29. | | | | | 10.45 | | | | | 2.40 | 2.50 | |
| 30. | 5.10 | | 12.34 | 8.40 | | 6.39 | 3.35 | 2.65 | | | | |
| 31. | 4.88 | | | | 9.35 | | | | | | | |

MISCELLANEOUS MEASUREMENTS IN FEATHER RIVER DRAINAGE BASIN.

The following miscellaneous measurements were made in Feather River drainage basin during 1905 and 1906:

Bailey Creek near Prattville, Cal.—This stream is a tributary of North Fork of Feather River. The following measurements were made a short distance above its mouth.

1905—July 31: Discharge, 2.6 second-feet.

1906—May 23: Discharge, 50 second-feet.

September 5: Discharge, 3.3 second-feet.

Berry Creek near Berrycreek post-office, Cal.—This creek is a small tributary of the North Fork of Feather River. A measurement was made September 11, 1906, at wagon bridge at Berrycreek post-office:

Width, 20 feet; area, 27 square feet; discharge, 8 second-feet.

Big Springs near Prattville, Cal.—These springs discharge into Hamilton Branch of North Fork of Feather River. The following measurements were made above its mouth:

1905—June 13: Discharge, 56 second-feet.

July 5: Discharge, 65 second-feet.

August 8: Discharge, 69 second-feet.

September 1: Discharge, 50 second-feet.

December 16: Discharge, 61 second-feet.

1906—June 1: Discharge, 150 second-feet.

July 6: Discharge, 56 second-feet.

August 7: Discharge, 61 second-feet.

Butt Creek near Prattville, Cal.—This stream is a tributary of North Fork of Feather River. The following measurements were made at the bridge on Prattville-Sterling road:

1905—July 11: Discharge, 21 second-feet.

1906—March 27: Discharge, 156 second-feet.

June 21: Discharge, 142 second-feet.

July 20: Discharge 54 second-feet.

Clear Creek near Prattville, Cal.—This stream is a tributary of Hamilton Branch of North Fork of Feather River. The following measurements were made in 1905 a short distance above its mouth:

July 5: Discharge, 29 second-feet.

August 8: Discharge, 28 second-feet.

September 1: Discharge, 27 second-feet.

Chester Branch of North Fork of Feather River near Prattville, Cal.—The following measurements were made at the wagon bridge at Chester, Cal.:

1905—July 7: Discharge, 35 second-feet.

August 5: Discharge, 23 second-feet.

August 31: Discharge, 21 second-feet.

October 4: Discharge, 23 second-feet.

1906—March 1: Discharge, 48 second-feet.

June 23: Discharge, 95 second-feet.

July 11: Discharge, 70 second-feet.

September 5: Discharge, 45 second-feet.

Dotta Spring near Prattville, Cal.—This spring discharges into North Fork Feather River. The following measurements were made a short distance above its mouth.

1905—June 12: Discharge, 50 second-feet.

July 3: Discharge, 99 second-feet.

August 5: Discharge, 84 second-feet.

September 2: Discharge, 89 second-feet.

October 18: Discharge, 90 second-feet.

December 14: Discharge, 77 second-feet.

1906—June 21: Discharge, 122 second-feet.

August 3: Discharge, 94 second-feet.

Feather River near Bidwell Bar.—The following measurements were made 2 miles below Bidwell Bar and above the junction with North Fork of Feather River during 1905:

June 11: Discharge, 1,525 second-feet.

July 25: Discharge, 410 second-feet.

August 19: Discharge, 279 second-feet.

September 17: Discharge, 256 second-feet.

Flournoy ditch near Genesee, Cal.—This ditch diverts water from Red Clover Creek for irrigation at Flournoy's ranch. A measurement was made August 21, 1906, $1\frac{1}{4}$ miles southeast of Flournoy a short distance below the point of diversion:

Width, 4 feet; area, 3.6 square feet; discharge, 9.5 second-feet.

Hamilton Branch of North Fork of Feather River near Prattville, Cal.—The following measurements were made a short distance below its junction with Clear Creek:

- 1905—July 5: Discharge, 108 second-feet.
- August 8: Discharge, 79 second-feet.
- September 1: Discharge, 93 second-feet.
- October 2: Discharge, 83 second-feet.
- December 15: Discharge, 74 second-feet.
- 1906—June 1: Discharge, 498 second-feet.
- July 6: Discharge, 250 second-feet.
- August 7: Discharge, 139 second-feet.

The following measurements were made at wagon bridge on east side of Big Meadow and below its junction with Rock Creek:

- 1905—June 23: Discharge, 169 second-feet.
- 1906—September 1: Discharge, 232 second-feet.

Hot Springs Valley Creek at Hot Springs Valley.—This creek is a tributary of Warner Creek. The following measurements were made a short distance above its junction with Warner Creek:

- 1905—June 28: Discharge, 44 second-feet.
- August 2: Discharge, 30 second-feet.
- August 30: Discharge, 28 second-feet.
- October 4: Discharge, 25 second-feet.
- 1906—May 23: Discharge, 117 second-feet.
- July 11: Discharge, 80 second-feet.
- September 4: Discharge, 35 second-feet.

Hossekus ditch near Genesee, Cal.—This ditch diverts water from Little Grizzly Creek. A measurement was made August 20, 1906, 1½ miles southwest of Genesee post-office and a short distance below point of diversion:

Width, 5 feet; area, 3.5 square feet; discharge, 5 second-feet.

Indian Creek.—This creek is one of the principal tributaries of North Fork of Feather River. The following measurements were made a short distance above its mouth during 1905:

- June 16: Discharge, 321 second-feet.
- September 8: Discharge, 106 second-feet.

Indian Creek near Genesee, Cal.—A measurement of this stream was made August 21, 1906, one-half mile northwest of Flournoy's and above its junction with Red Clover Creek:

Width, 6.5 feet; area, 4.3 square feet; discharge, 3.8 second-feet.

King Creek at Hot Springs Valley, Cal.—This stream is a tributary of Warner Creek. The following measurements were made at crossing of the Prattville-Lassen Peak road, one-half mile above the junction with Warner Creek:

- 1905—June 28: Discharge, 66 second-feet.
- August 2: Discharge, 29 second-feet.
- August 30: Discharge, 18 second-feet.
- October 4: Discharge, 12.6 second-feet.
- 1906—May 22: Discharge, 151 second-feet.
- July 11: Discharge, 117 second-feet.

Little Grizzly Creek near Genesee, Cal.—This stream is a tributary of Indian Creek. A measurement was made August 20, 1906, 1 mile southwest of Genesee post-office, above the diversion of Hosselkus ditch:

Width, 21 feet; area, 21 square feet; discharge, 14.7 second-feet.

Middle Fork of Feather River near Beckwith, Cal.—A measurement of this stream was made August 12, 1906, 2 miles west of Beckwith, Cal., and one-half mile above its junction with Grizzly Creek:

Width, 10 feet; area, 4.4 square feet; discharge, 5 second-feet.

North Arm Creek near Taylorsville, Cal.—This stream is a tributary of Indian Creek. A measurement was made August 22, 1906, at "Dead Fall" bridge, $1\frac{3}{4}$ miles north of Taylorsville, Cal.:

Width, 14 feet; area, 12.4 square feet; discharge, 5.1 second-feet.

North Fork of Feather River near Tyler, Cal.—The following measurements were made at the bridge on the Prattville-Red Bluff road:

1905—June 29: Discharge, 52 second-feet.

August 2: Discharge, 17.4 second-feet.

August 30: Discharge, 12.4 second-feet.

October 4: Discharge, 11.4 second-feet.

1906—May 23: Discharge, 91 second-feet.

July 10: Discharge, 117 second-feet.

North Fork of Feather River.—The following measurements were made a short distance above its junction with Warner Creek:

1905—August 30: Discharge, 84 second-feet.

October 3: Discharge, 64 second-feet.

1906—May 23: Discharge, 506 second-feet.

July 11: Discharge, 323 second-feet.

North Fork of Feather River near Prattville, Cal.—The following measurements were made at Olsen's ranch, 8 miles northwest of Prattville, Cal.:

1905—June 30: Discharge, 286 second-feet.

August 4: Discharge, 188 second-feet.

August 29: Discharge, 146 second-feet.

October 3: Discharge, 128 second-feet.

1906—March 1: Discharge, 164 second-feet.

May 22: Discharge, 805 second-feet.

July 10: Discharge, 647 second-feet.

Prattville Branch of North Fork of Feather River at Prattville, Cal.—The following measurements were made 800 feet above its junction with North Fork of Feather River:

1905—June 12: Discharge, 186 second-feet.

July 7: Discharge, 196 second-feet.

August 14: Discharge, 180 second-feet.

September 2: Discharge, 179 second-feet.

1906—January 5: Discharge, 147 second-feet.

June 29: Discharge, 303 second-feet.

August 3: Discharge, 227 second-feet.

Red Clover Creek near Genesee, Cal.—This stream is a tributary of Indian Creek. A measurement was made August 21, 1906, $1\frac{1}{4}$ miles southeast of Flournoy's and above diversion of Flournoy's ditch:

Width, 10 feet; area, 11 square feet; discharge, 21 second feet.

Rock Creek near Prattville, Cal.—This stream is a tributary of Hamilton Branch of North Fork of Feather River. The following measurements were made at bridge on Prattville-Susanville road:

1905—June 24: Discharge, 12 second-feet.

July 5: Discharge, 7.4 second-feet.

August 8: Discharge, 5 second-feet.

September 1: Discharge, 2.1 second-feet.

October 2: Discharge, 1.5 second-feet.

December 15: Discharge, 0.5 second-foot.

1906—June 1: Discharge, 85 second-feet.

July 6: Discharge, 25 second-feet.

August 7: Discharge, 25 second-feet.

South Fork of Feather River near Enterprise, Cal.—The following measurements, which include the flow in the Enterprise ditch, were made a short distance above its junction with Feather River during 1905:

June 11: Discharge, 246 second-feet.

July 25: Discharge, 64 second-feet.

August 18: Discharge, 48 second-feet.

September 17: Discharge, 34 second-feet.

Spanish Creek near Quincy, Cal.—This stream is a tributary of Indian Creek. A measurement was made September 9, 1906, at the wagon bridge, $2\frac{1}{2}$ miles northeast of Quincy, Cal.:

Width, 40 feet; area, 40 feet; discharge, 44 second-feet.

Squaw Queen Creek near Genesee, Cal.—This stream is a tributary of Red Clover Creek. A measurement was made August 21, 1906, three-fourths mile southeast of Flournoy and 500 feet above its junction with Clover Creek:

Width, 6 feet; area, 3.6 square feet; discharge, 2.3 second-feet.

Warner Creek near Chester, Cal.—This stream is a tributary of the North Fork of Feather River. The following measurements were made at bridge on Prattville-Red Bluff road:

1905—June 30: Discharge, 140 second-feet.

August 5: Discharge, 81 second-feet.

August 29: Discharge, 63 second-feet.

October 3: Discharge, 61 second-feet.

1906—May 23. Discharge, 320 second-feet.

July 10: Discharge, 268 second-feet.

September 4: Discharge, 95 second-feet.

Ward Creek near Genesee, Cal.—This stream is a tributary of Indian Creek. A measurement was made August 22, 1906, at Phelan's ranch house, $1\frac{1}{2}$ miles above its junction with Indian Creek:

Width, 8 feet; area, 3.2 square feet; discharge, 8.1 second-feet.

Willow Creek near Chester, Cal.—This stream is a tributary of North Fork of Feather River. The following measurements were made at the ford on the Prattville-Red Bluff road:

- 1905—June 29: Discharge, 4.1 second-feet.
 August 2: Discharge, 4.0 second-feet.
 October 4: Discharge, 2.5 second-feet.
 1906—May 23: Discharge, 40 second-feet.

Wolf Creek near Greenville, Cal.—This stream is a tributary of Indian Creek, discharging through swamp in west arm of Indian Creek. A measurement was made August 23, 1906, one-fourth mile southwest of Greenville, Cal., above its junction with North Canyon, a stream which discharges from Round Valley Reservoir. A diversion of 3.4 second-feet for irrigation is made above point of measurement.

Width, 3 feet; area, 1.2 square feet; discharge, 1.8 second-feet.

PRECIPITATION AND EVAPORATION DATA.

The following tables give the total precipitation and evaporation in inches, by months at Prattville, Cal.:

Precipitation and evaporation at Prattville, Cal.

PRECIPITATION.

| Year. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | A. |
|-----------|-------|------|-------|------|------|-------|-------|------|-------|------|------|-------|-----|
| 1905..... | | | | | | | 0.00 | 0.17 | 0.70 | 0.28 | 2.77 | 1.74 | ... |
| 1906..... | 16.20 | 6.45 | 14.42 | 0.73 | 4.99 | 1.42 | 0.34 | 0.15 | 0.53 | 0.20 | 3.91 | 14.68 | ... |

EVAPORATION.

| Year. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | A. |
|-----------|------|------|------|------|------|-------|-------|------|-------|------|------|------|-----|
| 1905..... | | | | | | | 3.81 | 4.31 | 3.80 | 2.72 | 1.50 | 1.00 | ... |
| 1906..... | 1.30 | 0.95 | 1.16 | 2.84 | 2.58 | 2.77 | 3.86 | 3.42 | 2.72 | 3.06 | 1.28 | 0.41 | ... |

YUBA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Yuba River is a tributary of Feather River, which it enters at Marysville, 30 miles above the junction of Feather and Sacramento rivers. The entire drainage area of the Yuba is about 1,327 square miles, of which about 1,220 square miles are above the gaging station at Marysville. Its extreme length is about 60 miles, and extreme width is about 10 miles. In the lower stretches of the river, at the location of the present gaging station and in the valley below, the channel has been deepened to a considerable depth with debris from hydraulic mining.

The drainage basin is subdivided into 5 small basins, namely: North Fork, with a drainage area of 491.6 square miles; Middle Fork, with a drainage area of 218 square miles; South Fork, with a drainage area of 360 square miles; Deer Creek, with a drainage of 89.6 square miles, and Dry Creek, with a drainage area of 105.5 square miles.

latter tributary discharges into the main river about 5 miles below the gaging station. The watershed rises gently in rounded and broken mountains, to the crest of the Sierra Nevada, which at the headwaters of the Yuba has a mean elevation of about 8,200 feet, with peaks rising to a height of 9,100 feet. From Mount Lincoln—a peak common to the watersheds of the Yuba, American, and Truckee rivers—to a point about $2\frac{1}{2}$ miles northeast of Mount Weber, the summit of the Sierra Nevada divides the watershed of Yuba River from that of Truckee River, which discharges into Humboldt Basin. Farther north from Mount Weber there is a secondary crest which divides the watersheds of Yuba and Feather rivers, the watershed of the latter stream reaching farther east to a less elevated divide in which the passes are lower than those of the easterly crest.

The western and lower portions of the Yuba drainage basin are composed of slate and kindred rock, very much eroded and merging into the gravel and alluvial deposits of the Sacramento Valley. The upper portions of the basin are composed principally of lavas and granites, all deeply eroded, particularly the lavas. A stratum of serpentine traverses the watershed of the Yuba River in a direction generally parallel with the crest of the Sierra. North Fork rises in lavas which vary much in composition and hardness, but which generally have a deep soil covering, with timber and brush growth. Middle Fork rises in similar lavas and granite. The main and tributary streams fall rapidly, and their canyons head well up in the mountains. The sides of these canyons are covered with timber and brush, which, with the deep soil, retain the moisture and feed numerous perennial springs. In the case of North Fork this is particularly noticeable. The forests of its watersheds make a reliable and constant stream. The mean annual precipitation for the basins of North and Middle forks is about 54 inches. Warm rains on soft snow sometimes give high flood discharge, but snow remains on the higher peaks until midsummer. The headwaters of South Fork lie upon a broad granite surface into which the streams have not cut deeply until the main stream reaches a point 16 miles from the summit, where it drops rapidly into a deeply eroded canyon. This part of the basin has a precipitation annually of about 60 inches. The entire drainage area of the Yuba contains nearly 100 small glacial lakes.

YUBA RIVER NEAR SMARTSVILLE, CAL.

This station was established June 2, 1903. It is located at what is called "The Narrows," 1 mile from Smartsville, Cal., 18 miles from the Southern Pacific Railroad station at Wheatland, Cal., and 20 miles from Marysville, Cal. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 160, where are given also references to publications that contain data for previous years.

Discharge measurements of Yuba River near Smartsville, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-------------------|------------------------|--------------|------------------|--------------|-------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.</i> |
| January 4..... | J. R. McKeel..... | 73 | 147 | 1.70 | |
| January 11..... | do..... | 79 | 153 | 1.80 | |
| January 25..... | do..... | 189 | 1,400 | 6.30 | |
| January 30..... | do..... | 189 | 984 | 5.70 | |
| February 4..... | do..... | 187 | 663 | 5.40 | |
| February 9..... | F. R. S. Buttemer..... | 189 | 575 | 5.32 | |
| February 11..... | J. R. McKeel..... | 188 | 631 | 5.50 | |
| February 15..... | R. S. Hawley..... | 260 | 1,570 | 8.00 | |
| March 9..... | do..... | 219 | 1,020 | 6.85 | |
| March 10..... | do..... | 219 | 1,020 | 6.90 | |
| March 23..... | do..... | 289 | 1,850 | 9.80 | |
| March 24..... | do..... | 309 | 2,660 | 12.20 | |
| April 10..... | Hawley and Sawyer..... | 240 | 1,290 | 7.20 | |
| April 17..... | W. C. Sawyer..... | 242 | 1,340 | 7.20 | |
| April 18..... | do..... | 240 | 1,380 | 7.20 | |
| April 26..... | do..... | 219 | 1,320 | 6.65 | |
| May 3..... | do..... | 257 | 1,650 | 7.70 | |
| May 4..... | do..... | 257 | 1,580 | 7.70 | |
| May 5..... | do..... | 260 | 1,820 | 8.15 | |
| May 18..... | do..... | 173 | 1,180 | 6.07 | |
| July 10..... | R. S. Hawley..... | 162 | 1,010 | 2.47 | |
| July 11..... | do..... | 169 | 965 | 2.23 | |
| July 24..... | do..... | 156 | 710 | 0.95 | |
| July 25..... | do..... | 156 | 679 | 0.75 | |
| August 6..... | J. R. McKeel..... | 159 | 560 | 9.80 | |
| August 20..... | do..... | 159 | 505 | 9.45 | |
| August 30..... | do..... | 159 | 484 | 9.35 | |
| September 9..... | do..... | 159 | 459 | 9.25 | |
| September 16..... | do..... | 159 | 469 | 9.30 | |
| September 24..... | do..... | 159 | 487 | 9.20 | |
| October 2..... | R. S. Hawley..... | 147 | 440 | 9.10 | |
| October 25..... | do..... | 146 | 453 | 9.10 | |

Daily gage height, in feet, of Yuba River near Smartsville, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------------------|-------|------------------|-------|------------------|------------------|-----------------|------------------|------------------|------|-------|
| 1..... | 1.8 | 5.5 | 7.4 | 9.7 | 7.1 | 6.3 | 3.5 | 10.0 | 9.4 | 9.1 | 9.0 |
| 2..... | 1.7 | 5.5 | 7.0 | 8.7 | 7.5 | 6.4 | 3.8 | 9.9 | 9.3 | 9.1 | 9.1 |
| 3..... | 1.7 | 5.5 | 7.5 | 8.0 | 7.9 | 6.7 | 4.0 | 9.9 | 9.3 | 9.1 | 9.1 |
| 4..... | 1.7 | 5.4 | 7.3 | 7.5 | 8.0 | 10.0 | 3.7 | 9.8 | 9.3 | 9.1 | 12.7 |
| 5..... | 1.7 | 5.4 | 6.9 | 7.3 | 8.1 | 8.0 | 3.5 | ^a 9.8 | 9.3 | 9.1 | 10.6 |
| 6..... | 1.7 | 5.4 | 6.7 | 7.2 | 8.0 | 7.0 | 3.2 | 9.8 | 9.3 | 9.0 | 10.0 |
| 7..... | 1.7 | 5.3 | 6.8 | 7.2 | 8.0 | 6.5 | 3.0 | 9.8 | 9.3 | 9.0 | 9.7 |
| 8..... | 1.7 | 5.3 | 6.8 | 7.3 | 8.0 | 6.1 | 2.8 | 9.7 | 9.3 | 9.0 | 9.5 |
| 9..... | 1.6 | 5.3 | 6.8 | 7.3 | 8.2 | 6.3 | 2.6 | 9.7 | 9.2 | 9.0 | 9.5 |
| 10..... | 1.8 | 5.6 | 6.9 | 7.3 | 8.1 | ^a 6.7 | 2.5 | 9.7 | 9.2 | 9.0 | 9.4 |
| 11..... | 1.8 | 5.5 | 7.0 | 7.1 | 8.4 | 7.0 | 2.1 | 9.7 | 9.2 | 9.0 | 9.4 |
| 12..... | 4.7 | 5.4 | 12.0 | 7.0 | 7.6 | 8.0 | 2.4 | ^a 9.6 | 9.2 | 9.0 | 9.4 |
| 13..... | 9.7 | 5.3 | 8.8 | 7.1 | 7.0 | 6.6 | 2.3 | 9.6 | 9.2 | 9.0 | 9.4 |
| 14..... | 8.5 | 5.4 | 8.8 | 7.0 | ^a 7.1 | 5.7 | 2.2 | 9.6 | 9.2 | 9.0 | 9.4 |
| 15..... | 11.0 | 8.3 | 8.1 | 7.2 | 7.3 | 5.7 | 1.8 | 9.6 | 9.3 | 9.0 | 9.4 |
| 16..... | 11.0 | 6.7 | 7.5 | 7.2 | 6.3 | 7.0 | 1.7 | 9.6 | 9.3 | 9.0 | 9.6 |
| 17..... | 9.7 | 6.1 | 7.2 | 7.3 | 6.2 | 5.8 | 1.6 | 9.5 | 9.2 | 9.1 | 9.5 |
| 18..... | 17.0 | 6.4 | ^a 6.9 | 7.3 | 6.1 | 5.0 | 1.6 | 9.5 | 9.2 | 9.1 | 9.4 |
| 19..... | 13.0 | 8.5 | 6.7 | 7.4 | 6.2 | 6.2 | 1.4 | 9.5 | ^a 9.2 | 9.1 | 9.3 |
| 20..... | 8.9 | 7.0 | 6.6 | 7.5 | 6.3 | 5.9 | 1.2 | 9.5 | 9.2 | 9.1 | 9.3 |
| 21..... | 8.0 | 8.4 | 7.1 | 7.5 | 6.2 | 5.3 | 1.1 | 9.5 | 9.2 | 9.1 | 9.3 |
| 22..... | 7.4 | 7.4 | 9.6 | 7.5 | 6.1 | 5.0 | 1.0 | 9.5 | 9.2 | 9.1 | 9.3 |
| 23..... | 7.0 | 7.7 | 10.0 | 7.3 | 5.9 | 5.1 | 1.0 | 9.5 | 9.2 | 9.1 | 9.3 |
| 24..... | 6.7 | 7.7 | 12.2 | 7.0 | 5.5 | 4.3 | 0.9 | 9.5 | 9.2 | 9.0 | 9.3 |
| 25..... | 6.3 | 7.8 | 11.6 | 6.7 | 6.6 | 4.2 | 0.8 | 9.5 | 9.2 | 9.0 | 9.3 |
| 26..... | 6.1 | 7.4 | 12.4 | 6.8 | 8.8 | 4.0 | .7 | ^a 9.4 | 9.2 | 9.0 | 9.3 |
| 27..... | 6.0 | 8.5 | 9.5 | 6.6 | 8.7 | 3.8 | .6 | 9.4 | 9.2 | 9.0 | 9.3 |
| 28..... | ^a 5.9 | 8.0 | 8.6 | 6.4 | 9.0 | 3.7 | .5 | 9.4 | 9.2 | 9.0 | 9.3 |
| 29..... | 5.8 | ..... | 8.0 | 6.7 | 7.7 | 3.5 | ^a .4 | ^a 9.4 | 9.2 | 9.0 | 9.2 |
| 30..... | 5.7 | ..... | 9.4 | 6.8 | 6.7 | 3.5 | .3 | 9.4 | 9.1 | 9.0 | 9.3 |
| 31..... | 5.6 | ..... | 14.0 | ..... | 6.3 | ..... | .2 | 9.4 | ..... | 9.0 | ..... |

^a Estimated.

NOTE.—The datum of the gage was lowered 10 feet August 1.

Daily discharge, in second-feet, of Yuba River near Smartsville, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|--------|--------|--------|--------|--------|--------|-------|-------|-------|------|-------|--------|
| 1..... | 600 | 2,390 | 6,810 | 18,100 | 9,000 | 8,900 | 5,200 | 1,040 | 620 | 440 | 380 | 560 |
| 2..... | 555 | 2,390 | 5,550 | 13,500 | 10,500 | 9,350 | 6,000 | 920 | 560 | 440 | 440 | 560 |
| 3..... | 555 | 2,390 | 7,150 | 11,700 | 12,400 | 10,500 | 6,600 | 920 | 560 | 440 | 440 | 560 |
| 4..... | 555 | 2,250 | 6,480 | 9,100 | 11,600 | 25,600 | 6,000 | 860 | 560 | 440 | 5,000 | 560 |
| 5..... | 555 | 2,250 | 5,260 | 8,600 | 13,000 | 16,500 | 5,800 | 860 | 560 | 440 | 1,540 | 560 |
| 6..... | 555 | 2,250 | 4,730 | 8,300 | 12,500 | 12,200 | 5,200 | 860 | 560 | 380 | 1,040 | 560 |
| 7..... | 555 | 2,120 | 4,990 | 8,350 | 12,500 | 10,400 | 5,000 | 860 | 560 | 380 | 800 | 560 |
| 8..... | 555 | 2,120 | 4,990 | 8,700 | 12,500 | 9,200 | 4,800 | 800 | 560 | 380 | 680 | 1,880 |
| 9..... | 515 | 2,120 | 4,990 | 8,700 | 13,600 | 10,100 | 4,550 | 800 | 500 | 380 | 680 | 1,170 |
| 10..... | 600 | 2,540 | 5,260 | 8,600 | 13,200 | 11,700 | 4,520 | 800 | 500 | 380 | 520 | 1,880 |
| 11..... | 600 | 2,390 | 5,550 | 8,000 | 14,400 | 13,100 | 3,720 | 800 | 500 | 380 | 520 | 16,800 |
| 12..... | 3,590 | 2,250 | 28,400 | 7,700 | 11,400 | 18,000 | 4,320 | 740 | 500 | 380 | 520 | 5,850 |
| 13..... | 16,900 | 2,120 | 12,500 | 7,950 | 8,600 | 11,700 | 4,120 | 740 | 500 | 380 | 520 | 4,100 |
| 14..... | 11,500 | 2,250 | 12,500 | 7,500 | 9,300 | 8,700 | 3,920 | 740 | 500 | 380 | 520 | 3,100 |
| 15..... | 18,900 | 10,200 | 9,400 | 8,100 | 10,000 | 8,800 | 3,130 | 740 | 560 | 380 | 520 | 2,850 |
| 16..... | 18,900 | 4,730 | 7,150 | 8,100 | 6,950 | 14,100 | 2,950 | 740 | 560 | 380 | 740 | 2,700 |
| 17..... | 16,900 | 3,400 | 6,160 | 8,500 | 6,700 | 9,450 | 2,780 | 680 | 500 | 440 | 680 | 2,600 |
| 18..... | 48,000 | 4,010 | 5,260 | 8,500 | 6,500 | 7,200 | 2,780 | 680 | 500 | 440 | 520 | 2,500 |
| 19..... | 33,000 | 11,100 | 4,730 | 8,900 | 6,800 | 11,700 | 2,450 | 680 | 500 | 440 | 560 | 2,350 |
| 20..... | 13,000 | 5,550 | 4,480 | 9,200 | 7,200 | 10,300 | 2,160 | 680 | 500 | 440 | 560 | 2,350 |
| 21..... | 9,000 | 10,700 | 5,850 | 9,200 | 7,150 | 8,400 | 2,030 | 680 | 500 | 440 | 560 | 2,350 |
| 22..... | 6,810 | 6,810 | 16,400 | 9,200 | 7,000 | 8,200 | 1,900 | 680 | 500 | 440 | 560 | 2,350 |
| 23..... | 5,550 | 7,850 | 18,400 | 8,600 | 6,500 | 8,100 | 1,900 | 680 | 500 | 440 | 560 | 3,700 |
| 24..... | 4,730 | 7,850 | 29,400 | 7,650 | 5,750 | 6,100 | 1,880 | 680 | 500 | 380 | 560 | 3,700 |
| 25..... | 3,800 | 8,220 | 26,400 | 6,800 | 8,900 | 6,000 | 1,760 | 680 | 500 | 380 | 560 | 11,300 |
| 26..... | 3,400 | 6,810 | 30,400 | 7,050 | 18,700 | 5,700 | 1,650 | 620 | 500 | 380 | 560 | 22,800 |
| 27..... | 3,210 | 11,100 | 15,900 | 7,000 | 18,200 | 5,400 | 1,540 | 620 | 500 | 380 | 560 | 8,000 |
| 28..... | 3,040 | 9,000 | 11,600 | 6,450 | 20,100 | 5,300 | 1,440 | 620 | 500 | 380 | 560 | 6,000 |
| 29..... | 2,860 | ..... | 9,000 | 7,350 | 13,700 | 5,000 | 1,340 | 620 | 500 | 380 | 500 | 4,300 |
| 30..... | 2,700 | ..... | 15,400 | 7,800 | 10,000 | 5,100 | 1,250 | 620 | 440 | 380 | 560 | 5,300 |
| 31..... | 2,540 | ..... | 40,600 | ..... | 8,800 | ..... | 1,170 | 620 | ..... | 380 | ..... | 5,300 |

NOTE.—These discharges were obtained partly by rating tables and partly by the indirect method for shifting channels.

Monthly discharge of Yuba River near Smartsville, Cal., for 1906.

[Drainage area, 1,220 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|--------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 48,000 | 515 | 7,560 | 465,000 | 6.20 | 7.15 |
| February..... | 11,100 | 2,120 | 4,970 | 276,000 | 4.07 | 4.24 |
| March..... | 40,600 | 4,480 | 12,000 | 738,000 | 9.84 | 11.34 |
| April..... | 18,100 | 6,450 | 8,770 | 522,000 | 7.19 | 8.02 |
| May..... | 20,100 | 5,750 | 10,800 | 664,000 | 8.85 | 10.20 |
| June..... | 25,600 | 5,000 | 10,000 | 595,000 | 8.20 | 9.15 |
| July..... | 6,600 | 1,170 | 3,350 | 206,000 | 2.75 | 3.17 |
| August..... | 1,040 | 620 | 744 | 45,700 | .610 | .70 |
| September..... | 620 | 440 | 520 | 30,900 | .426 | .48 |
| October..... | 440 | 380 | 403 | 24,800 | .330 | .38 |
| November..... | 5,000 | 380 | 757 | 45,000 | .620 | .69 |
| December..... | 22,800 | 560 | 4,130 | 254,000 | 3.39 | 3.91 |
| The year..... | 48,000 | 380 | 5,330 | 3,870,000 | 4.37 | 59.43 |

NOTE.—Values are rated as follows: February and March, excellent; June, November, and December, fair, on account of the lack of measurements; remainder of 1906, good.

BEAR RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Bear River drains an area of 287 square miles between Yuba and American rivers. Its headwaters do not reach back to the crest of the range, so that it seldom receives precipitation in the form of lasting snow. It is torrential in character, having no forested areas except

in its upper portion. The rainfall records kept by the Central Pa. from Auburn to Emigrant Gap are indicative of the precipitation the southern part of its basin. A 28-year record at Grass Valley in northern portion of its watershed gives a mean of 49.41 inches.

BEAR RIVER ABOVE WHEATLAND, CAL.

This station was established on October 8, 1904. It is located a 800 feet below McCourtney Crossing and 8 miles above Wheatland. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 165, where are given also references to publications that contain data for previous years.

Discharge measurements of Bear River above Wheatland, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|------------------------|--------------|------------------|--------------|------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>S</i> |
| February 10..... | F. R. S. Buttemer..... | 123 | 117 | 4.55 | |
| February 26..... | do..... | 156 | 323 | 6.10 | |
| March 10..... | do..... | 118 | 222 | 4.97 | |
| March 18..... | do..... | 137 | 284 | 5.60 | |
| April 12..... | W. C. Sawyer..... | 144 | 232 | 5.34 | |
| April 19..... | do..... | 139 | 181 | 4.83 | |
| April 27..... | do..... | 140 | 186 | 4.85 | |
| April 27..... | do..... | 141 | 236 | 5.22 | |
| May 19..... | do..... | 130 | 122 | 4.02 | |
| July 12..... | R. S. Hawley..... | 53 | 57 | 3.57 | |
| July 24..... | do..... | 58 | 38 | 3.30 | |
| July 25..... | do..... | 75 | 61 | 3.28 | |
| October 3..... | do..... | 25 | 20 | 3.06 | |

Daily gage height, in feet, of Bear River above Wheatland, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|-------|-------|-------|-------|------|-------|-------|------|-------|------|-------|
| 1..... | 3.2 | 4.6 | 6.0 | 8.7 | 4.5 | 5.2 | 3.9 | 3.2 | 3.0 | 3.0 | 3.1 |
| 2..... | 3.1 | 4.6 | 5.7 | 7.3 | 4.6 | 5.0 | 3.9 | 3.2 | 3.0 | 3.0 | 3.1 |
| 3..... | 3.1 | 4.5 | 5.5 | 6.8 | 4.5 | 5.0 | 3.8 | 3.1 | 3.0 | 3.0 | 3.2 |
| 4..... | 3.1 | 4.5 | 6.5 | 6.4 | 4.4 | 6.0 | 3.8 | 3.1 | 3.0 | 3.0 | 4.45 |
| 5..... | 3.0 | 4.5 | 5.8 | 6.2 | 4.4 | 5.4 | 3.7 | 3.1 | 3.0 | 3.0 | 3.9 |
| 6..... | 3.0 | 4.4 | 5.5 | 6.0 | 4.4 | 5.7 | 3.7 | 3.1 | 3.0 | 3.0 | 3.6 |
| 7..... | 3.1 | 4.4 | 5.3 | 5.8 | 4.3 | 5.2 | 3.7 | 3.1 | 3.0 | 3.0 | 3.5 |
| 8..... | 3.0 | 4.4 | 5.1 | 5.6 | 4.3 | 5.0 | 3.7 | 3.1 | 3.0 | 3.0 | 3.4 |
| 9..... | 3.0 | 4.5 | 5.0 | 5.4 | 4.3 | 4.8 | 3.6 | 3.1 | 3.0 | 3.0 | 3.3 |
| 10..... | 3.0 | 4.6 | 4.9 | 5.5 | 4.3 | 4.7 | 3.6 | 3.1 | 3.0 | 3.0 | 3.3 |
| 11..... | 3.0 | 4.7 | 4.8 | 5.7 | 4.4 | 4.6 | 3.6 | 3.1 | 3.0 | 3.0 | 3.3 |
| 12..... | 3.9 | 4.5 | 7.55 | 5.4 | 4.4 | 4.7 | 3.5 | 3.1 | 3.0 | 3.0 | 3.3 |
| 13..... | 10.35 | 4.5 | 6.3 | 5.2 | 4.3 | 4.5 | 3.5 | 3.0 | 3.0 | 3.1 | 3.3 |
| 14..... | 6.8 | 4.4 | 7.6 | 5.1 | 4.2 | 4.5 | 3.5 | 3.0 | 3.1 | 3.1 | 3.3 |
| 15..... | 10.5 | 6.4 | 8.7 | 5.0 | 4.6 | 4.4 | 3.4 | 3.0 | 3.1 | 3.0 | 3.3 |
| 16..... | 11.65 | 5.4 | 6.6 | 5.0 | 4.3 | 4.9 | 3.4 | 3.0 | 3.1 | 3.0 | 3.4 |
| 17..... | 8.5 | 5.1 | 6.1 | 4.9 | 4.2 | 4.5 | 3.4 | 3.1 | 3.1 | 3.1 | 3.3 |
| 18..... | 14.55 | 4.9 | 5.7 | 4.9 | 4.2 | 4.4 | 3.3 | 3.0 | 3.1 | 3.1 | 3.3 |
| 19..... | 12.25 | 6.9 | 5.4 | 4.8 | 4.1 | 4.3 | 3.3 | 3.0 | 3.1 | 3.1 | 3.3 |
| 20..... | 9.5 | 5.9 | 5.2 | 4.8 | 4.1 | 4.3 | 3.3 | 3.0 | 3.1 | 3.1 | 3.3 |
| 21..... | 6.5 | 7.7 | 5.7 | 4.8 | 4.1 | 4.2 | 3.3 | 3.0 | 3.0 | 3.1 | 3.3 |
| 22..... | 6.0 | 6.7 | 7.2 | 4.7 | 4.1 | 4.2 | 3.3 | 3.0 | 3.0 | 3.1 | 3.3 |
| 23..... | 5.7 | 7.3 | 6.8 | 4.75 | 4.0 | 4.2 | 3.2 | 3.0 | 3.0 | 3.1 | 3.3 |
| 24..... | 5.4 | 6.5 | 11.7 | 4.85 | 4.0 | 4.2 | 3.3 | 3.0 | 3.1 | 3.1 | 3.3 |
| 25..... | 5.2 | 6.9 | 10.5 | 5.1 | 4.45 | 4.1 | 3.3 | 3.0 | 3.1 | 3.1 | 3.3 |
| 26..... | 5.0 | 6.1 | 12.3 | 4.8 | 5.6 | 4.1 | 3.2 | 3.0 | 3.1 | 3.1 | 3.2 |
| 27..... | 4.9 | 6.55 | 8.3 | 4.9 | 6.85 | 4.1 | 3.2 | 3.0 | 3.1 | 3.1 | 3.2 |
| 28..... | 4.8 | 7.0 | 7.2 | 5.0 | 8.65 | 4.1 | 3.2 | 3.0 | 3.1 | 3.1 | 3.3 |
| 29..... | 4.7 | ----- | 6.8 | 4.7 | 6.6 | 4.0 | 3.2 | 3.0 | 3.1 | 3.0 | 3.3 |
| 30..... | 4.7 | ----- | 7.4 | 4.7 | 5.9 | 4.0 | 3.2 | 3.0 | 3.1 | 3.1 | 3.3 |
| 31..... | 4.6 | ----- | 15.25 | ----- | 5.4 | ----- | 3.2 | 3.0 | ----- | 3.1 | ----- |

Rating table for Bear River above Wheatland, Cal., for 1904-1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 3.00 | 20 | 4.10 | 328 | 5.20 | 1,015 | 6.60 | 2,640 | 8.80 | 6,640 |
| 3.10 | 33 | 4.20 | 375 | 5.30 | 1,105 | 6.80 | 2,935 | 9.00 | 7,060 |
| 3.20 | 49 | 4.30 | 425 | 5.40 | 1,200 | 7.00 | 3,250 | 10.00 | 9,160 |
| 3.30 | 69 | 4.40 | 475 | 5.50 | 1,300 | 7.20 | 3,575 | 11.00 | 11,360 |
| 3.40 | 92 | 4.50 | 530 | 5.60 | 1,405 | 7.40 | 3,910 | 12.00 | 13,660 |
| 3.50 | 118 | 4.60 | 585 | 5.70 | 1,515 | 7.60 | 4,265 | 13.00 | 15,960 |
| 3.60 | 146 | 4.70 | 645 | 5.80 | 1,625 | 7.80 | 4,635 | 14.00 | 18,360 |
| 3.70 | 177 | 4.80 | 710 | 5.90 | 1,740 | 8.00 | 5,020 | | |
| 3.80 | 210 | 4.90 | 780 | 6.00 | 1,860 | 8.20 | 5,410 | | |
| 3.90 | 246 | 5.00 | 855 | 6.20 | 2,105 | 8.40 | 5,810 | | |
| 4.00 | 285 | 5.10 | 930 | 6.40 | 2,365 | 8.60 | 6,220 | | |

NOTE.—This table is based on discharge measurements made during 1904-1906 and is well defined between gage heights 3.1 feet and 5.1 feet.

Monthly discharge of Bear River above Wheatland, Cal., for 1906.

[Drainage area, 263 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 19,700 | 20 | 3,130 | 192,000 | 11.90 | 13.72 |
| February..... | 4,450 | 475 | 1,500 | 83,300 | 5.70 | 5.94 |
| March..... | 21,400 | 710 | 3,970 | 244,000 | 15.10 | 17.41 |
| April..... | 6,430 | 645 | 1,390 | 82,700 | 5.28 | 5.89 |
| May..... | 6,320 | 285 | 870 | 53,500 | 3.31 | 3.82 |
| June..... | 1,860 | 285 | 644 | 38,300 | 2.45 | 2.73 |
| July..... | 246 | 49 | 113 | 6,950 | .430 | .50 |
| August..... | 49 | 20 | 26.5 | 1,630 | .101 | .12 |
| September..... | 33 | 20 | 26.1 | 1,550 | .099 | .11 |
| October..... | 33 | 20 | 26.7 | 1,640 | .102 | .12 |
| November..... | 502 | 33 | 90.7 | 5,400 | .345 | .38 |
| December..... | 13,400 | 69 | 1,770 | 109,000 | 6.73 | 7.76 |
| The year..... | 21,400 | 20 | 1,130 | 820,000 | 4.29 | 58.50 |

NOTE.—These values are fair.

AMERICAN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

American River drains an area of about 2,000 square miles of the western slope of the Sierra Nevada. This drainage basin lies between those of the Bear and Yuba rivers on the north and that of Consumnes River on the south. It has three main forks, heading in the summit of the range, which reaches an elevation of about 9,000 feet. The country lying between these main forks is drained by numerous small tributaries. The formation in the higher and greater portions of this basin is of granite, with a considerable timber growth. The flow is rather torrential during the winter months, due to the large area of barren and sparsely timbered country in the lower portion of the watershed. The precipitation on the higher elevations is in the form of snow, which usually melts late in the spring. Rainfall records have been kept along the line of the Central Pacific Railroad, which follows the ridge to the north of North Fork.

The mean annual rainfall at Auburn is 33.40 inches, that at Colusa 47.4 inches, and at Cisco and Emigrant Gap about 50 inches. Georgetown, between North and Middle forks, a 30-year record shows an average of 56.72 inches, and at Placerville, above South Fork, another of about the same length shows 43.58 inches.

There are several small lakes in the upper reaches of this basin, the capacity of a few having been increased by the construction of dams at their outlets. Their water is stored for mining purposes during the low-water flow and is used entirely within the drainage basin.

AMERICAN RIVER NEAR FAIROAKS, CAL.

This station was established November 3, 1904, at Fair Oaks Bridge near Fair Oaks. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 176, where are also given references to publications that contain data for previous years.

Discharge measurements of American River near Fair Oaks, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|------------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec. ft.</i> |
| February 13.... | F. R. S. Buttemer..... | 300 | 1,400 | 3.66 | |
| March 3..... | do..... | 352 | 2,180 | 5.95 | |
| April 6..... | R. S. Hawley..... | 360 | 2,490 | 7.30 | |
| April 13..... | W. C. Sawyer..... | 376 | 2,580 | 7.26 | |
| April 23..... | do..... | 367 | 2,940 | 8.54 | |
| April 30..... | do..... | 352 | 2,450 | 7.24 | |
| April 30..... | do..... | 352 | 2,390 | 7.15 | |
| May 21..... | do..... | 354 | 2,640 | 7.80 | |
| May 21..... | do..... | 354 | 2,680 | 7.90 | |
| June 11..... | do..... | 370 | 3,510 | 10.50 | |
| June 18..... | do..... | 360 | 3,000 | 9.00 | |
| June 26..... | do..... | 369 | 2,770 | 8.35 | |
| July 7..... | do..... | 366 | 2,620 | 7.90 | |
| July 16..... | do..... | 354 | 1,730 | 5.40 | |
| July 27..... | do..... | 345 | 1,260 | 4.00 | |
| August 8..... | Sawyer and Martin..... | 248 | 854 | 2.68 | |
| September 3..... | W. F. Martin..... | 210 | 648 | 1.75 | |
| November 26..... | do..... | 205 | 620 | 1.64 | |
| November 27..... | R. S. Hawley..... | 206 | 569 | 1.45 | |

Daily gage height, in feet, of American River near Fair Oaks, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|------|-------|-------|-------|-------|-------|------|-------|------|------|
| 1..... | 1.5 | 3.65 | 6.8 | 10.4 | 7.6 | 9.1 | 7.45 | 3.35 | 1.8 | 1.3 | 1.35 |
| 2..... | 1.4 | 3.55 | 6.4 | 9.6 | 8.45 | 9.45 | 8.35 | 3.15 | 1.75 | 1.4 | 1.4 |
| 3..... | 1.4 | 3.7 | 7.9 | 8.8 | 8.45 | 10.3 | 8.25 | 3.2 | 1.8 | 1.35 | 1.55 |
| 4..... | 1.5 | 3.6 | 7.65 | 8.25 | 9.2 | 9.75 | 8.0 | 3.1 | 1.7 | 1.3 | 1.95 |
| 5..... | 1.2 | 3.65 | 6.3 | 7.4 | 10.4 | 9.1 | 8.15 | 2.95 | 1.8 | 1.3 | 3.4 |
| 6..... | 1.2 | 3.75 | 5.95 | 7.1 | 9.85 | 8.7 | 7.4 | 2.75 | 1.65 | 1.3 | 2.75 |
| 7..... | 1.5 | 3.7 | 5.95 | 7.15 | 10.3 | 9.0 | 7.25 | 2.7 | 1.6 | 1.3 | 2.25 |
| 8..... | 1.2 | 3.75 | 5.95 | 7.6 | 10.25 | 9.25 | 7.05 | 2.75 | 1.6 | 1.3 | 1.9 |
| 9..... | 1.4 | 3.8 | 6.1 | 7.35 | 9.6 | 9.25 | 6.9 | 2.7 | 1.6 | 1.3 | 1.75 |
| 10..... | 1.2 | 4.1 | 6.15 | 7.65 | 9.75 | 9.75 | 6.2 | 2.65 | 1.5 | 1.3 | 1.6 |
| 11..... | 1.4 | 3.85 | 6.45 | ----- | 10.1 | 10.8 | 6.0 | 2.7 | 1.5 | 1.3 | 1.6 |
| 12..... | 1.75 | 3.7 | 9.25 | ----- | 9.85 | 11.0 | 5.85 | 2.7 | 1.5 | 1.25 | 1.55 |
| 13..... | 5.85 | 3.75 | 9.7 | 7.2 | 8.7 | 9.95 | 5.8 | 2.45 | 1.5 | 1.2 | 1.6 |
| 14..... | 8.35 | 4.2 | 12.85 | 7.2 | 8.0 | 9.1 | 5.9 | 2.4 | 1.5 | 1.25 | 1.6 |
| 15..... | 6.75 | 6.05 | 11.35 | 7.65 | 8.05 | 8.9 | 5.65 | 2.4 | 1.6 | 1.2 | 1.6 |

Daily gage height, in feet, of American River near Fair Oaks, Cal., for 1906—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|-------|------|-------|------|-------|-------|-------|------|-------|------|------|------|
| 16..... | 9.3 | 6.05 | 8.85 | 8.0 | 7.75 | 9.8 | 5.45 | 2.25 | 1.7 | 1.2 | 1.7 | 2.85 |
| 17..... | 10.55 | 6.0 | 8.3 | 8.0 | 7.5 | 9.85 | 5.3 | 2.2 | 1.6 | 1.25 | 1.8 | 2.65 |
| 18..... | 15.45 | 5.3 | 6.65 | 8.1 | 7.7 | 9.45 | 5.0 | 2.15 | 1.5 | 1.2 | 1.7 | 2.55 |
| 19..... | 15.5 | 8.35 | 6.2 | 7.85 | 7.35 | 8.25 | 4.8 | 2.1 | 1.5 | 1.25 | 1.6 | 2.5 |
| 20..... | 9.85 | 6.6 | 6.0 | 7.7 | 7.25 | 8.8 | 4.6 | 2.1 | 1.4 | 1.3 | 1.6 | 2.45 |
| 21..... | 6.85 | 9.35 | 6.0 | 7.6 | 7.7 | 9.7 | 4.6 | 2.1 | 1.4 | 1.3 | 1.6 | 2.4 |
| 22..... | 6.25 | 8.35 | 8.1 | 8.2 | 7.6 | 10.25 | 4.4 | 2.15 | 1.3 | 1.3 | 1.6 | 2.8 |
| 23..... | 5.2 | 7.0 | 9.95 | 8.7 | 7.4 | 10.25 | 4.35 | 2.1 | 1.3 | 1.3 | 1.6 | 3.65 |
| 24..... | 5.05 | 6.65 | 13.35 | 8.5 | 7.15 | 9.4 | 4.35 | 2.0 | 1.3 | 1.3 | 1.6 | 3.55 |
| 25..... | 4.9 | 7.0 | 12.65 | 7.95 | 7.1 | 8.35 | 4.4 | 2.0 | 1.35 | 1.3 | 1.6 | 5.7 |
| 26..... | 4.4 | 6.5 | 12.00 | 7.65 | 9.75 | 8.1 | 4.35 | 1.85 | 1.3 | 1.3 | 1.6 | 9.95 |
| 27..... | 4.05 | 6.5 | 10.45 | 8.3 | 9.7 | 7.1 | 4.15 | 1.9 | 1.35 | 1.3 | 1.5 | 9.45 |
| 28..... | 4.25 | 7.8 | 9.15 | 8.45 | 11.75 | 6.85 | 3.95 | 1.7 | 1.4 | 1.35 | 1.5 | 6.25 |
| 29..... | 4.0 | | 7.85 | 8.2 | 11.25 | 6.85 | 3.95 | 1.7 | 1.3 | 1.4 | 1.5 | 5.15 |
| 30..... | 3.7 | | 8.45 | 7.6 | 8.85 | 6.65 | 3.7 | 1.7 | 1.35 | 1.35 | 1.5 | 5.5 |
| 31..... | 3.65 | | 9.25 | | 8.6 | | 3.5 | 1.75 | | 1.4 | | 5.8 |

Rating table for American River near Fair Oaks, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1.20 | 300 | 2.30 | 910 | 3.40 | 1,980 | 5.00 | 4,380 | 8.00 | 12,100 |
| 1.30 | 340 | 2.40 | 990 | 3.50 | 2,090 | 5.20 | 4,780 | 9.00 | 15,380 |
| 1.40 | 380 | 2.50 | 1,070 | 3.60 | 2,200 | 5.40 | 5,180 | 10.00 | 18,980 |
| 1.50 | 420 | 2.60 | 1,160 | 3.70 | 2,310 | 5.60 | 5,600 | 11.00 | 22,900 |
| 1.60 | 470 | 2.70 | 1,250 | 3.80 | 2,420 | 5.80 | 6,040 | 12.00 | 27,100 |
| 1.70 | 520 | 2.80 | 1,350 | 3.90 | 2,540 | 6.00 | 6,540 | 13.00 | 31,300 |
| 1.80 | 570 | 2.90 | 1,450 | 4.00 | 2,660 | 6.20 | 7,060 | 14.00 | 35,500 |
| 1.90 | 630 | 3.00 | 1,550 | 4.20 | 2,920 | 6.40 | 7,580 | 15.00 | 39,700 |
| 2.00 | 690 | 3.10 | 1,650 | 4.40 | 3,260 | 6.60 | 8,100 | 16.00 | 43,900 |
| 2.10 | 760 | 3.20 | 1,760 | 4.60 | 3,600 | 6.80 | 8,620 | | |
| 2.20 | 830 | 3.30 | 1,870 | 4.80 | 3,980 | 7.00 | 9,140 | | |

NOTE.—This table is based on 19 discharge measurements made during 1906, and is well defined between gage heights 1.4 feet and 10.5 feet.

Monthly discharge of American River near Fair Oaks, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|---------------------|---------------------|
| | Maximum | Minimum. | Mean. | |
| January..... | 41,800 | 300 | 7,010 | 431,000 |
| February..... | 16,600 | 2,140 | 5,830 | 324,000 |
| March..... | 32,800 | 6,410 | 13,900 | 855,000 |
| April..... | 20,500 | 9,420 | ^a 12,100 | 720,000 |
| May..... | 26,000 | 9,420 | 15,000 | 922,000 |
| June..... | 22,900 | 8,230 | 15,900 | 946,000 |
| July..... | 13,200 | 2,090 | 6,180 | 380,000 |
| August..... | 1,920 | 520 | 1,010 | 62,100 |
| September..... | 570 | 340 | 433 | 25,800 |
| October..... | 380 | 300 | 338 | 20,800 |
| November..... | 1,980 | 360 | 567 | 33,700 |
| December..... | 19,900 | 420 | 3,900 | 240,000 |
| The year..... | 41,800 | 300 | 6,850 | 4,900,000 |

^a Discharge for April 11 and 12 interpolated.

NOTE.—These values are excellent.

SAN JOAQUIN RIVER DRAINAGE BASIN.**DESCRIPTION OF BASIN.**

San Joaquin River is divided into two distinct parts. The valley portion forms the central drainage line of the San Joaquin Valley and during the spring is navigable for 100 miles or more. Stanislaus, Tuolumne, Merced, and Kings rivers are the largest streams in this portion of the drainage basin. The waters of Kings, Kaweah, Tule, and Kern rivers, which are located in the portion of the San Joaquin Valley south and east of Fresno, although forming a portion of the drainage of San Joaquin River, seldom reach this stream; their entire flow, except in extreme flood, being diverted and used for irrigation at points where they emerge from the foothills. The valley is fertile and almost destitute of timber. The mountain portion of the stream drains the western slope of the Sierra Nevada between Merced River on the north and Kings River on the south, the crest of its divide reaching an elevation of 13,000 feet in Mount Lyell and an elevation of 14,000 feet in Mount Goddard. There are numerous tributaries in this portion of the drainage basin, many of which have their source in the high elevations. The formation is of granite, which in the upper reaches is bare and sharply marked by glacial action. The middle reaches of the basin are well timbered, the timber diminishing on the lower foothills, which have a covering of brush and grass. The precipitation takes the form of snow on the higher elevations. The fall of the river is rapid, with many favorable locations for power development. There are numerous lakes in the upper reaches of the basin. A storage reservoir has been constructed on North Fork, which will tend to further regulate the flow of the river.

MAIN SAN JOAQUIN RIVER.**SAN JOAQUIN RIVER AT HERNDON, CAL.**

The gage rod at this station was established by the engineering department of the Southern Pacific Railroad Company in 1889. The old trestle bridge was torn down by the railroad company during 1899 and a new iron structure was erected in its place. The conditions at this station and the bench marks are described in Water Supply Paper No. 177, page 184, where are given also references to publications that contain data for previous years.

Daily gage height, in feet, of San Joaquin River at Herndon, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|------|------|-------|------|-------|-------|-------|-------|------|-------|------|-------|------|
| 1. | 2.65 | 3.25 | 4.2 | 8.5 | 6.4 | 8.4 | 10.5 | 8.2 | 4.35 | 3.2 | 3.0 | 2.6 |
| 2. | 2.65 | 3.25 | 3.75 | 7.0 | 6.75 | 8.25 | 11.25 | 7.65 | 4.35 | 3.2 | 3.0 | 2.6 |
| 3. | 2.65 | 3.1 | 3.75 | 6.65 | 7.5 | 8.5 | 11.4 | 7.2 | 4.35 | 3.2 | 3.0 | 2.6 |
| 4. | 2.65 | 3.1 | 5.6 | 6.5 | 8.35 | 8.75 | 12.5 | 7.0 | 4.25 | 3.2 | 3.0 | 2.5 |
| 5. | 2.65 | 3.1 | 4.5 | 6.35 | 8.5 | 8.65 | 12.25 | 7.0 | 4.25 | 3.2 | 3.0 | 2.5 |
| 6. | 2.65 | 3.1 | 4.25 | 5.75 | 9.4 | 9.35 | 12.0 | 7.0 | 4.25 | 3.2 | 3.0 | 2.5 |
| 7. | 2.65 | 3.1 | 4.1 | 5.65 | 9.65 | 8.5 | 12.0 | 6.65 | 4.2 | 3.1 | 3.0 | 2.5 |
| 8. | 2.65 | 3.1 | 4.0 | 5.65 | 10.0 | 9.0 | 11.75 | 6.6 | 4.2 | 3.1 | 3.0 | 2.5 |
| 9. | 2.65 | 3.1 | 4.2 | 6.0 | 9.75 | 10.25 | 11.65 | 6.6 | 4.2 | 3.1 | 3.0 | 2.5 |
| 10. | 2.65 | 3.0 | 4.25 | 6.5 | 11.0 | 11.0 | 11.0 | 6.4 | 4.0 | 3.1 | 3.0 | 2.5 |
| 11. | 2.65 | 3.0 | 4.25 | 7.35 | 12.35 | 11.5 | 10.65 | 6.25 | 4.0 | 3.1 | 3.0 | 2.5 |
| 12. | 2.65 | 3.0 | 6.75 | 6.65 | 12.0 | 12.5 | 11.0 | 6.25 | 3.65 | 3.1 | 3.0 | 2.5 |
| 13. | 2.65 | 3.0 | 6.35 | 6.65 | 11.25 | 12.75 | 10.65 | 6.5 | 3.65 | 3.1 | 3.0 | 3.0 |
| 14. | 10.5 | 3.25 | 6.0 | 6.4 | 10.2 | 11.75 | 10.65 | 6.5 | 3.6 | 3.1 | 3.0 | 3.5 |
| 15. | 6.5 | 3.4 | 10.0 | 6.65 | 9.65 | 11.5 | 10.65 | 6.4 | 3.5 | 3.1 | 3.0 | 3.25 |
| 16. | 4.9 | 3.4 | 8.5 | 6.65 | 9.0 | 12.0 | 10.5 | 6.2 | 3.5 | 3.1 | 3.0 | 3.25 |
| 17. | 4.0 | 3.65 | 7.2 | 6.65 | 9.25 | 13.0 | 10.5 | 6.2 | 3.5 | 3.1 | 3.0 | 3.1 |
| 18. | 4.0 | 4.2 | 7.0 | 7.0 | 9.5 | 12.0 | 10.5 | 6.1 | 3.4 | 3.0 | 3.0 | 3.0 |
| 19. | 13.0 | 4.2 | 6.0 | 7.5 | 10.4 | 12.35 | 10.0 | 6.1 | 3.4 | 3.0 | 3.0 | 3.0 |
| 20. | 9.0 | 4.1 | 6.0 | 8.2 | 10.5 | 13.2 | 9.65 | 6.0 | 3.35 | 3.0 | 3.0 | 3.0 |
| 21. | 7.35 | 4.0 | 6.0 | 8.0 | 10.65 | 14.35 | 9.5 | 6.0 | 3.35 | 3.0 | 3.0 | 3.0 |
| 22. | 5.2 | 4.0 | 6.35 | 8.4 | 10.0 | 13.65 | 9.5 | 6.0 | 3.35 | 3.0 | 3.0 | 3.0 |
| 23. | 4.5 | 4.2 | 9.00 | 10.0 | 10.35 | 13.0 | 9.75 | 5.65 | 3.35 | 3.0 | 3.0 | 3.0 |
| 24. | 4.2 | 4.25 | 8.5 | 8.35 | 10.0 | 13.0 | 10.35 | 5.65 | 3.35 | 3.0 | 3.0 | 3.0 |
| 25. | 4.0 | 4.25 | 8.4 | 7.75 | 9.35 | 12.65 | 10.0 | 5.5 | 3.2 | 3.0 | 3.0 | 3.0 |
| 26. | 4.0 | 4.2 | 8.0 | 7.75 | 9.75 | 12.35 | 10.0 | 5.5 | 3.2 | 3.0 | 3.0 | 3.5 |
| 27. | 4.0 | 4.2 | 7.5 | 7.65 | 10.65 | 11.2 | 9.65 | 5.35 | 3.2 | 3.0 | 3.0 | 3.65 |
| 28. | 4.0 | 4.2 | 7.2 | 8.0 | 11.6 | 11.0 | 9.5 | 5.0 | 3.2 | 3.0 | 3.0 | 3.65 |
| 29. | 3.75 | ..... | 6.5 | 7.75 | 10.35 | 10.35 | 9.0 | 4.65 | 3.2 | 3.0 | 2.85 | 3.75 |
| 30. | 3.5 | ..... | 7.35 | 6.75 | 10.0 | 10.0 | 8.5 | 4.5 | 3.2 | 3.0 | 2.6 | 3.75 |
| 31. | 3.4 | ..... | 8.25 | ..... | 9.65 | ..... | 8.25 | 4.5 | ..... | 3.0 | ..... | 3.75 |

NOTE.—Gage heights have been reduced to feet and tenths from feet and inches as furnished by the Southern Pacific Railroad Company.

MISCELLANEOUS MEASUREMENT IN SAN JOAQUIN RIVER DRAINAGE BASIN.

The following measurement was made of San Joaquin River November 21, 1906, from the bridge at Polasky, Cal.:

Width, 133 feet; area, 194 square feet; discharge, 333 second-feet.

KERN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Kern River drains 2,345 square miles of the western slope of the Sierra Nevada at its extreme southern limits. This drainage basin is the largest of any stream discharging into the San Joaquin Valley, having an area 600 square miles greater than that of Kings River. It has its source in the highest elevations of the Sierra Nevada, draining the western and southern slopes of Mount Whitney and numerous other high granite peaks grouped about it, which reach elevations of over 14,000 feet. Its general direction is south for about 65 miles, when it turns and flows in a southwesterly direction, discharging into the San Joaquin Valley east of Bakersfield, Cal. Extending, as it

does in its upper reaches, for some distance parallel with the Sierra Nevada, it receives waters not only from the main crest on the east but also from a somewhat lower divide on the west behind the basins of the Kaweah and Tule rivers. It has numerous tributaries, the principal ones, which drain the higher elevations of the main crest of the Sierra Nevada, entering from the east. The topography is extremely rough and broken in the upper reaches of this basin, becoming less rugged in the middle portion in the vicinity of Kernville, where there is quite an extensive valley with considerable cultivated land; below this point the stream enters a rough canyon, finally discharging into the flat country of the San Joaquin Valley. The entire flow, except during extreme flood stages, is diverted and used for irrigation at points where streams emerge from the foothills.

The formation is of granite, which, above the 10,000-foot contour, is practically bare of timber growth. Between elevations of 3,000 and 10,000 feet there is a good depth of soil, with timber and brush covering; the lower reaches have a light covering of brush and grass.

There are several lakes and marshes scattered throughout the basin, but they are less numerous than in the basins farther to the north. Several power plants are located on this stream, none of which, however, receive water from storage reservoirs, the diversion being made from the natural flow of the river and again returned to the river channel. The precipitation is very light throughout the basin, with the possible exception of the high elevations surrounding Mount Whitney, where the snow remains through the summer months.

KERN RIVER NEAR BAKERSFIELD, CAL.

This station, established in 1893 by Walter James, chief engineer of the Kern County Land Company, is located at what is known as "first point of measurement," 5 miles above Bakersfield and at the mouth of the canyon of the river.

Regular meter measurements are taken, and an automatic gage records daily fluctuations of the river heights. A. K. Warren, engineer in charge of this work for the Kern County Land Company, attends to the discharge measurements with accuracy and precision and furnishes the Geological Survey with the final results. Information in regard to this station is contained in Water-Supply Papers Nos. 81, 85, 100, 134, and 177 of the United States Geological Survey.

Daily discharge, in second-feet, of Kern River near Bakersfield, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|
| 1..... | 242 | 529 | 854 | 2,980 | 2,846 | 5,416 | 7,369 | 3,552 | 1,522 | 697 | 546 | 518 |
| 2..... | 253 | 513 | 806 | 2,651 | 2,798 | 5,353 | 7,765 | 3,282 | 1,438 | 705 | 570 | 517 |
| 3..... | 230 | 506 | 779 | 2,424 | 2,986 | 5,306 | 8,251 | 3,236 | 1,369 | 695 | 566 | 542 |
| 4..... | 233 | 509 | 795 | 2,291 | 3,337 | 5,495 | 8,431 | 3,147 | 1,297 | 677 | 554 | 575 |
| 5..... | 241 | 529 | 842 | 2,172 | 3,786 | 5,964 | 8,246 | 2,953 | 1,255 | 680 | 550 | 545 |
| 6..... | 246 | 538 | 777 | 2,051 | 4,434 | 6,126 | 8,129 | 2,905 | 1,201 | 687 | 580 | 506 |
| 7..... | 253 | 560 | 765 | 2,010 | 4,608 | 5,788 | 7,973 | 2,880 | 1,167 | 622 | 555 | 530 |
| 8..... | 256 | 580 | 755 | 1,970 | 5,278 | 5,932 | 7,729 | 2,852 | 1,111 | 618 | 528 | 552 |
| 9..... | 260 | 646 | 785 | 2,135 | 6,097 | 6,311 | 7,607 | 2,769 | 1,064 | 634 | 539 | 587 |
| 10..... | 265 | 578 | 851 | 2,296 | 6,782 | 6,797 | 7,257 | 2,627 | 1,039 | 639 | 516 | 676 |
| 11..... | 269 | 589 | 896 | 2,302 | 6,624 | 7,213 | 7,176 | 2,536 | 1,030 | 645 | 499 | 675 |
| 12..... | 267 | 610 | 1,026 | 2,278 | 6,133 | 8,190 | 7,211 | 2,548 | 983 | 647 | 502 | 654 |
| 13..... | 272 | 568 | 1,996 | 2,336 | 5,687 | 8,829 | 7,072 | 2,473 | 938 | 649 | 518 | 677 |
| 14..... | 1,626 | 538 | 1,945 | 2,484 | 5,640 | 9,079 | 6,705 | 2,377 | 919 | 631 | 520 | 653 |
| 15..... | 1,828 | 574 | 1,716 | 2,635 | 5,886 | 9,072 | 6,628 | 2,276 | 916 | 612 | 529 | 601 |
| 16..... | 1,293 | 684 | 5,264 | 2,767 | 6,079 | 9,142 | 6,719 | 2,211 | 891 | 613 | 514 | 589 |
| 17..... | 890 | 701 | 5,527 | 2,898 | 6,055 | 9,004 | 6,603 | 2,215 | 883 | 592 | 462 | 587 |
| 18..... | 687 | 661 | 3,025 | 3,032 | 6,348 | 8,819 | 6,254 | 2,206 | 883 | 564 | 446 | 584 |
| 19..... | 1,370 | 646 | 2,106 | 3,178 | 6,868 | 8,993 | 6,093 | 2,097 | 839 | 554 | 476 | 562 |
| 20..... | 2,554 | 655 | 1,807 | 3,343 | 7,339 | 9,375 | 5,870 | 2,215 | 807 | 555 | 468 | 556 |
| 21..... | 1,145 | 717 | 1,725 | 3,597 | 7,443 | 9,505 | 5,439 | 2,192 | 809 | 564 | 433 | 552 |
| 22..... | 931 | 785 | 1,854 | 3,911 | 7,381 | 9,505 | 4,997 | 2,071 | 806 | 560 | 450 | 560 |
| 23..... | 807 | 739 | 1,978 | 4,135 | 7,025 | 9,311 | 5,648 | 1,840 | 788 | 558 | 474 | 556 |
| 24..... | 746 | 681 | 2,284 | 4,255 | 6,492 | 9,107 | 5,920 | 1,662 | 785 | 564 | 462 | 550 |
| 25..... | 698 | 665 | 3,417 | 3,853 | 6,184 | 8,948 | 5,595 | 1,540 | 781 | 559 | 440 | 562 |
| 26..... | 666 | 710 | 3,983 | 3,698 | 7,660 | 8,668 | 5,347 | 1,446 | 777 | 562 | 446 | 592 |
| 27..... | 643 | 735 | 4,150 | 3,598 | 7,832 | 8,187 | 5,392 | 1,405 | 755 | 568 | 478 | 948 |
| 28..... | 616 | 773 | 3,195 | 3,692 | 7,420 | 7,529 | 5,269 | 1,435 | 731 | 557 | 479 | 914 |
| 29..... | 602 | ..... | 2,701 | 3,347 | 6,825 | 7,143 | 4,659 | 1,467 | 715 | 553 | 487 | 802 |
| 30..... | 551 | ..... | 2,527 | 2,973 | 6,102 | 7,010 | 4,311 | 1,434 | 704 | 564 | 502 | 732 |
| 31..... | 548 | ..... | 2,818 | ..... | 5,646 | ..... | 3,925 | 1,431 | ..... | 565 | ..... | 697 |

Monthly discharge of Kern River near Bakersfield, Cal., for 1906.

[Drainage area, 2,345 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|------------------------|---------------------------|---------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 2,554 | 230 | 693 | 42,600 | 0.296 | 0.34 |
| February..... | 785 | 506 | 626 | 34,800 | .267 | .28 |
| March..... | 5,527 | 755 | 2,063 | 127,000 | .880 | 1.01 |
| April..... | 4,255 | 1,970 | 2,910 | 173,000 | 1.24 | 1.38 |
| May..... | 7,832 | 2,798 | 5,859 | 360,000 | 2.50 | 2.88 |
| June..... | 9,505 | 5,306 | 7,704 | 458,000 | 3.29 | 3.67 |
| July..... | 8,431 | 3,925 | 6,503 | 400,000 | 2.77 | 3.19 |
| August..... | 3,552 | 1,405 | 2,299 | 141,000 | .980 | 1.13 |
| September..... | 1,522 | 704 | 973 | 57,900 | .415 | .46 |
| October..... | 705 | 553 | 609 | 37,400 | .260 | .30 |
| November..... | 580 | 433 | 503 | 29,900 | .215 | .24 |
| December..... | 948 | 506 | 618 | 38,000 | .264 | .30 |
| The year..... | 9,505 | 230 | 2,613 | 1,900,000 | 1.11 | 15.18 |

TULE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Tule River rises in the Sierra Nevada, and drains the country between Kaweah River on the north and Kern River on the south and east. Its drainage area is much less than that of Keweah River,

although of the same general character. It has numerous small tributaries, few of which have their source at elevations above 8,000 feet. Its drainage basin does not extend back to the main divide, being cut off by Kern River, which reaches to the north and drains the higher portion of Sierra Nevada east of Tule River. There is good timber and brush covering on the higher and middle elevations, with grass and scattering timber on the lower elevations, where the soil is extensively cultivated. Below the gaging station the water is diverted by several canals and used for the irrigation of land in the vicinity of Portersville, where it is especially adapted for the raising of citrus fruits. During the flood period the water discharges through the old channel, and either sinks in the sand or finds its way to the bed of Tulare Lake. The mean precipitation is probably not more than 20 inches, and falls principally in the form of rain.

TULE RIVER NEAR PORTERSVILLE, CAL.

This station was established April 8, 1901. It is located about 10 miles east of Portersville, near the McFarland ranch, 100 feet below the wagon bridge and about 1 mile above the mouth of South Fork of Tule River. The conditions at this station and the bench marks described in Water-Supply Paper No. 177, page 189, where are given are also references to publications that contain data for previous years.

Discharge measurements of Tule River near Portersville, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-------------------|-------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec. ft.</i> |
| February 15..... | C. H. Lee..... | 76 | 144 | 3.02 | |
| March 28..... | do..... | 83 | 206 | 4.42 | |
| May 10..... | do..... | 80 | 264 | 4.20 | |
| May 24..... | R. S. Hawley..... | 80 | 211 | 3.62 | |
| May 26..... | C. H. Lee..... | 159 | 607 | 6.75 | |
| June 1..... | do..... | 88 | 287 | 4.65 | |
| June 8..... | do..... | 84 | 251 | 4.10 | |
| June 22..... | R. S. Hawley..... | 86 | 278 | 4.40 | |
| July 20..... | do..... | 73 | 132 | 2.65 | |
| July 26..... | C. H. Lee..... | 69 | 112 | 2.30 | |
| September 27..... | R. S. Hawley..... | 59 | 46 | 1.40 | |
| November 15..... | do..... | 58 | 47 | 1.40 | |
| November 24..... | do..... | 58 | 47 | 1.44 | |

Daily gage height, in feet, of Tule River near Portersville, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|
| 1..... | 2.1 | 2.0 | 2.4 | 4.8 | 3.6 | 4.6 | 3.7 | 2.05 | 1.5 | 1.3 | 1.4 |
| 2..... | 2.07 | 2.0 | 2.4 | 4.6 | 3.6 | 4.6 | 3.8 | 2.0 | 1.5 | 1.3 | 1.4 |
| 3..... | 2.0 | 2.0 | 2.4 | 4.0 | 3.7 | 4.4 | 3.7 | 1.95 | 1.5 | 1.3 | 1.4 |
| 4..... | 1.9 | 2.0 | 3.6 | 3.8 | 3.8 | 4.2 | 3.6 | 1.95 | 1.45 | 1.3 | 1.4 |
| 5..... | 1.9 | 2.0 | 3.2 | 3.8 | 4.0 | 4.1 | 3.5 | 1.9 | 1.45 | 1.3 | 1.4 |
| 6..... | 1.9 | 2.0 | 3.1 | 4.4 | 3.9 | 4.0 | 3.55 | 1.9 | 1.45 | 1.3 | 1.4 |
| 7..... | 1.87 | 2.0 | 3.0 | 4.0 | 3.9 | 4.0 | 3.5 | 1.85 | 1.45 | 1.3 | 1.4 |
| 8..... | 1.85 | 2.2 | 2.9 | 3.6 | 4.1 | 4.1 | 3.2 | 1.85 | 1.45 | 1.3 | 1.4 |
| 9..... | 1.83 | 2.15 | 2.8 | 3.6 | 4.1 | 4.2 | 3.2 | 1.8 | 1.4 | 1.3 | 1.4 |
| 10..... | 1.8 | 2.1 | 2.7 | 3.8 | 4.4 | 4.3 | 3.15 | 1.8 | 1.4 | 1.3 | 1.4 |

Daily gage height, in feet, of Tule River near Portersville, Cal., for 1906—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|------|-------|------|
| 11..... | 1.8 | 2.05 | 2.7 | 3.8 | 4.4 | 4.4 | 3.1 | 1.8 | 1.4 | 1.3 | 1.4 | 2.6 |
| 12..... | 2.0 | 2.0 | 6.6 | 3.6 | 4.5 | 4.5 | 3.0 | 1.75 | 1.4 | 1.3 | 1.4 | 2.4 |
| 13..... | 5.65 | 2.0 | 5.7 | 3.6 | 4.25 | 4.4 | 2.9 | 1.7 | 1.4 | 1.3 | 1.4 | 2.0 |
| 14..... | 7.35 | 2.0 | 4.2 | 3.6 | 4.0 | 4.3 | 2.85 | 1.7 | 1.4 | 1.3 | 1.4 | 1.8 |
| 15..... | 3.85 | 3.1 | 8.35 | 3.6 | 4.0 | 4.35 | 2.8 | 1.65 | 1.4 | 1.3 | 1.4 | 1.5 |
| 16..... | 3.3 | 2.8 | 8.5 | 3.6 | 4.1 | 4.3 | 2.75 | 1.65 | 1.4 | 1.3 | 1.4 | 1.65 |
| 17..... | 3.0 | 2.7 | 7.0 | 3.6 | 4.1 | 4.35 | 2.75 | 1.6 | 1.4 | 1.3 | 1.4 | 1.65 |
| 18..... | 2.8 | 2.6 | 5.0 | 3.6 | 4.1 | 4.3 | 2.7 | 1.6 | 1.35 | 1.3 | 1.4 | 1.65 |
| 19..... | 7.0 | 2.5 | 4.5 | 3.6 | 4.1 | 4.35 | 2.7 | 1.6 | 1.35 | 1.3 | 1.4 | 1.65 |
| 20..... | 4.1 | 2.5 | 4.2 | 3.7 | 4.0 | 4.35 | 2.65 | 1.55 | 1.35 | 1.3 | 1.45 | 1.65 |
| 21..... | 3.3 | 2.7 | 4.2 | 3.8 | 3.9 | 4.3 | 2.6 | 1.55 | 1.35 | 1.3 | 1.45 | 1.65 |
| 22..... | 2.9 | 2.65 | 4.2 | 4.0 | 3.8 | 4.4 | 2.5 | 1.55 | 1.35 | 1.3 | 1.45 | 1.65 |
| 23..... | 2.7 | 2.6 | 4.2 | 4.25 | 3.7 | 4.3 | 2.45 | 1.55 | 1.35 | 1.35 | 1.45 | 1.65 |
| 24..... | 2.5 | 2.5 | 5.4 | 4.0 | 3.65 | 4.2 | 2.4 | 1.55 | 1.4 | 1.35 | 1.45 | 1.65 |
| 25..... | 2.4 | 2.45 | 6.0 | 3.7 | 3.6 | 4.0 | 2.35 | 1.55 | 1.45 | 1.35 | 1.45 | 1.65 |
| 26..... | 2.3 | 2.4 | 7.25 | 3.6 | 6.4 | 3.95 | 2.3 | 1.55 | 1.4 | 1.35 | 1.45 | 2.3 |
| 27..... | 2.2 | 2.4 | 5.2 | 3.4 | 6.55 | 3.9 | 2.25 | 1.5 | 1.4 | 1.35 | 1.45 | 2.1 |
| 28..... | 2.15 | 2.4 | 4.5 | 4.6 | 6.5 | 3.7 | 2.25 | 1.5 | 1.35 | 1.35 | 1.45 | 2.0 |
| 29..... | 2.1 | ..... | 4.3 | 3.8 | 5.4 | 3.7 | 2.2 | 1.5 | 1.35 | 1.35 | 1.45 | 1.95 |
| 30..... | 2.05 | ..... | 4.3 | 3.7 | 5.0 | 3.7 | 2.15 | 1.5 | 1.3 | 1.35 | 1.45 | 1.9 |
| 31..... | 2.03 | ..... | 5.4 | ..... | 4.7 | ..... | 2.1 | 1.5 | ..... | 1.35 | ..... | 1.9 |

Rating table for Tule River near Portersville, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 1.30 | 37 | 2.20 | 170 | 3.10 | 420 | 4.00 | 840 | 5.80 | 2,140 |
| 1.40 | 47 | 2.30 | 190 | 3.20 | 460 | 4.20 | 960 | 6.00 | 2,300 |
| 1.50 | 58 | 2.40 | 210 | 3.30 | 500 | 4.40 | 1,090 | 6.20 | 2,460 |
| 1.60 | 70 | 2.50 | 235 | 3.40 | 540 | 4.60 | 1,230 | 6.40 | 2,640 |
| 1.70 | 83 | 2.60 | 260 | 3.50 | 580 | 4.80 | 1,370 | 6.60 | 2,820 |
| 1.80 | 98 | 2.70 | 285 | 3.60 | 630 | 5.00 | 1,510 | 6.80 | 3,000 |
| 1.90 | 115 | 2.80 | 315 | 3.70 | 680 | 5.20 | 1,660 | 7.00 | 3,180 |
| 2.00 | 132 | 2.90 | 345 | 3.80 | 730 | 5.40 | 1,820 | 8.00 | 4,080 |
| 2.10 | 150 | 3.00 | 380 | 3.90 | 780 | 5.60 | 1,980 | 9.00 | 4,980 |

NOTE.—This table is based on discharge measurements made during 1904–1906, and is well defined between gage heights 2.2 feet and 6.7 feet.

Monthly discharge of Tule River near Portersville, Cal., for 1906.

[Drainage area, 437 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 3,500 | 98 | 500 | 30,700 | 1.14 | 1.31 |
| February..... | 420 | 132 | 200 | 11,100 | .458 | .48 |
| March..... | 4,530 | 210 | 1,370 | 84,200 | 3.14 | 3.62 |
| April..... | 1,370 | 540 | 772 | 45,900 | 1.77 | 1.98 |
| May..... | 2,780 | 630 | 1,080 | 66,400 | 2.47 | 2.85 |
| June..... | 1,220 | 680 | 972 | 57,800 | 2.22 | 2.48 |
| July..... | 730 | 150 | 362 | 22,300 | .828 | .95 |
| August..... | 141 | 58 | 84.3 | 5,180 | .193 | .22 |
| September..... | 58 | 37 | 47.4 | 2,820 | .108 | .12 |
| October..... | 42 | 37 | 38.5 | 2,370 | .088 | .10 |
| November..... | 52 | 47 | 48.8 | 2,900 | .112 | .12 |
| December..... | 260 | 52 | 97.1 | 5,970 | .222 | .26 |
| The year..... | 4,530 | 37 | 464 | 338,000 | 1.06 | 14.49 |

NOTE.—Values are rated as follows: January, February, and July, good; March to June, excellent; August to December, fair.

MISCELLANEOUS MEASUREMENTS IN THE TULE RIVER DRAINAGE BASIN.

The following miscellaneous measurements were made on South Fork of Tule River at a point one-half mile above the junction of South Fork with main Tule River:

May 26: Width, 40 feet; area, 100 square feet; discharge, 644 second-feet.

July 26: Width, 25 feet; area, 35 square feet; discharge, 64 second-feet.

KAWEAH RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Kaweah River drains the western slope of the Sierra Nevada between the basins of Kings River on the north and Kern and Santa River on the south. This is an important stream, but its watershed is only about one-third that of Kings River and is much less elevated and snow covered than those of the Kings and Kern rivers. It has a number of tributaries which have their sources in numerous lakes and meadows on the higher elevations. The formation is of granite and similar in every way to that in the Kings River basin. The greater part of the area of 619 square miles above the gaging station is well covered with brush and timber. In this basin is situated Sequoia National Park, where the largest grove of big trees (*Sequoia gigantea*) of the Sierra Nevada is found. Two power plants on the stream owned by the Mount Whitney Power Company, divert water from Middle and East forks. By building low dams at the outlet of some of the larger lakes, in the upper reaches of the basin, the company has constructed several small reservoirs, in which the water is held back for use during the low-water flow of the stream, and it is of great benefit to irrigators in the valley during the late summer months. About 6 miles below the gaging station the river leaves the foot of the Sierra and flows across San Joaquin Valley in a general southwestward direction to the old bed of Tulare Lake. After it leaves the foot of the Sierra many canals divert water for the purpose of irrigating land in Tulare County, which is especially adapted to the raising of fruits.

The mean annual precipitation in the basin above the gaging station is from 20 to 40 inches, which falls in the form of snow or rain, probably one-half the area.

KAWEAH RIVER BELOW THREE RIVERS, CAL.

This station was established April 29, 1903. It is located at a point three-fourths of a mile below the confluence of the North, Middle, and South forks, 10 miles from the Southern Pacific Railroad station at Lemon Cove, Tulare County, Cal., and one-fourth mile west of the wagon road from Exeter to Three Rivers. The conditions

at this station and the bench marks are described in Water-Supply Paper No. 177, page 192, where are given also references to publications that contain data for previous years.

Discharge measurements of Kaweah River below Three Rivers, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-------------------|-------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| February 16..... | C. H. Lee..... | 156 | 491 | 6.00 | 644 |
| March 29..... | do..... | 174 | 653 | 7.35 | 2,090 |
| May 11..... | do..... | 183 | 888 | 8.35 | 3,780 |
| May 23..... | R. S. Hawley..... | 180 | 814 | 7.80 | 2,690 |
| May 28..... | C. H. Lee..... | 200 | 1,050 | 9.20 | 5,280 |
| May 31..... | do..... | 182 | 837 | 8.00 | 3,180 |
| June 9..... | do..... | 186 | 896 | 8.40 | 3,640 |
| June 20..... | R. S. Hawley..... | 200 | 1,050 | 9.10 | 5,680 |
| June 20..... | do..... | 198 | 1,010 | 8.95 | 5,250 |
| June 21..... | do..... | 202 | 1,080 | 9.25 | 5,930 |
| June 29..... | do..... | 185 | 896 | 8.25 | 3,470 |
| July 19..... | do..... | 179 | 793 | 7.65 | 2,480 |
| July 28..... | C. H. Lee..... | 170 | 676 | 7.10 | 1,700 |
| September 26..... | R. S. Hawley..... | 146 | 332 | 4.97 | 148 |
| November 14..... | do..... | 142 | 293 | 4.72 | 98 |

Daily gage height, in feet, of Kaweah River below Three Rivers, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|-------|-------|------|-------|------|
| 1..... | 4.55 | 5.3 | 5.85 | 7.8 | 6.95 | 8.05 | 8.8 | 6.65 | 5.5 | 4.9 | 4.7 | 4.8 |
| 2..... | 4.5 | 5.3 | 5.75 | 7.6 | 7.05 | 8.0 | 9.1 | 6.8 | 5.45 | 4.9 | 4.7 | 4.8 |
| 3..... | 4.6 | 5.3 | 5.85 | 7.4 | 7.2 | 8.15 | 9.1 | ..... | 5.4 | 4.9 | 4.7 | 4.8 |
| 4..... | 4.6 | 5.3 | 6.45 | 7.3 | 7.45 | 8.1 | 9.05 | 6.4 | 5.4 | 4.9 | 4.75 | 5.0 |
| 5..... | 4.6 | 5.3 | 5.95 | 7.05 | 7.6 | 8.25 | 9.0 | 6.5 | 5.35 | 4.9 | 5.05 | 4.9 |
| 6..... | 4.6 | 5.3 | 5.95 | 7.1 | 7.55 | 8.0 | 9.0 | 6.45 | 5.3 | 4.85 | 4.85 | 4.9 |
| 7..... | 4.6 | 5.3 | 5.95 | 6.95 | 7.8 | 7.95 | 8.8 | 6.45 | 5.25 | 4.8 | 4.8 | 4.9 |
| 8..... | 4.6 | 5.4 | 6.0 | 6.9 | 8.2 | 8.3 | 8.8 | 6.4 | 5.3 | 4.8 | 4.8 | 4.9 |
| 9..... | 4.6 | 5.45 | 6.0 | 7.0 | 8.35 | 8.65 | 8.6 | 6.4 | 5.3 | 4.8 | 4.75 | 5.3 |
| 10..... | 4.6 | 5.4 | 6.05 | 7.35 | 8.35 | 8.85 | 8.55 | 6.3 | 5.3 | 4.75 | 4.75 | 5.1 |
| 11..... | 4.6 | 5.4 | 6.05 | 7.1 | 8.25 | 9.1 | 8.5 | 6.3 | 5.25 | 4.75 | 4.7 | 5.0 |
| 12..... | 4.7 | 5.35 | 9.3 | 6.95 | 8.0 | 9.25 | 8.5 | 6.2 | 5.2 | 4.75 | 4.7 | 5.7 |
| 13..... | 8.1 | 5.3 | 7.9 | 7.0 | 7.75 | 9.1 | 8.4 | 6.15 | 5.1 | 4.75 | 4.7 | 5.25 |
| 14..... | 9.25 | 5.4 | 7.05 | 7.05 | 7.8 | 9.1 | 8.4 | 6.1 | 5.15 | 4.7 | 4.7 | 5.1 |
| 15..... | 6.55 | 6.3 | 10.3 | 7.05 | 7.75 | 9.1 | 8.35 | 6.1 | 5.15 | 4.7 | 4.7 | 5.1 |
| 16..... | 5.95 | 6.0 | 10.1 | 7.15 | 7.9 | 9.25 | 8.3 | 6.1 | 5.2 | 4.7 | 4.7 | 5.0 |
| 17..... | 5.7 | 5.8 | 8.75 | 7.15 | 8.15 | 9.1 | 8.2 | 6.0 | 5.1 | 4.7 | 4.7 | 5.0 |
| 18..... | 6.3 | 5.7 | 7.85 | 7.15 | 8.3 | 9.1 | 7.95 | 6.0 | 5.05 | 4.7 | 4.7 | 5.0 |
| 19..... | 9.3 | 5.7 | 7.35 | 7.25 | 8.35 | 9.45 | 7.8 | 6.0 | 5.0 | 4.7 | 4.7 | 4.95 |
| 20..... | 6.7 | 5.7 | 7.15 | 7.45 | 8.3 | 9.4 | 7.7 | 5.9 | 5.0 | 4.7 | 4.7 | 4.95 |
| 21..... | 6.15 | 6.25 | 7.25 | 7.6 | 8.2 | 9.5 | 7.6 | 5.8 | 5.0 | 4.7 | 4.7 | 4.95 |
| 22..... | 5.85 | 5.9 | 7.15 | 7.6 | 8.1 | 9.35 | 7.75 | 5.75 | 5.0 | 4.7 | 4.7 | 5.0 |
| 23..... | 5.7 | 5.75 | 7.05 | 7.8 | 7.75 | 9.35 | 7.85 | 5.65 | 4.95 | 4.7 | 4.75 | 5.0 |
| 24..... | 5.6 | 5.7 | 8.05 | 7.45 | 7.6 | 9.35 | 7.7 | 5.6 | 5.0 | 4.7 | 4.75 | 5.0 |
| 25..... | 5.6 | 5.7 | 8.7 | 7.25 | 8.05 | 9.15 | 7.6 | 5.6 | 5.0 | 4.7 | 4.75 | 5.0 |
| 26..... | 5.5 | 5.7 | 8.6 | 7.15 | 9.45 | 8.9 | 7.6 | 5.55 | 4.95 | 4.7 | 4.8 | 6.5 |
| 27..... | 5.5 | 5.7 | 8.2 | 7.35 | 8.5 | 8.55 | 7.5 | 5.5 | 4.9 | 4.7 | 4.75 | 5.75 |
| 28..... | 5.4 | 6.15 | 7.95 | 7.45 | 9.75 | 8.4 | 7.4 | 5.5 | 4.9 | 4.7 | 4.75 | 5.8 |
| 29..... | 5.4 | ..... | 7.4 | 7.15 | 8.45 | 8.45 | 7.05 | 5.5 | 4.9 | 4.65 | 4.8 | 5.4 |
| 30..... | 5.4 | ..... | 7.65 | 7.0 | 8.2 | 8.65 | 6.9 | 5.5 | 4.9 | 4.65 | 4.7 | 5.3 |
| 31..... | 5.3 | ..... | 8.35 | ..... | 8.1 | ..... | 6.8 | 5.6 | ..... | 4.7 | ..... | 5.45 |

Rating table for Kaweah River below Three Rivers, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 4.50 | 75 | 5.40 | 312 | 6.30 | 840 | 7.20 | 1,830 | 8.20 | 3,420 |
| 4.60 | 91 | 5.50 | 350 | 6.40 | 930 | 7.30 | 1,960 | 8.40 | 3,800 |
| 4.70 | 109 | 5.60 | 395 | 6.50 | 1,020 | 7.40 | 2,100 | 8.60 | 4,180 |
| 4.80 | 130 | 5.70 | 445 | 6.60 | 1,120 | 7.50 | 2,240 | 8.80 | 4,590 |
| 4.90 | 154 | 5.80 | 500 | 6.70 | 1,220 | 7.60 | 2,400 | 9.00 | 5,040 |
| 5.00 | 180 | 5.90 | 560 | 6.80 | 1,340 | 7.70 | 2,560 | 9.20 | 5,520 |
| 5.10 | 210 | 6.00 | 625 | 6.90 | 1,460 | 7.80 | 2,720 | 9.40 | 6,000 |
| 5.20 | 240 | 6.10 | 690 | 7.00 | 1,580 | 7.90 | 2,880 | 9.60 | 6,480 |
| 5.30 | 274 | 6.20 | 760 | 7.10 | 1,700 | 8.00 | 3,060 | 9.80 | 6,960 |

NOTE.—This table is based upon 15 discharge measurements made during 1906 and is well below gage height 9.2 feet. Above gage height 9 feet the rating curve is a tangent, the difference 240 per tenth.

Monthly discharge of Kaweah River below Three Rivers, Cal., for 1906.

[Drainage area, 520 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-c Sec.-ft. per sq. mile. |
|----------------|---------------------------|----------|-------|---------------------|------------------------------------|
| | Maximum. | Minimum. | Mean. | | |
| January..... | 5,760 | 75 | 784 | 48,200 | 1.51 |
| February..... | 840 | 274 | 418 | 23,200 | .804 |
| March..... | 8,160 | 472 | 2,440 | 150,000 | 4.69 |
| April..... | 2,720 | 1,460 | 1,910 | 114,000 | 3.67 |
| May..... | 6,840 | 1,520 | 3,210 | 197,000 | 6.17 |
| June..... | 6,240 | 2,970 | 4,670 | 278,000 | 8.98 |
| July..... | 5,280 | 1,340 | 3,430 | 211,000 | 6.60 |
| August..... | 1,340 | 350 | 697 | 42,500 | 1.33 |
| September..... | 350 | 154 | 226 | 13,400 | .435 |
| October..... | 154 | 100 | 120 | 7,380 | .231 |
| November..... | 195 | 109 | 119 | 7,080 | .229 |
| December..... | 1,020 | 109 | 245 | 15,100 | .471 |
| The year..... | 8,160 | 75 | 1,520 | 1,110,000 | 2.93 |

NOTE.—These values are excellent.

KINGS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Kings River rises on the western slope of the Sierra Nevada, drains the country located between San Joaquin River on the north and Kaweah and Kern rivers on the south. The Sierra Nevada at the head of this basin reaches elevations of over 14,000 feet and comprises the most rugged portion of the range; the sharp and precipitous peaks produce the grandest scenery to be found in the United States. The main tributaries of this stream flow through great canyons with high precipitous walls cut in the granite. The Kings Canyon on South Fork and Tehipite Valley on Middle Fork rival the famed Yosemite Valley for grandeur of scenery. There are numerous tributaries, many of which have their sources in perpetual snow banks on the higher elevations. A large number of small lakes on the higher elevations are fed by small streams from perpetual snow or glaciers, and in them many of the tributaries have their sources.



4. CABLE STATION, KINGS RIVER, NEAR RED MOUNTAIN, CALIFORNIA.



8. DISCHARGE MEASUREMENT BY WADING.

The formation is of granite, which above an elevation of 10,000 feet is bare, with scanty vegetation, being carved by the action of glaciers; below the 10,000-foot contour is a heavy covering of timber and underbrush. Extensive groves of big trees are scattered throughout this basin. On the lower elevations along the foothills the soil covering is light with a grass growth used for pasturage. Fully 80 per cent of the drainage area is now included in the boundaries of the Sierra Forest Reserve, which is patrolled for the prevention of fires and illegal herding. Below the gaging station, which is located at the point where the river leaves the foothills, canals divert the water for use in the valleys and of Fresno, Kings, and Tulare counties, where the climate and soil are especially adapted to the raising of grapes, fruits, etc., and the soil is under a high state of cultivation. During the period of flood discharge some water passes these canals and finds its way across Kings River delta in the natural channel to the old bed of Tulare Lake, which is now but an intermittent lake due largely to the diversion of water for irrigation purposes from the streams which drain into it. The drainage area above the Red Mountain gaging station is 1,742 square miles. The mean annual precipitation for this area varies from about 30 to 60 inches, which over a greater portion of the basin falls in the form of snow. The greater discharge of this stream is in the spring months when the snow is melting. (See Pl. III, A.)

KINGS RIVER NEAR SANGER, CAL.

This station was established September 3, 1895. It is located 15 miles east of Sanger, Cal., near the mouth of the canyon, and is above all diversions. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 196, where are given also references to publications that contain data for previous years.

Discharge measurements of Kings River near Sanger, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-------------------|-------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| January 30..... | C. H. Lee..... | 164 | 564 | 5.20 | 966 |
| March 30..... | do..... | 289 | 1,200 | 8.20 | 4,380 |
| May 12..... | do..... | 320 | 2,060 | 10.80 | 10,500 |
| May 22..... | R. S. Hawley..... | 320 | 2,190 | 11.15 | 12,600 |
| May 27..... | C. H. Lee..... | 320 | 2,040 | 10.70 | 10,400 |
| June 2..... | do..... | 312 | 1,800 | 9.90 | 8,200 |
| June 19..... | R. S. Hawley..... | 358 | 2,880 | 13.10 | 21,600 |
| July 18..... | do..... | 322 | 2,280 | 11.40 | 13,200 |
| July 27..... | C. H. Lee..... | 317 | 2,240 | 11.20 | 11,800 |
| September 25..... | R. S. Hawley..... | 172 | 496 | 5.18 | 768 |
| October 18..... | do..... | 150 | 398 | 4.75 | 472 |
| November 13..... | do..... | 149 | 375 | 4.63 | 398 |

Daily gage height, in feet, of Kings River near Sanger, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|
| 1..... | 4.25 | 5.1 | 5.85 | 9.35 | 8.05 | 10.0 | 12.85 | 9.8 | 6.6 | 5.05 | 4.8 |
| 2..... | 3.9 | 5.1 | 5.7 | 8.5 | 8.3 | 9.95 | 12.95 | 9.8 | 6.45 | 5.05 | 4.8 |
| 3..... | 3.9 | 5.1 | 5.8 | 8.15 | 8.75 | 10.15 | 13.1 | 9.8 | 6.75 | 5.05 | 4.8 |
| 4..... | 4.0 | 5.1 | 6.5 | 7.9 | 9.3 | 10.15 | 13.25 | 9.8 | 6.3 | 5.05 | 4.8 |
| 5..... | 4.05 | 5.1 | 6.5 | 7.7 | 9.8 | 10.95 | 13.1 | 9.1 | 6.2 | 5.05 | 4.8 |
| 6..... | 4.1 | 5.1 | 6.2 | 7.55 | 9.85 | 10.25 | 13.0 | 9.2 | 6.1 | 5.0 | 4.8 |
| 7..... | 4.1 | 5.1 | 6.2 | 7.4 | 10.2 | 10.25 | 12.6 | 9.2 | 5.95 | 4.95 | 4.8 |
| 8..... | ..... | 5.1 | 6.3 | 7.4 | 10.7 | 10.75 | 12.7 | 9.2 | 5.85 | 4.95 | 4.8 |
| 9..... | 4.0 | 5.2 | 6.25 | 7.6 | 11.0 | 11.45 | 12.7 | 8.8 | 5.9 | 4.9 | 4.8 |
| 10..... | 4.0 | 5.3 | 6.4 | 8.1 | 11.2 | 11.95 | 12.6 | 8.6 | 5.9 | 4.9 | 4.8 |
| 11..... | 4.0 | 5.5 | 6.45 | 8.15 | 11.4 | 12.5 | 12.8 | 8.9 | 5.85 | 4.85 | 4.8 |
| 12..... | 4.05 | 5.2 | 9.7 | 7.85 | 10.9 | 12.85 | 12.7 | 8.4 | 5.75 | 4.85 | 4.8 |
| 13..... | 7.3 | ..... | 10.9 | 7.9 | 10.25 | 12.8 | 12.8 | 8.4 | 5.65 | 4.8 | 4.8 |
| 14..... | 11.4 | 5.2 | 8.4 | 8.1 | 10.6 | 12.6 | 12.6 | 8.3 | 5.55 | 4.8 | 4.8 |
| 15..... | 7.0 | 6.75 | 10.7 | 8.1 | 10.65 | 12.7 | 12.9 | 8.25 | 5.5 | 4.8 | 4.8 |
| 16..... | 6.2 | 6.25 | 13.0 | 8.4 | 10.7 | 12.9 | 12.6 | 8.2 | 5.45 | 4.75 | 4.8 |
| 17..... | 5.85 | 5.85 | 10.35 | 8.4 | 10.8 | 13.0 | 12.3 | 8.0 | 5.4 | 4.75 | 4.8 |
| 18..... | 8.5 | 5.65 | 9.15 | 8.5 | 11.2 | 13.0 | 11.5 | 8.0 | 5.3 | 4.75 | 4.8 |
| 19..... | 13.8 | 5.65 | 8.25 | 8.75 | 11.4 | 13.3 | 11.5 | 7.9 | 5.2 | 4.75 | 4.8 |
| 20..... | 8.1 | 5.7 | 7.90 | 9.1 | 11.5 | 14.0 | 11.4 | 7.65 | 5.15 | 4.7 | 4.8 |
| 21..... | 6.85 | 6.05 | 8.00 | 9.4 | 11.4 | 13.8 | 11.15 | 7.6 | 5.15 | 4.7 | 4.8 |
| 22..... | 6.4 | 6.2 | 8.05 | 9.45 | 11.2 | 13.5 | 11.2 | 7.25 | 5.15 | 4.7 | 4.8 |
| 23..... | 6.1 | 6.05 | 8.10 | 9.75 | 11.05 | 13.3 | 11.4 | 6.9 | 5.15 | 4.65 | 4.8 |
| 24..... | 5.75 | 5.9 | 9.35 | 9.1 | 10.55 | 13.4 | 11.4 | 6.7 | 5.15 | 4.7 | 4.8 |
| 25..... | 5.7 | 5.75 | 10.35 | 8.65 | 10.5 | 13.4 | 11.4 | 6.55 | 5.15 | 4.65 | 4.8 |
| 26..... | 5.65 | 5.8 | 10.45 | 8.55 | 12.0 | 12.8 | 11.2 | 6.5 | 5.15 | 4.65 | 4.8 |
| 27..... | 5.6 | 5.8 | 9.50 | 8.75 | 11.45 | 12.1 | 11.1 | 6.5 | 5.1 | 4.65 | 4.8 |
| 28..... | 5.5 | 6.0 | 8.70 | 9.15 | 12.2 | 11.6 | 10.85 | 6.5 | 5.05 | 4.65 | 4.8 |
| 29..... | 5.3 | ..... | 8.25 | 8.5 | 11.6 | 11.7 | 10.55 | 6.45 | 5.05 | 4.65 | 4.8 |
| 30..... | 5.2 | ..... | 8.15 | 8.1 | 10.15 | 12.3 | 10.05 | 6.45 | 5.05 | 4.6 | 4.8 |
| 31..... | 5.15 | ..... | 9.40 | ..... | 9.95 | ..... | 9.9 | 6.7 | ..... | 4.6 | ..... |

NOTE.—These gage heights were taken from an automatic river stage register, except Jan. 30, when the instrument was out of use, and the readings are from the staff gage. The mean gage height is determined from the register sheets by the use of a planometer.

Rating table for Kings River near Sanger, Cal.

JANUARY 1 TO JUNE 30, 1906.^a

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 3.90 | 205 | 5.00 | 740 | 6.10 | 1,550 | 7.40 | 2,965 | 9.60 | 7,360 |
| 4.00 | 240 | 5.10 | 805 | 6.20 | 1,640 | 7.60 | 3,240 | 9.80 | 7,900 |
| 4.10 | 280 | 5.20 | 870 | 6.30 | 1,730 | 7.80 | 3,535 | 10.00 | 8,470 |
| 4.20 | 325 | 5.30 | 940 | 6.40 | 1,820 | 8.00 | 3,850 | 11.00 | 11,700 |
| 4.30 | 370 | 5.40 | 1,010 | 6.50 | 1,920 | 8.20 | 4,190 | 12.00 | 15,900 |
| 4.40 | 420 | 5.50 | 1,085 | 6.60 | 2,020 | 8.40 | 4,570 | 13.00 | 21,040 |
| 4.50 | 470 | 5.60 | 1,160 | 6.70 | 2,120 | 8.60 | 4,980 | 14.00 | 26,600 |
| 4.60 | 520 | 5.70 | 1,235 | 6.80 | 2,230 | 8.80 | 5,410 | | |
| 4.70 | 570 | 5.80 | 1,310 | 6.90 | 2,340 | 9.00 | 5,860 | | |
| 4.80 | 625 | 5.90 | 1,390 | 7.00 | 2,460 | 9.20 | 6,330 | | |
| 4.90 | 680 | 6.00 | 1,470 | 7.20 | 2,705 | 9.40 | 6,840 | | |

JULY 1 TO DECEMBER 31, 1906.^b

| | | | | | | | | | |
|------|-----|------|-----|------|-------|------|-------|------|-------|
| 4.50 | 330 | 4.90 | 575 | 5.30 | 870 | 5.70 | 1,190 | 6.00 | 1,460 |
| 4.60 | 385 | 5.00 | 645 | 5.40 | 950 | 5.80 | 1,280 | 6.10 | 1,550 |
| 4.70 | 445 | 5.10 | 720 | 5.50 | 1,030 | 5.90 | 1,370 | | |
| 4.80 | 510 | 5.20 | 795 | 5.60 | 1,110 | | | | |

^a This table is based on discharge measurements made during 1895-1906 and is well defined.

^b This table is based on 3 discharge measurements made during 1906 and is well defined. At height 6.1 feet it is the same as the previous table.

Monthly discharge of Kings River near Sanger, Cal., for 1906.

[Drainage area, 1,740 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|--------|------------------------|---------------------------|---------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 25,500 | 205 | 2,360 | 144,000 | 1.36 | 1.57 |
| February..... | 2,150 | 792 | 1,150 | 63,900 | 0.661 | .69 |
| March..... | 21,000 | 1,220 | 5,240 | 222,000 | 2.01 | 3.47 |
| April..... | 7,760 | 2,960 | 4,720 | 281,000 | 2.71 | 3.02 |
| May..... | 16,800 | 3,920 | 10,700 | 658,000 | 6.15 | 7.09 |
| June..... | 26,600 | 8,320 | 17,100 | 1,020,000 | 9.83 | 11.00 |
| July..... | 22,400 | 8,180 | 16,300 | 1,000,000 | 9.37 | 10.80 |
| August..... | 7,900 | 1,870 | 4,200 | 264,000 | 2.47 | 2.85 |
| September..... | 2,020 | 682 | 1,120 | 66,600 | 0.644 | .72 |
| October..... | 682 | 385 | 516 | 21,700 | 0.297 | .34 |
| November..... | 610 | 330 | 297 | 23,600 | 0.228 | .25 |
| December..... | 2,230 | 330 | 700 | 43,000 | 0.402 | .46 |
| The year..... | 26,600 | 205 | 5,280 | 3,920,000 | 3.09 | 42.26 |

NOTE.—Values are rated as excellent; discharges for September to December are based on 3 measurements which indicate a greater change in conditions of flow than had taken place in ten years previously, but they are believed to be accurate.

MERCED RIVER DRAINAGE BASIN.**DESCRIPTION OF BASIN.**

Merced River drains that portion of the western slope of the Sierra Nevada located between Tuolumne River on the north and San Joaquin River on the south. Its drainage area is much less than that of Tuolumne River. It has numerous tributaries, several of which are of considerable size.

The topography of the country in this basin is similar to that of Tuolumne River, being rough and broken in the upper reaches. In this basin is situated the famous Yosemite Valley, with its precipitous walls and domes and great waterfalls, which occur on the main stream and its tributaries, which discharge into the valley over precipitous cliffs rising 2,000 to 3,000 feet above the floor of the valley. The formation is of granite, which on the upper reaches of the basin above Yosemite Valley is bare, rising in precipitous peaks and domes, and is smoothly marked by glacial action. The middle reaches of the basin are well timbered. The Mariposa grove of big trees is situated in the basin of the South Fork. The timber growth extends well down on the lower elevations to the foothills, where the covering is of brush and grass, used extensively for pasturage. Numerous lakes are scattered over the upper portion of the basin. The mean annual precipitation varies from 25 inches in the foothills to 60 inches on the higher elevations, where it falls in the form of snow, which melts in the spring months, except on the extreme higher mountain peaks, where it often remains during the entire year. After leaving the foothills at Merced Falls, where the gaging station is located, canals divert the water for irrigation on lands along the river bottom and in San Joaquin Valley. The surplus water during flood discharge enters San Joaquin River.

MERCED RIVER ABOVE MERCED FALLS, CAL.

The measurement of Merced River was undertaken in response to numerous requests from mining and irrigation interests, the minimum flow being less than the combined capacity of the irrigation power canals taking water in the vicinity of Snelling. The station was established April 6, 1901. It is located 1 mile above Merced Falls. The conditions at this station and the bench mark are described in Water-Supply Paper No. 177, page 203, where are also references to publications that contain data for previous years.

Discharge measurements of Merced River above Merced Falls, Cal., in 1901.

| Date. | Hydrographer. | Width. | Area of section | Gage height. |
|------------------|-------------------|--------------|-----------------|--------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> |
| January 27..... | C. H. Lee..... | 143 | 380 | 9.40 |
| February 17..... | do..... | 146 | 406 | 9.50 |
| March 31..... | do..... | 321 | 1,900 | 14.80 |
| March 31..... | do..... | 317 | 1,800 | 14.50 |
| April 1..... | do..... | 305 | 1,360 | 13.20 |
| April 26..... | R. S. Hawley..... | 268 | 760 | 11.42 |
| May 16..... | C. H. Lee..... | 287 | 1,140 | 12.60 |
| May 27..... | W. C. Sawyer..... | 301 | 1,270 | 13.15 |
| May 28..... | do..... | 353 | 2,320 | 16.40 |
| May 28..... | do..... | 350 | 2,270 | 16.20 |
| May 28..... | do..... | 348 | 2,160 | 16.00 |
| May 28..... | do..... | 347 | 2,160 | 15.90 |
| June 6..... | do..... | 285 | 1,030 | 12.42 |
| June 16..... | do..... | 318 | 1,640 | 14.50 |
| June 22..... | do..... | 325 | 1,670 | 14.75 |
| June 30..... | do..... | 306 | 1,240 | 13.48 |
| July 12..... | do..... | 289 | 1,140 | 13.56 |
| July 13..... | do..... | 303 | 1,210 | 13.68 |
| July 20..... | do..... | 250 | 875 | 12.15 |
| July 21..... | do..... | 247 | 846 | 11.85 |
| August 2..... | do..... | 180 | 543 | 10.38 |
| August 4..... | do..... | 180 | 522 | 10.30 |
| August 5..... | do..... | 180 | 527 | 10.24 |
| August 19..... | W. F. Martin..... | 168 | 428 | 9.85 |
| September 6..... | do..... | 142 | 292 | 8.90 |
| November 20..... | do..... | 130 | 224 | 8.42 |

Daily gage height, in feet, of Merced River above Merced Falls, Cal., for 1901.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|-------|------|-------|-------|-------|-------|-------|-------|-------|------|------|
| 1..... | 8.1 | 9.0 | 10.35 | 13.05 | 11.35 | 12.4 | 14.0 | 10.55 | 9.1 | 8.35 | 8.0 |
| 2..... | 8.1 | 9.0 | 10.15 | 12.15 | 11.55 | 12.45 | 14.2 | 10.5 | 9.1 | 8.35 | 8.0 |
| 3..... | 8.05 | 9.0 | 10.05 | 11.7 | 11.75 | 12.65 | 14.35 | 10.45 | 9.0 | 8.4 | 8.0 |
| 4..... | 8.0 | 9.0 | 11.3 | 11.45 | 12.15 | 12.65 | 14.35 | 10.35 | 9.0 | 8.4 | 8.0 |
| 5..... | 8.0 | 9.0 | 10.7 | 11.25 | 12.45 | 13.15 | 14.3 | 10.25 | 8.95 | 8.45 | 8.0 |
| 6..... | 8.05 | 9.0 | 10.5 | 11.0 | 12.75 | 12.55 | 14.15 | 10.15 | 8.9 | 8.4 | 8.0 |
| 7..... | 8.05 | 9.0 | 10.2 | 11.0 | 13.0 | 12.25 | 14.05 | 10.15 | 8.9 | 8.35 | 8.0 |
| 8..... | 8.0 | 9.0 | 10.15 | 10.85 | 13.15 | 12.7 | 14.05 | 10.15 | 8.9 | 8.4 | 8.0 |
| 9..... | 8.05 | 9.05 | 10.1 | 10.95 | 13.2 | 13.1 | 13.9 | 10.15 | 8.9 | 8.4 | 8.0 |
| 10..... | 8.15 | 9.1 | 10.1 | 11.25 | 13.5 | 13.35 | 13.5 | 10.15 | 8.8 | 8.4 | 8.0 |
| 11..... | 8.05 | 9.25 | 10.15 | 11.45 | 13.85 | 13.95 | 13.55 | 10.3 | 8.8 | 8.4 | 8.0 |
| 12..... | 8.15 | 9.1 | 13.25 | 11.15 | 13.35 | 14.4 | 13.6 | 10.15 | 8.75 | 8.3 | 8.0 |
| 13..... | 10.55 | 9.0 | 12.8 | 11.05 | 12.75 | 14.65 | 13.4 | 9.95 | 8.8 | 8.3 | 8.0 |
| 14..... | 13.45 | 9.05 | 11.7 | 11.15 | 12.75 | 14.0 | 13.3 | 9.9 | 8.75 | 8.3 | 8.0 |
| 15..... | 10.55 | 9.95 | 16.7 | 11.15 | 12.8 | 14.05 | 13.05 | 9.8 | 8.75 | 8.3 | 8.0 |
| 16..... | 10.3 | 9.9 | 13.55 | 11.3 | 12.7 | 14.4 | 12.8 | 9.75 | 8.7 | 8.3 | 8.0 |
| 17..... | 10.8 | 9.5 | 12.2 | 11.35 | 12.6 | 14.7 | 12.65 | 9.75 | 8.7 | 8.3 | 8.0 |
| 18..... | 13.85 | 9.4 | 11.5 | 11.3 | 12.95 | 14.15 | 12.4 | 9.65 | 8.6 | 8.35 | 8.0 |
| 19..... | 16.9 | 9.75 | 11.1 | 11.45 | 13.3 | 14.55 | 12.2 | 9.8 | 8.6 | 8.35 | 8.0 |
| 20..... | 11.55 | 9.65 | 10.85 | 11.6 | 13.3 | 14.8 | 11.85 | 9.85 | 8.5 | 8.3 | 8.0 |

Daily gage height, in feet, of Merced River above Merced Falls, Cal., for 1906—Cont'd.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|-------|
| 21..... | 10.55 | 11.15 | 10.85 | 11.85 | 13.2 | 15.0 | 11.85 | 9.75 | 8.5 | 8.3 | 8.35 | 8.6 |
| 22..... | 10.05 | 11.2 | 11.15 | 12.0 | 12.9 | 14.9 | 11.75 | 9.55 | 8.5 | 8.3 | 8.3 | 8.55 |
| 23..... | 9.85 | 10.7 | 11.1 | 12.7 | 12.5 | 14.45 | 11.75 | 9.45 | 8.5 | 8.3 | 8.3 | 8.7 |
| 24..... | 9.65 | 10.45 | 14.55 | 12.0 | 12.3 | 14.9 | 11.7 | 9.3 | 8.5 | 8.3 | 8.3 | 8.6 |
| 25..... | 9.5 | 10.8 | 15.85 | 11.6 | 12.25 | 14.9 | 11.7 | 9.2 | 8.5 | 8.3 | 8.3 | 8.65 |
| 26..... | 9.5 | 10.45 | 14.1 | 11.4 | 13.75 | 14.0 | 11.6 | 9.2 | 8.55 | 8.3 | 8.3 | 11.5 |
| 27..... | 9.4 | 10.25 | 12.9 | 11.45 | 13.4 | 13.45 | 11.5 | 9.1 | 8.55 | 8.3 | 8.3 | 11.45 |
| 28..... | 9.25 | 10.7 | 12.0 | 12.15 | 16.0 | 12.85 | 11.25 | 9.1 | 8.5 | 8.3 | 8.3 | 11.3 |
| 29..... | 9.2 | ..... | 11.55 | 11.7 | 13.6 | 13.0 | 11.0 | 9.1 | 8.5 | 8.3 | 8.3 | 10.35 |
| 30..... | 9.1 | ..... | 11.6 | 11.5 | 12.8 | 13.45 | 10.8 | 9.1 | 8.5 | 8.05 | 8.3 | 9.75 |
| 31..... | 9.0 | ..... | 14.1 | ..... | 12.5 | ..... | 10.7 | 9.1 | ..... | 8.3 | ..... | 10.35 |

Rating tables for Merced River above Merced Falls, Cal.

JANUARY 1, 1905, TO JULY 31, 1906.^a

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 8.00 | 90 | 9.00 | 465 | 10.00 | 1,240 | 11.00 | 2,545 | 13.00 | 6,630 |
| 8.10 | 115 | 9.10 | 520 | 10.10 | 1,345 | 11.20 | 2,870 | 13.20 | 7,130 |
| 8.20 | 140 | 9.20 | 580 | 10.20 | 1,455 | 11.40 | 3,215 | 13.40 | 7,630 |
| 8.30 | 170 | 9.30 | 645 | 10.30 | 1,570 | 11.60 | 3,570 | 13.60 | 8,150 |
| 8.40 | 200 | 9.40 | 715 | 10.40 | 1,690 | 11.80 | 3,945 | 13.80 | 8,670 |
| 8.50 | 235 | 9.50 | 790 | 10.50 | 1,820 | 12.00 | 4,340 | 14.00 | 9,200 |
| 8.60 | 275 | 9.60 | 870 | 10.60 | 1,955 | 12.20 | 4,755 | 15.00 | 12,050 |
| 8.70 | 315 | 9.70 | 955 | 10.70 | 2,095 | 12.40 | 5,200 | 16.00 | 15,300 |
| 8.80 | 360 | 9.80 | 1,045 | 10.80 | 2,240 | 12.60 | 5,665 | 17.00 | 18,800 |
| 8.90 | 410 | 9.90 | 1,140 | 10.90 | 2,390 | 12.80 | 6,140 | | |

AUGUST 1 TO DECEMBER 3, 1906.^b

| | | | | | | | | | |
|------|-----|------|-----|-------|-------|-------|-------|-------|-------|
| 8.00 | 55 | 8.80 | 280 | 9.60 | 750 | 10.40 | 1,510 | 11.40 | 3,140 |
| 8.10 | 70 | 8.90 | 320 | 9.70 | 820 | 10.50 | 1,650 | 11.60 | 3,520 |
| 8.20 | 90 | 9.00 | 370 | 9.80 | 890 | 10.60 | 1,800 | 11.80 | 3,930 |
| 8.30 | 115 | 9.10 | 425 | 9.90 | 970 | 10.70 | 1,960 | 12.00 | 4,340 |
| 8.40 | 140 | 9.20 | 480 | 10.00 | 1,060 | 10.80 | 2,120 | | |
| 8.50 | 170 | 9.30 | 540 | 10.10 | 1,160 | 10.90 | 2,280 | | |
| 8.60 | 205 | 9.40 | 610 | 10.20 | 1,260 | 11.00 | 2,440 | | |
| 8.70 | 240 | 9.50 | 680 | 10.30 | 1,380 | 11.20 | 2,780 | | |

^a This table is based on discharge measurements made during 1905-6 and is well defined.

^b This table is based on 7 discharge measurements made during August to November, 1906, and is well defined above gage height 8.4 feet. Above gage height 12 feet, the table is the same as the previous one.

Monthly discharge of Merced River above Merced Falls, Cal., for 1906.

[Drainage area, 1,090 square miles.]

| Month. | Discharge in second-feet. | | | Run-off. | | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | Total in acre-feet. | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 18,400 | 90 | 1,840 | 113,000 | 1.69 | 1.95 |
| February..... | 2,870 | 465 | 1,060 | 58,900 | .972 | 1.01 |
| March..... | 17,800 | 1,290 | 4,660 | 287,000 | 4.28 | 4.93 |
| April..... | 6,760 | 2,320 | 3,500 | 208,000 | 3.21 | 3.58 |
| May..... | 15,300 | 3,130 | 6,530 | 402,000 | 5.99 | 6.91 |
| June..... | 12,000 | 4,860 | 8,410 | 500,000 | 7.72 | 8.61 |
| July..... | 10,200 | 2,100 | 6,260 | 385,000 | 5.74 | 6.62 |
| August..... | 1,720 | 425 | 948 | 58,300 | .870 | 1.00 |
| September..... | 425 | 170 | 254 | 15,100 | .233 | .26 |
| October..... | 155 | 62 | 122 | 7,500 | .112 | .13 |
| November..... | 240 | 115 | 135 | 8,030 | .124 | .14 |
| December..... | 3,620 | 115 | 735 | 45,200 | .674 | .78 |
| The year..... | 18,400 | 62 | 2,870 | 2,090,000 | 2.63 | 35.92 |

NOTE.—These values are excellent.

MERCED RIVER IN YOSEMITE VALLEY, CALIFORNIA.

This station was established July 11, 1904. It is located at a wagon bridge, near the Sentinel Hotel. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 201, where are given also references to publications that contain data for previous years.

Discharge measurements of Merced River in Yosemite Valley, California, in 1904.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Stage. |
|----------------|-------------------|--------------|------------------|--------------|--------------|
| | | <i>Fect.</i> | <i>Sq. ft.</i> | <i>Fect.</i> | <i>Feet.</i> |
| May 24..... | W. B. Clapp..... | 95 | 668 | 6.80 | 8.00 |
| November 8.... | C. W. Tucker..... | 89 | 286 | 3.30 | 3.30 |

Daily gage height, in feet, of Merced River in Yosemite Valley, California, for 1904.

| Day. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|-------|-------|------|-------|------|------|
| 1..... | | 6.0 | 9.4 | 6.2 | 4.3 | 3.5 | 3.3 |
| 2..... | | 6.1 | 9.5 | 6.0 | 4.3 | 3.5 | 3.3 |
| 3..... | | 6.75 | 9.8 | 6.0 | 4.2 | 3.6 | 3.3 |
| 4..... | | 6.8 | 9.5 | 5.8 | 4.2 | 3.6 | 3.4 |
| 5..... | | 7.4 | 9.6 | 5.7 | 4.1 | 3.5 | 3.5 |
| 6..... | | 6.45 | 9.5 | 5.6 | 4.1 | 3.5 | 3.3 |
| 7..... | | 6.5 | 9.5 | 5.6 | 4.1 | 3.6 | 3.3 |
| 8..... | | 7.0 | 9.1 | 5.6 | 4.0 | 3.5 | 3.3 |
| 9..... | | 7.8 | 9.1 | 5.6 | 4.0 | 3.5 | 3.3 |
| 10..... | | 8.0 | 8.7 | 5.7 | 4.0 | 3.5 | 3.3 |
| 11..... | | 9.55 | 8.6 | 5.8 | 4.0 | 3.4 | 3.3 |
| 12..... | | 9.5 | 8.8 | 5.6 | 3.9 | 3.4 | 3.3 |
| 13..... | | 9.6 | 9.0 | 5.4 | 3.9 | 3.5 | 3.3 |
| 14..... | | 9.2 | 8.8 | 5.3 | 3.9 | 3.4 | 3.3 |
| 15..... | | 9.1 | 8.3 | 5.2 | 3.9 | 3.4 | 3.3 |
| 16..... | | 10.0 | 8.5 | 5.1 | 3.8 | 3.4 | 3.3 |
| 17..... | | 9.5 | 8.3 | 5.1 | 3.7 | 3.3 | 3.3 |
| 18..... | | 9.2 | 7.8 | 5.4 | 3.7 | 3.4 | 3.3 |
| 19..... | | 9.8 | 7.7 | 5.5 | 3.6 | 3.3 | 3.3 |
| 20..... | | 9.8 | 7.8 | 5.2 | 3.6 | 3.3 | 3.3 |
| 21..... | | 10.0 | 7.7 | 4.9 | 3.5 | 3.3 | 3.3 |
| 22..... | | 9.9 | 7.8 | 4.8 | 3.6 | 3.3 | 3.3 |
| 23..... | 7.00 | 9.8 | 7.8 | 4.5 | 3.6 | 3.3 | 3.3 |
| 24..... | 6.75 | 9.8 | 7.8 | 4.4 | 3.6 | 3.3 | 3.3 |
| 25..... | 6.80 | 10.0 | 7.7 | 4.4 | 3.6 | 3.3 | 3.3 |
| 26..... | 6.8 | 8.8 | 8.1 | 4.4 | 3.6 | 3.3 | 3.2 |
| 27..... | 6.3 | 8.4 | 7.4 | 4.4 | 3.5 | 3.3 | 3.2 |
| 28..... | 6.1 | 7.8 | 7.1 | 4.4 | 3.5 | 3.3 | 3.2 |
| 29..... | 5.7 | 8.0 | 6.7 | 4.4 | 3.5 | 3.3 | 3.2 |
| 30..... | 5.7 | 8.4 | 6.4 | 4.3 | 3.5 | 3.2 | 3.2 |
| 31..... | 5.7 | | 6.4 | 4.3 | | 3.2 | |

YOSEMITE CREEK IN YOSEMITE VALLEY, CALIFORNIA.

This station was established July 9, 1904. It is located at a wagon bridge, about one-half mile from Yosemite, Cal. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 205, where are given also references to publications that contain data for previous years.

No measurements were made at this station during 1906. November 12, with a gage height of 5 feet, there was no flow at section.

Daily gage height, in feet, of Yosemite Creek, in Yosemite Valley, Cal., for 1906.

| Day. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|------------------|-------|------|-------|------|------|------|
| 1..... | | 6.4 | 9.2 | 5.8 | 5.2 | 5.0 | 5.0 | 5.0 |
| 2..... | | 6.5 | 9.5 | 5.7 | 5.2 | 5.0 | 5.0 | 5.0 |
| 3..... | | 7.0 | 9.4 | 5.6 | 5.1 | 5.0 | 5.0 | 5.0 |
| 4..... | | 7.1 | 9.4 | 5.6 | 5.1 | 5.0 | 5.2 | 5.0 |
| 5..... | | 7.4 | 9.6 | 5.6 | 5.1 | 5.0 | 5.1 | 5.0 |
| 6..... | | 7.0 | 9.5 | 5.5 | 5.1 | 5.0 | 5.1 | 5.0 |
| 7..... | | 6.9 | 9.4 | 5.6 | 5.0 | 5.0 | 5.1 | 5.0 |
| 8..... | | 7.1 | 9.2 | 5.5 | 5.0 | 5.0 | 5.0 | 5.0 |
| 9..... | | 7.9 | 9.1 | 5.4 | 5.0 | 5.0 | 5.0 | 5.0 |
| 10..... | | 8.0 | 8.8 | 5.5 | 5.0 | 5.0 | 5.0 | 5.0 |
| 11..... | | 8.9 | 8.9 | 5.5 | 5.0 | 5.0 | 5.0 | 5.0 |
| 12..... | | 9.8 | 8.0 | 5.4 | 5.0 | 5.0 | 5.0 | 5.0 |
| 13..... | | 9.4 | 8.1 | 5.2 | 5.0 | 5.0 | 5.0 | 5.0 |
| 14..... | | 8.8 | 8.0 | 5.4 | 5.0 | 5.0 | 5.0 | 5.0 |
| 15..... | | 8.7 | 7.4 | 5.4 | 5.0 | 5.0 | 5.0 | 5.0 |
| 16..... | | 11.15 | 7.2 | 5.3 | 5.0 | 5.0 | 5.0 | 5.0 |
| 17..... | | 9.3 | 7.1 | 5.3 | 5.0 | 5.0 | 5.0 | 5.0 |
| 18..... | | 9.1 | 7.1 | 5.3 | 5.0 | 5.0 | 5.0 | 5.0 |
| 19..... | | 9.8 | 6.8 | 5.3 | 5.0 | 5.0 | 5.0 | 5.0 |
| 20..... | | 9.7 | 6.8 | 5.3 | 5.0 | 5.0 | 5.0 | 5.0 |
| 21..... | | 9.9 | 6.7 | 5.4 | 5.0 | 5.0 | 5.0 | 5.0 |
| 22..... | | 9.9 | 6.7 | 5.3 | 5.0 | 5.0 | 5.0 | 5.0 |
| 23..... | | 7.5 | 9.8 | 6.6 | 5.2 | 5.0 | 5.0 | 5.0 |
| 24..... | | 7.05 | 9.7 | 6.6 | 5.2 | 5.0 | 5.0 | 5.0 |
| 25..... | | 7.0 | 9.8 | 6.7 | 5.1 | 5.0 | 5.0 | 5.0 |
| 26..... | | 7.0 | 7.7 | 6.9 | 5.1 | 5.0 | 5.0 | 5.0 |
| 27..... | | 6.5 | 7.4 | 6.4 | 5.1 | 5.0 | 5.0 | 5.0 |
| 28..... | | 6.4 | 7.1 | 6.2 | 5.1 | 5.0 | 5.0 | 5.0 |
| 29..... | | ^a 9.0 | 7.4 | 5.9 | 5.1 | 5.0 | 5.0 | 5.0 |
| 30..... | | 6.0 | 7.7 | 5.7 | 5.1 | 5.0 | 4.9 | 5.0 |
| 31..... | | 6.1 | 6.0 | 5.1 | 5.0 | 4.9 | 5.0 | 5.0 |

^a Backwater from snow.

NOTE.—There was practically no flow after September 1.

TENAYA CREEK IN YOSEMITE VALLEY, CALIFORNIA.

This station was established July 11, 1904. It is located by the wagon bridge, about 2 miles from Yosemite, Cal. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 207, where are given also references to publications that contain data for previous years.

The following measurement was made June 11, 1906.:

Width, 44 feet; area, 176 square feet; gage height, 720 feet; discharge, 891 second-feet.

Daily gage height, in feet, of Tenaya Creek in Yosemite Valley, Cal., for 1906.

| Day. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|-------|------|-------|------|------|------|
| 1..... | | 5.6 | 7.1 | 4.6 | 3.5 | 3.0 | 3.0 | 3.0 |
| 2..... | | 5.7 | 7.2 | 4.4 | 3.4 | 3.0 | 3.0 | 3.0 |
| 3..... | | 6.0 | 7.3 | 4.5 | 3.4 | 3.0 | 3.0 | 3.0 |
| 4..... | | 6.0 | 7.2 | 4.4 | 3.3 | 3.0 | 3.2 | 3.0 |
| 5..... | | 6.3 | 7.2 | 4.3 | 3.2 | 2.9 | 3.2 | 3.0 |
| 6..... | | 6.0 | 7.1 | 4.4 | 3.2 | 2.9 | 3.1 | 3.0 |
| 7..... | | 6.1 | 7.2 | 4.4 | 3.1 | 2.9 | 3.1 | 3.0 |
| 8..... | | 6.3 | 7.1 | 4.3 | 3.0 | 2.9 | 3.0 | 3.0 |
| 9..... | | 6.7 | 7.0 | 4.3 | 3.0 | 2.9 | 3.0 | 3.0 |
| 10..... | | 6.8 | 6.7 | 4.4 | 3.0 | 2.9 | 3.0 | 3.0 |
| 11..... | | 6.9 | 6.6 | 4.3 | 3.0 | 2.9 | 3.0 | 3.0 |
| 12..... | | 6.9 | 7.0 | 4.2 | 2.9 | 2.9 | 3.0 | 3.0 |
| 13..... | | 7.0 | 7.1 | 4.2 | 3.0 | 2.9 | 3.0 | 3.0 |
| 14..... | | 7.1 | 7.0 | 4.1 | 3.0 | 3.0 | 3.0 | 3.0 |
| 15..... | | 7.4 | 6.5 | 4.1 | 3.1 | 3.0 | 3.0 | 3.0 |

Daily gage height, in feet, of Tenaya Creek in Yosemite Valley, Cal., for 1906—Con-

| Day. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | I |
|---------|------|-------|-------|------|-------|------|------|---|
| 16..... | | 8.1 | 6.3 | 4.0 | 3.0 | 2.9 | 3.0 | |
| 17..... | | 7.8 | 6.2 | 4.0 | 3.0 | 2.9 | 3.0 | |
| 18..... | | 7.3 | 6.1 | 3.9 | 3.0 | 3.0 | 3.0 | |
| 19..... | | 7.1 | 6.0 | 3.8 | 3.0 | 2.9 | 3.0 | |
| 20..... | | 7.5 | 5.8 | 3.9 | 3.0 | 2.9 | 3.0 | |
| 21..... | | 7.4 | 5.6 | 3.8 | 3.0 | 2.9 | 3.0 | |
| 22..... | | 7.3 | 5.5 | 3.8 | 3.0 | 2.9 | 3.0 | |
| 23..... | | 7.4 | 5.5 | 3.8 | 3.0 | 3.0 | 3.0 | |
| 24..... | | 7.4 | 5.4 | 3.7 | 3.0 | 2.9 | 3.0 | |
| 25..... | 6.2 | 7.5 | 5.5 | 3.6 | 3.0 | 2.9 | 3.0 | |
| 26..... | 6.1 | 6.1 | 5.7 | 3.6 | 3.0 | 2.9 | 3.0 | |
| 27..... | 5.9 | 6.0 | 5.7 | 3.5 | 3.0 | 3.0 | 3.0 | |
| 28..... | 5.7 | 6.4 | 5.2 | 3.5 | 3.0 | 2.9 | 3.0 | |
| 29..... | 5.5 | 6.6 | 5.0 | 3.4 | 3.0 | 2.9 | 3.0 | |
| 30..... | 5.5 | 6.9 | 4.7 | 3.4 | 3.0 | 3.0 | 3.0 | |
| 31..... | 5.5 | | 4.7 | 3.4 | | 3.0 | | |

TUOLUMNE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Tuolumne River rises on the western slope of the Sierra Nevada; drains the country located between Stanislaus River on the north and Merced River on the south. It has numerous tributaries, several of which produce a heavy discharge. The country throughout the basin is rough and rugged, especially along the main river, which flows through solid granite, with high precipitous cliffs on either side. Along this stream is found some of the grandest scenery of the Sierra Nevada. This stream drains the northern portion of the Yosemite National Park, where is located the Grand Canyon of the Tuolumne and the Hetch Hetchy Valley, declared by many to exceed the far-famed Yosemite Valley in grandeur and beauty. The formation is of granite, which on the higher elevations is bare and glaciated, often rising thousands of feet in vertical cliffs and domes. Along the middle reaches of this basin there is good soil covering, with a heavy timber growth of pine, fir, cedar, and other kindred trees. On the lower reaches the covering is a heavy growth of brush, which diminishes toward the foothills where the stream enters the San Joaquin Valley. The northern portion of the basin has a light soil covering, with grass growth, which is used for pasturage. There are several glacial lakes throughout the upper reaches of this basin, many of the larger of which offer excellent opportunities for the construction of storage reservoirs. There are also many reservoir sites on the main river. The stream has a heavy fall, and the opportunities for power development are numerous. Several diversions are made above the gaging station, which is located at Lagrange, where the stream breaks from the foothills. The precipitation on the upper half of this basin falls in the form of snow, a greater portion of which disappears in the spring months, but on the higher elevations much remains until late in summer. The mean annual rainfall varies from about 30 inches on the lower foothills to about 60 inches on the higher elevations.

TUOLUMNE RIVER AT LA GRANGE, CAL.

This station was established August 29, 1895. It is located at the wagon bridge, in the town of La Grange. It is below the high dam, where the diversions are made by the Turlock and Modesto canals, and also below the head of the canal of the La Grange Ditch and Hydraulic Mining Company, which diverts water from the left bank of the river above the dam. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 209, where are given also references to publications that contain data for previous years.

Discharge measurements of Tuolumne River at La Grange, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge |
|------------------|-------------------|--------|------------------|--------------|-----------|
| | | Feet. | Sq. ft. | Feet. | Sec.-ft. |
| February 18..... | C. H. Lee..... | 314 | 1,360 | 5.80 | 1,870 |
| March 29..... | R. S. Hawley..... | 342 | 2,060 | 7.71 | 6,220 |
| April 25..... | do..... | 337 | 2,000 | 7.52 | 5,710 |
| May 15..... | C. H. Lee..... | 348 | 2,550 | 8.80 | 11,000 |
| May 25..... | W. C. Sawyer..... | 330 | 2,140 | 8.18 | 7,760 |
| May 28..... | do..... | 370 | 2,970 | 10.45 | 15,900 |
| June 4..... | do..... | 348 | 2,500 | 9.11 | 11,100 |
| June 14..... | do..... | 380 | 2,810 | 10.10 | 14,800 |
| June 21..... | do..... | 384 | 3,050 | 10.54 | 17,000 |
| June 29..... | do..... | 342 | 2,360 | 8.62 | 9,750 |
| July 3..... | do..... | 376 | 3,060 | 10.79 | 18,300 |
| July 11..... | do..... | 366 | 2,610 | 9.00 | 11,800 |
| July 21..... | do..... | 340 | 2,230 | 8.22 | 8,570 |
| July 31..... | do..... | 331 | 1,790 | 6.80 | 4,150 |
| August 3..... | do..... | 326 | 1,580 | 6.20 | 2,700 |
| August 6..... | do..... | 320 | 1,440 | 5.78 | 1,890 |
| August 20..... | W. F. Martin..... | 318 | 1,360 | 5.43 | 1,380 |
| November 21..... | do..... | 298 | 983 | 4.26 | 197 |

Daily gage height, in feet, of Tuolumne River at La Grange, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|------|
| 1..... | 4.2 | 4.85 | 6.0 | 8.15 | 7.1 | 8.3 | 9.8 | 6.4 | 3.45 | 3.45 | 4.1 | 4.2 |
| 2..... | 4.1 | 4.9 | 5.9 | 8.1 | 7.3 | 8.25 | 10.4 | 6.25 | 3.45 | 3.45 | 4.1 | 4.2 |
| 3..... | 4.0 | 4.8 | 6.1 | 7.85 | 7.5 | 8.55 | 10.65 | 6.3 | 3.45 | 3.45 | 4.1 | 4.2 |
| 4..... | 4.0 | 4.8 | 6.3 | 7.3 | 7.75 | 9.1 | 10.6 | 6.1 | 3.45 | 3.45 | 4.1 | 4.3 |
| 5..... | 4.0 | 4.8 | 6.2 | 7.05 | 8.4 | 9.35 | 10.3 | 5.95 | 3.45 | 3.45 | 4.8 | 4.35 |
| 6..... | 3.7 | 4.8 | 6.2 | 7.05 | 9.7 | 8.55 | 10.25 | 5.9 | 3.45 | 3.45 | 4.6 | 4.4 |
| 7..... | 3.75 | 4.75 | 6.1 | 7.05 | 9.45 | 8.1 | 10.05 | 5.9 | 3.45 | 3.45 | 4.55 | 4.4 |
| 8..... | 3.7 | 4.8 | 6.1 | 7.1 | 9.25 | 8.25 | 10.1 | 5.9 | 3.45 | 3.45 | 4.35 | 4.3 |
| 9..... | 3.3 | 4.85 | 6.3 | 7.15 | 9.6 | 8.9 | 9.85 | 5.95 | 3.4 | 3.8 | 4.4 | 3.9 |
| 10..... | 3.3 | 4.95 | 6.4 | 7.45 | 9.8 | 9.5 | 9.1 | 5.75 | 3.0 | 3.85 | 4.4 | 4.65 |
| 11..... | 3.3 | 5.5 | 6.55 | 7.6 | 10.15 | 10.2 | 9.2 | 5.9 | 3.0 | 3.85 | 4.35 | 7.8 |
| 12..... | 3.4 | 5.0 | 9.7 | 7.45 | 9.25 | 10.9 | 9.3 | 5.9 | 3.0 | 3.9 | 4.35 | 7.2 |
| 13..... | 6.45 | 4.85 | 7.9 | 7.3 | 8.8 | 11.0 | 9.65 | 5.75 | 3.0 | 3.9 | 4.35 | 5.5 |
| 14..... | 8.2 | 5.1 | 7.5 | 7.1 | 8.75 | 9.9 | 9.5 | 5.7 | 3.0 | 3.9 | 4.6 | 5.05 |
| 15..... | 6.75 | 6.35 | 11.4 | 7.35 | 8.8 | 9.6 | 9.1 | 5.5 | 3.0 | 3.9 | 4.8 | 4.9 |
| 16..... | 6.6 | 6.0 | 9.1 | 7.45 | 8.4 | 10.65 | 8.8 | 5.4 | 3.0 | 4.0 | 4.3 | 4.8 |
| 17..... | 6.9 | 5.55 | 6.75 | 7.55 | 8.3 | 10.8 | 8.7 | 5.35 | 3.0 | 3.9 | 4.35 | 4.8 |
| 18..... | 10.55 | 5.6 | 6.65 | 7.6 | 8.75 | 9.6 | 8.35 | 5.3 | 3.0 | 3.9 | 4.35 | 4.75 |
| 19..... | 11.65 | 5.7 | 6.65 | 7.75 | 9.4 | 10.2 | 8.3 | 5.3 | 3.0 | 3.9 | 4.35 | 4.75 |
| 20..... | 7.3 | 6.45 | 6.85 | 7.8 | 9.45 | 10.45 | 8.1 | 5.4 | 3.0 | 3.9 | 4.35 | 4.75 |
| 21..... | 6.7 | 7.2 | 6.75 | 8.0 | 9.0 | 10.5 | 8.3 | 5.4 | 3.0 | 4.2 | 4.3 | 4.75 |
| 22..... | 6.3 | 6.85 | 6.35 | 8.0 | 8.7 | 10.45 | 8.05 | 5.7 | 3.0 | 4.2 | 4.2 | 4.75 |
| 23..... | 5.9 | 6.4 | 7.8 | 9.0 | 8.25 | 10.3 | 8.2 | 5.6 | 3.05 | 3.8 | 4.25 | 4.8 |
| 24..... | 5.5 | 6.25 | 12.45 | 8.45 | 8.0 | 10.15 | 8.2 | 5.35 | 3.05 | 4.1 | 4.3 | 4.9 |
| 25..... | 5.35 | 6.3 | 11.3 | 7.6 | 8.0 | 10.4 | 8.5 | 5.2 | 3.05 | 4.15 | 4.2 | 5.35 |
| 26..... | 5.4 | 6.25 | 10.55 | 7.3 | 9.6 | 9.9 | 8.0 | 3.6 | 3.05 | 4.1 | 4.2 | 7.4 |
| 27..... | 5.25 | 6.0 | 7.9 | 7.35 | 9.5 | 9.0 | 7.9 | 3.5 | 3.05 | 4.1 | 4.15 | 7.3 |
| 28..... | 5.2 | 6.55 | 7.9 | 7.55 | 10.4 | 8.35 | 7.6 | 3.45 | 3.05 | 4.1 | 4.15 | 6.8 |
| 29..... | 5.0 | ..... | 7.05 | 7.4 | 9.1 | 8.6 | 7.2 | 3.45 | 3.05 | 4.1 | 3.3 | 6.1 |
| 30..... | 4.95 | ..... | 8.4 | 7.15 | 8.4 | 9.2 | 6.8 | 3.45 | 3.05 | 4.1 | 4.15 | 5.7 |
| 31..... | 4.9 | ..... | 10.2 | ..... | 8.2 | ..... | 6.6 | 3.45 | ..... | 4.1 | ..... | 6.45 |

Rating table for Tuolumne River at La Grange, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 3.00 | 0 | 4.00 | 115 | 5.00 | 750 | 6.00 | 2,260 | 8.00 | 7,380 |
| 3.10 | 1 | 4.10 | 145 | 5.10 | 900 | 6.20 | 2,650 | 8.20 | 8,030 |
| 3.20 | 5 | 4.20 | 180 | 5.20 | 1,030 | 6.40 | 3,050 | 8.40 | 8,700 |
| 3.30 | 10 | 4.30 | 220 | 5.30 | 1,160 | 6.60 | 3,530 | 8.60 | 9,390 |
| 3.40 | 20 | 4.40 | 270 | 5.40 | 1,300 | 6.80 | 4,000 | 8.80 | 10,090 |
| 3.50 | 30 | 4.50 | 330 | 5.50 | 1,440 | 7.00 | 4,500 | 9.00 | 10,810 |
| 3.60 | 40 | 4.60 | 400 | 5.60 | 1,510 | 7.20 | 5,020 | 10.00 | 14,610 |
| 3.70 | 55 | 4.70 | 480 | 5.70 | 1,750 | 7.40 | 5,570 | 11.00 | 18,610 |
| 3.80 | 70 | 4.80 | 570 | 5.80 | 1,910 | 7.60 | 6,140 | | |
| 3.90 | 90 | 4.90 | 670 | 5.90 | 2,080 | 7.80 | 6,750 | | |

NOTE.—This table is based on 18 discharge measurements made during 1906 and earlier low water measurements, and is well defined.

Monthly discharge of Tuolumne River at La Grange, Cal., for 1906.

[Drainage area, 1,500 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|--------|---------------------|-----------------------|-----------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft per sq. mile. | Dep. inc. |
| January..... | 21,400 | 55 | 2,860 | 176,000 | 1.91 | |
| February..... | 5,330 | 1,110 | 2,180 | 121,000 | 1.45 | |
| March..... | 24,400 | 2,320 | 7,180 | 441,000 | 4.79 | |
| April..... | 11,300 | 4,730 | 6,500 | 387,000 | 4.33 | |
| May..... | 16,800 | 5,510 | 11,100 | 682,000 | 7.40 | |
| June..... | 19,600 | 8,640 | 13,900 | 827,000 | 9.27 | |
| July..... | 18,200 | 4,530 | 11,600 | 713,000 | 7.73 | |
| August..... | 4,080 | 770 | 2,220 | 136,000 | 1.48 | |
| September..... | 831 | 288 | 470 | 28,000 | .313 | |
| October..... | 307 | 70 | 216 | 13,300 | .144 | |
| November..... | 570 | 10 | 243 | 14,500 | .162 | |
| December..... | 6,750 | 90 | 1,470 | 90,400 | .980 | |
| The year..... | 24,400 | 10 | 4,990 | 3,630,000 | 3.33 | |

NOTE.—These discharges include those of Modesto and Turlock canals. Values are excellent, except those for Modesto canal for April, September, and October, which are classed as good, on account of the lack of measurements of the canal at low stages.

MODESTO CANAL AT LA GRANGE, CAL.

The Modesto canal is the property of the Modesto irrigation district. The water is diverted from the right side of Tuolumne River at La Grange dam. This canal was designed to carry 660 second-feet to irrigate land in the vicinity of Modesto, Stanislaus County. The principal part of the construction work was done on this canal prior to 1892, but on account of litigation the canal was not completed until April, 1903.

Information in regard to this station is contained in Water-Supply Papers Nos. 100, 134, and 177 of the United States Geological Survey.

During 1906 gagings were made about 500 feet below the intake of the La Grange dam. The canal at this point has a concrete section, the width being 20.2 feet at the bottom and the walls having a batter of about 1 to 5 outward. The floor of the canal is practically a plane surface, but the left side is 0.26 foot lower than the right side, where the highest velocity occurs. Measurements were made from the up-

side of a plank footbridge. The gage is an iron bar $1\frac{1}{2}$ by $\frac{1}{4}$ inches, graduated into feet and tenths and placed in a concrete well on the left side of the canal about 400 feet above the gaging station. The well is connected to the canal by means of a small pipe from the bottom at right angles to the canal wall.

Discharge measurements of Modesto canal at La Grange, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height | Dis-charge. |
|------------------|------------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| May 16..... | C. H. Lee..... | 22 | 59 | 2.80 | 395 |
| June 5..... | W. C. Sawyer..... | 21 | 43 | 2.11 | 302 |
| June 5..... | do..... | 21 | 39 | 1.91 | 257 |
| June 8..... | do..... | 21 | 58 | 2.79 | 393 |
| June 8..... | do..... | 21 | 56 | 2.70 | 412 |
| June 24..... | do..... | 22 | 70 | 2.66 | 387 |
| July 2..... | do..... | 21 | 69 | 2.60 | 380 |
| July 11..... | do..... | 21 | 70 | 2.60 | 383 |
| July 19..... | do..... | 21 | 68 | 2.52 | 376 |
| August 6..... | Sawyer and Martin..... | 21 | 66 | 2.46 | 362 |
| September 5..... | W. F. Martin..... | 21 | 46 | 1.70 | 250 |

Daily gage height, in feet, of Modesto canal at La Grange, Cal., for 1906.

| Day. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. |
|---------|------|------|------|-------|-------|------|-------|------|
| 1..... | | | 2.4 | 0.2 | 2.6 | 2.5 | 2.25 | 0.85 |
| 2..... | | | 2.5 | .85 | 2.6 | 2.45 | 1.95 | .85 |
| 3..... | | | 2.6 | 1.1 | 2.6 | 2.45 | 1.8 | .85 |
| 4..... | | | 2.5 | 1.5 | 2.6 | 2.45 | 1.6 | .85 |
| 5..... | | | 2.65 | 1.9 | 2.55 | 2.45 | 1.65 | .85 |
| 6..... | | | 2.8 | 2.2 | 2.6 | 2.5 | 1.6 | .85 |
| 7..... | | | 2.8 | 2.6 | 2.55 | 2.5 | 1.55 | .85 |
| 8..... | | | 2.8 | 2.7 | 2.6 | 2.5 | 1.55 | .8 |
| 9..... | | 1.4 | 2.8 | 2.85 | 2.55 | 2.45 | 1.5 | .9 |
| 10..... | | 2.0 | 2.8 | 2.75 | 2.55 | 1.85 | 1.35 | .95 |
| 11..... | | 2.0 | 2.8 | 2.5 | 2.6 | | 1.45 | .85 |
| 12..... | | 1.95 | 2.8 | 2.5 | 2.6 | | 1.45 | .85 |
| 13..... | 1.5 | 2.25 | 2.8 | 2.5 | 2.6 | | 1.4 | .9 |
| 14..... | .65 | 2.3 | 2.8 | 1.65 | 2.6 | | 1.25 | 1.1 |
| 15..... | 1.15 | 2.3 | 2.8 | 2.6 | 2.6 | | 1.35 | 1.05 |
| 16..... | 1.5 | 2.35 | 2.8 | 2.55 | 2.6 | | 1.35 | 1.0 |
| 17..... | 1.7 | 2.3 | 2.8 | 2.5 | 2.6 | | 1.3 | 1.0 |
| 18..... | 1.8 | 2.3 | 2.8 | 2.5 | 2.5 | | 1.2 | .95 |
| 19..... | 2.0 | 2.3 | 2.8 | 2.6 | 2.5 | | 1.15 | .95 |
| 20..... | | 2.4 | 2.8 | 2.6 | 2.45 | | 1.05 | .95 |
| 21..... | | 2.5 | 2.8 | 2.6 | 2.5 | | 1.05 | |
| 22..... | | | 2.8 | 2.6 | 2.5 | | 1.0 | |
| 23..... | | | 1.5 | 2.6 | 2.5 | 0.6 | .95 | |
| 24..... | | | | 2.6 | 2.5 | .5 | .95 | |
| 25..... | | | | 2.6 | 2.5 | 1.3 | .95 | |
| 26..... | | | | 2.55 | 2.45 | 1.9 | 1.0 | |
| 27..... | | | | 2.55 | 2.5 | 2.1 | 1.0 | |
| 28..... | | | | 2.6 | 2.5 | 2.2 | .95 | |
| 29..... | | 2.45 | | 2.6 | 2.5 | 1.95 | .9 | |
| 30..... | | 2.5 | | 2.65 | 2.5 | 1.95 | .85 | |
| 31..... | | | | | 2.5 | 1.9 | | |

NOTE.—No gage height record was kept April 22 to 28. Discharges have been interpolated. The canal was dry on other days on which the gage was not read.

Rating table for Modesto canal at La Grange, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 0.50 | 90 | 1.10 | 156 | 1.70 | 238 | 2.30 | 328 | 2.90 | 428 |
| 0.60 | 100 | 1.20 | 169 | 1.80 | 253 | 2.40 | 344 | 3.00 | 445 |
| 0.70 | 110 | 1.30 | 182 | 1.90 | 268 | 2.50 | 360 | | |
| 0.80 | 120 | 1.40 | 196 | 2.00 | 283 | 2.60 | 377 | | |
| 0.90 | 131 | 1.50 | 210 | 2.10 | 298 | 2.70 | 394 | | |
| 1.00 | 143 | 1.60 | 224 | 2.20 | 313 | 2.80 | 411 | | |

NOTE.—This table is based on 11 discharge measurements made during 1906, and is well defined between gage heights 1.7 feet and 2.8 feet. Discharges have been included with those of Tuolumne River, p. 167. The total discharge of the canal for 1906 was 105,000 acre-feet.

TURLOCK CANAL AT LA GRANGE, CAL.

The Turlock canal, the property of the Turlock irrigation district, takes water from the left bank of Tuolumne River at the La Grange dam. This canal was designed to carry 1,500 second-feet and to irrigate a large area of fertile land in the vicinity of Turlock and Stanislaus County, Cal.

During 1898 water was first turned into the canal in small quantities and used for puddling the banks. A record of the gage height has been kept since July, 1899. The conditions at this station are described in Water-Supply Paper No. 177, page 214, where are given also references to publications that contain data for previous years.

Discharge measurements of Turlock canal at La Grange, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|------------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| May 16..... | C. H. Lee..... | 20 | 110 | 5.55 | 238 |
| May 24..... | W. C. Sawyer..... | 20 | 113 | 5.75 | 253 |
| May 29..... | do..... | 20 | 26 | 1.30 | 90 |
| May 29..... | do..... | 20 | 40 | 2.05 | 110 |
| May 29..... | do..... | 20 | 58 | 2.97 | 120 |
| May 29..... | do..... | 20 | 58 | 2.97 | 131 |
| May 29..... | do..... | 20 | 74 | 3.75 | 143 |
| May 29..... | do..... | 20 | 92 | 4.70 | 156 |
| May 30..... | do..... | 20 | 105 | 5.35 | 169 |
| May 30..... | do..... | 20 | 118 | 6.02 | 182 |
| June 7..... | do..... | 20 | 108 | 5.50 | 196 |
| July 2..... | do..... | 20 | 115 | 6.02 | 210 |
| July 19..... | do..... | 20 | 98 | 5.02 | 224 |
| July 21..... | do..... | 20 | 21 | 1.68 | 238 |
| August 6..... | Sawyer and Martin..... | 20 | 120 | 6.10 | 253 |
| August 20..... | W. E. Martin..... | 20 | 120 | 6.10 | 268 |
| September 5..... | do..... | 20 | 87 | 4.46 | 283 |

Daily gage height, in feet, of Turlock canal at La Grange, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|------|------|------|-------|-------|------|-------|
| 1..... | | 5.25 | 3.25 | | 4.5 | 5.0 | 6.05 | 6.05 | 5.05 |
| 2..... | | 5.6 | 3.25 | 2.0 | 4.1 | 5.0 | 6.05 | 6.05 | 5.25 |
| 3..... | | 5.6 | 2.9 | 2.0 | 4.4 | 5.0 | 6.05 | 6.05 | 4.1 |
| 4..... | | 5.6 | 2.4 | 2.0 | 5.4 | 5.0 | 6.0 | 6.05 | 4.35 |
| 5..... | | 5.7 | 2.0 | 2.0 | 5.35 | 5.6 | 6.05 | 6.05 | 4.4 |
| 6..... | | 5.7 | 2.0 | 2.0 | 5.35 | 5.5 | 6.05 | 6.0 | 4.3 |
| 7..... | | 5.7 | 2.0 | 2.0 | 5.35 | 5.5 | 6.05 | 6.05 | 4.25 |
| 8..... | 2.05 | 5.7 | 2.0 | 2.0 | 5.35 | 5.65 | 6.05 | 6.05 | 4.2 |
| 9..... | 2.05 | 5.75 | | 2.0 | 5.35 | 5.75 | 6.05 | 6.05 | 4.05 |
| 10..... | 2.65 | 4.65 | | | 5.6 | 5.75 | 6.05 | 6.05 | 3.75 |

Daily gage height, in feet, of Turlock canal at La Grange, Cal., for 1906—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. |
|------|------|------|------|------|------|-------|-------|------|-------|------|
| 11. | 2.65 | 5.7 | | | 5.6 | 5.8 | 6.05 | 6.05 | 3.9 | |
| 12. | 2.7 | 5.9 | | 2.5 | 5.6 | 5.8 | 6.05 | 6.05 | 3.9 | |
| 13. | 2.7 | 5.1 | | 2.6 | 5.6 | 5.8 | 6.05 | 6.05 | 3.8 | |
| 14. | 2.6 | 4.55 | | 2.5 | 5.6 | 5.8 | 6.05 | 6.05 | 3.4 | |
| 15. | 2.5 | 5.1 | | 2.5 | 5.6 | 5.5 | 6.05 | 6.05 | 3.5 | |
| 16. | 2.55 | 5.4 | | 2.5 | 5.6 | 6.0 | 6.05 | 6.05 | 3.4 | |
| 17. | 2.6 | 2.25 | | 2.5 | 5.6 | 6.0 | 6.05 | 6.05 | 3.4 | |
| 18. | 2.1 | | | 2.5 | 5.6 | 6.0 | 6.05 | 6.05 | 3.0 | |
| 19. | 2.5 | 3.0 | | 2.5 | 5.6 | 6.0 | 5.08 | 6.0 | 3.05 | |
| 20. | 2.7 | 3.7 | | 2.5 | 5.6 | 6.0 | 6.05 | 6.05 | 2.85 | |
| 21. | 2.7 | 3.75 | 0.75 | 2.6 | 5.7 | 6.0 | 6.05 | 6.05 | 2.85 | |
| 22. | 2.7 | 4.6 | 2.0 | 2.6 | 5.8 | 6.0 | 6.05 | 0.0 | 2.75 | |
| 23. | 2.8 | 4.0 | 1.25 | 2.6 | 5.8 | 6.0 | 6.05 | 0.0 | 2.75 | |
| 24. | 2.4 | 3.2 | | 2.6 | 5.85 | 6.0 | 6.05 | 5.02 | 2.7 | |
| 25. | 0.5 | 3.5 | | 2.6 | 5.05 | 6.05 | 6.05 | 5.02 | 2.7 | |
| 26. | 1.7 | 3.5 | | 3.15 | 5.9 | 6.0 | 6.05 | 5.45 | 2.75 | |
| 27. | 3.7 | 3.5 | | 3.6 | 4.7 | 6.05 | 6.05 | 5.87 | 2.75 | |
| 28. | 3.9 | 3.5 | | 3.6 | 5.7 | 6.05 | 6.05 | 5.04 | 2.7 | |
| 29. | 3.9 | | | 3.6 | 5.45 | 6.05 | 6.05 | 5.05 | 2.6 | |
| 30. | 5.1 | | | 4.0 | 5.6 | 6.05 | 6.05 | 5.15 | 2.55 | |
| 31. | 5.1 | | | | 5.3 | | 6.05 | 5.00 | | |

NOTE.—The canal was dry on days when the gage was not read.

Rating table for Turlock canal at La Grange, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 0.50 | 4 | 1.50 | 58 | 2.50 | 156 | 3.50 | 274 | 5.00 | 478 |
| 0.60 | 6 | 1.60 | 67 | 2.60 | 167 | 3.60 | 287 | 5.20 | 508 |
| 0.70 | 10 | 1.70 | 76 | 2.70 | 178 | 3.70 | 300 | 5.40 | 538 |
| 0.80 | 14 | 1.80 | 85 | 2.80 | 189 | 3.80 | 313 | 5.60 | 568 |
| 0.90 | 19 | 1.90 | 94 | 2.90 | 201 | 3.90 | 326 | 5.80 | 598 |
| 1.00 | 25 | 2.00 | 104 | 3.00 | 213 | 4.00 | 339 | 6.00 | 628 |
| 1.10 | 31 | 2.10 | 114 | 3.10 | 225 | 4.20 | 365 | | |
| 1.20 | 37 | 2.20 | 124 | 3.20 | 237 | 4.40 | 392 | | |
| 1.30 | 44 | 2.30 | 134 | 3.30 | 249 | 4.60 | 420 | | |
| 1.40 | 51 | 2.40 | 145 | 3.40 | 261 | 4.80 | 448 | | |

NOTE.—This table is based on 17 discharge measurements made during 1906 and is well defined above gage heights 1 foot. Discharges have been included with those for Tuolumne River, p —. The total discharge of the canal for 1906 was 202,000 acre-feet.

STANISLAUS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Stanislaus River drains a portion of the western slope of the Sierra Nevada and heads well back on the crest, at elevations of from 10,000 to 12,000 feet. It drains the country between the basins of Mokelumne River on the north and Tuolumne River on the south, and flows in a general southwesterly direction, entering San Joaquin River 23 miles above Stockton. In the upper reaches of the basin it has many tributaries, which have their source in numerous small glacial lakes. The topography is rough and broken, with high mountain peaks. The formation is of granite, which is bare and destitute of timber growth above an elevation of 8,000 feet, except where small glacial lakes and moraines occur. In the middle reaches of the basin there is good soil covering and a heavy growth of timber. In this basin is situated the Calaveras grove of big trees (*Sequoia gigantea*), for which the Sierra Nevada is famous. This is the most north-

erly of the groves of these trees which extend as far south as Kern River basin. The mean annual rainfall for the basin is about inches. The precipitation falls chiefly in the form of snow on higher elevations, remaining well into the summer months. Mining operations have been carried on extensively in this basin, and many canals have been taken out of the river, all of which discharge into the river again. The canal of the Stanislaus Water Company diverts water 3 miles above Knights Ferry and is used to irrigate the land between Knights Ferry and Stockton. A gaging station is maintained on this canal to determine its discharge.

STANISLAUS RIVER AT KNIGHTS FERRY, CAL.

A station was first established on this river on May 3, 1895, at the railroad bridge one-half mile north of Oakdale. On July 30, 1898, a cable was placed 1,000 feet below the railroad bridge. This station was used until February 16, 1901.

The station at Knights Ferry was established May 19, 1903. It is located 200 feet from the post-office at Knights Ferry. The conditions at this station and the bench marks are described in Water Supply Paper No. 177, page 217, where are given also references to publications that contain data for previous years.

Discharge measurements of Stanislaus River at Knights Ferry, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-------------------|------------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec. ft.</i> |
| February 19..... | C. H. Lee..... | 194 | 793 | 9.20 | Se |
| March 29..... | R. S. Hawley..... | 221 | 989 | 10.37 | |
| April 24..... | do..... | 230 | 1,030 | 10.60 | |
| April 25..... | Hawley and Ostrom..... | 225 | 1,040 | 10.43 | |
| April 30..... | G. A. Ostrom..... | 213 | 980 | 10.00 | |
| May 3..... | do..... | 268 | 1,280 | 11.52 | |
| May 5..... | do..... | 297 | 1,630 | 12.52 | |
| May 7..... | do..... | 323 | 1,870 | 13.35 | |
| May 10..... | do..... | 329 | 1,900 | 13.56 | |
| May 15..... | do..... | 295 | 1,660 | 12.58 | |
| May 15..... | Ostrom and Lee..... | 295 | 1,670 | 12.60 | |
| May 22..... | G. A. Ostrom..... | 274 | 1,380 | 11.72 | |
| May 26..... | W. C. Sawyer..... | 297 | 1,560 | 12.30 | |
| June 2..... | G. A. Ostrom..... | 245 | 1,240 | 11.23 | |
| June 5..... | do..... | 304 | 1,780 | 12.84 | |
| June 11..... | do..... | 345 | 2,200 | 13.95 | |
| June 12..... | do..... | 347 | 2,420 | 14.55 | |
| June 13..... | do..... | 348 | 2,570 | 14.71 | |
| June 15..... | W. C. Sawyer..... | 323 | 1,640 | 12.55 | |
| June 21..... | G. A. Ostrom..... | 291 | 1,860 | 13.40 | |
| June 23..... | W. C. Sawyer..... | 287 | 1,490 | 12.08 | |
| June 29..... | G. A. Ostrom..... | 242 | 1,260 | 10.98 | |
| July 10..... | W. C. Sawyer..... | 241 | 1,180 | 10.78 | |
| July 14..... | G. A. Ostrom..... | 245 | 1,290 | 11.22 | |
| July 17..... | do..... | 212 | 1,020 | 10.00 | |
| July 21..... | do..... | 194 | 849 | 9.30 | |
| July 25..... | do..... | 193 | 890 | 9.68 | |
| July 28..... | do..... | 185 | 762 | 8.70 | |
| July 30..... | do..... | 169 | 594 | 8.04 | |
| August 1..... | do..... | 160 | 521 | 7.63 | |
| August 9..... | do..... | 153 | 463 | 7.16 | |
| August 16..... | do..... | 140 | 388 | 6.68 | |
| August 27..... | do..... | 131 | 327 | 6.34 | |
| September 5..... | W. F. Martin..... | 123 | 299 | 6.13 | |
| September 9..... | G. A. Ostrom..... | 123 | 294 | 6.08 | |
| September 18..... | do..... | 121 | 254 | 5.86 | |
| September 28..... | do..... | 118 | 238 | 5.75 | |
| October 9..... | do..... | 114 | 227 | 5.64 | |
| October 19..... | do..... | 113 | 221 | 5.58 | |
| November 23..... | W. F. Martin..... | 125 | 256 | 5.82 | |

Daily gage height, in feet, of Stanislaus River at Knights Ferry, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|------|
| 1. | 6.4 | 7.15 | 8.6 | 11.5 | 10.25 | 10.8 | 12.0 | 7.8 | 6.3 | 5.8 | 5.7 | 5.8 |
| 2. | 6.3 | 7.2 | 8.4 | 10.8 | 10.8 | 11.1 | 12.2 | 7.75 | 6.25 | 5.8 | 5.7 | 5.8 |
| 3. | 6.3 | 7.25 | 8.45 | 10.3 | 11.4 | 11.4 | 12.4 | 7.65 | 6.25 | 5.8 | 5.7 | 5.7 |
| 4. | 6.3 | 7.3 | 9.3 | 9.95 | 11.8 | 12.3 | 12.3 | 7.55 | 6.15 | 5.8 | 5.85 | 5.8 |
| 5. | 6.25 | 7.25 | 8.8 | 9.75 | 12.35 | 12.5 | 12.15 | 7.45 | 6.15 | 5.8 | 6.45 | 5.8 |
| 6. | 6.3 | 7.35 | 8.65 | 9.7 | 12.95 | 11.4 | 11.75 | 7.4 | 6.1 | 5.8 | 6.15 | 5.8 |
| 7. | 6.3 | 7.35 | 8.6 | 9.7 | 12.7 | 11.05 | 11.6 | 7.4 | 6.1 | 5.85 | 5.9 | 5.8 |
| 8. | 6.25 | 7.3 | 8.55 | 9.8 | 12.85 | 11.3 | 11.6 | 7.35 | 6.1 | 5.75 | 5.9 | 6.2 |
| 9. | 6.3 | 7.35 | 8.65 | 11.0 | 12.85 | 12.05 | 11.2 | 7.3 | 6.1 | 5.75 | 5.85 | 5.9 |
| 10. | 6.3 | 7.4 | 8.7 | 10.4 | 12.9 | 12.85 | 10.6 | 7.25 | 6.15 | 5.75 | 5.85 | 6.05 |
| 11. | 6.3 | 7.5 | 8.8 | 10.3 | 13.35 | 13.5 | 10.5 | 7.2 | 6.15 | 5.8 | 5.85 | 13.1 |
| 12. | 7.9 | 7.35 | 11.1 | 9.9 | 12.15 | 14.1 | 10.65 | 7.1 | 6.1 | 5.75 | 5.85 | 9.95 |
| 13. | 11.35 | 7.35 | 10.5 | 10.0 | 11.65 | 13.85 | 11.1 | 7.0 | 6.0 | 5.75 | 5.9 | 7.65 |
| 14. | 10.45 | 7.5 | 10.15 | 10.2 | 11.8 | 12.8 | 10.8 | 7.0 | 6.0 | 5.75 | 5.7 | 6.85 |
| 15. | 9.1 | 8.8 | 13.2 | 10.3 | 12.3 | 12.8 | 10.4 | 6.8 | 6.0 | 5.75 | 5.6 | 6.55 |
| 16. | 8.8 | 8.3 | 10.6 | 10.6 | 11.3 | 13.4 | 10.0 | 6.75 | 6.0 | 5.9 | 5.6 | 6.55 |
| 17. | 9.9 | 8.0 | 9.9 | 10.55 | 11.2 | 13.15 | 9.95 | 6.7 | 6.0 | 5.7 | 5.6 | 6.3 |
| 18. | 13.25 | 7.95 | 9.35 | 10.75 | 11.8 | 12.4 | 9.55 | 6.65 | 5.95 | 5.7 | 5.7 | 6.2 |
| 19. | 14.1 | 8.95 | 9.05 | 10.8 | 12.1 | 13.0 | 9.3 | 6.7 | 5.9 | 5.7 | 5.65 | 6.2 |
| 20. | 9.9 | 8.7 | 9.0 | 11.15 | 12.1 | 12.9 | 9.3 | 6.8 | 5.85 | 5.7 | 5.6 | 6.15 |
| 21. | 8.9 | 9.9 | 9.2 | 11.4 | 11.9 | 12.9 | 9.25 | 6.7 | 5.8 | 5.7 | 5.7 | 6.1 |
| 22. | 8.4 | 9.85 | 9.75 | 11.6 | 11.5 | 12.8 | 9.3 | 6.6 | 5.8 | 5.75 | 5.7 | 6.1 |
| 23. | 8.05 | 9.3 | 10.2 | 11.85 | 11.0 | 12.45 | 9.5 | 6.55 | 5.8 | 5.7 | 5.7 | 6.25 |
| 24. | 7.9 | 9.25 | 14.1 | 10.9 | 10.9 | 12.15 | 9.45 | 6.45 | 5.8 | 5.75 | 5.75 | 6.35 |
| 25. | 7.75 | 9.4 | 14.3 | 10.4 | 10.8 | 12.55 | 9.4 | 6.35 | 5.85 | 5.75 | 5.8 | 7.65 |
| 26. | 7.65 | 8.95 | 13.0 | 10.2 | 11.9 | 12.1 | 9.2 | 6.3 | 5.9 | 5.75 | 5.8 | 9.3 |
| 27. | 7.55 | 8.8 | 11.5 | 10.3 | 11.7 | 11.1 | 9.0 | 6.25 | 5.9 | 5.75 | 5.8 | 9.35 |
| 28. | 7.5 | 9.0 | 10.75 | 10.5 | 12.05 | 10.7 | 8.7 | 6.25 | 5.8 | 5.7 | 5.8 | 8.45 |
| 29. | 7.5 | ..... | 10.4 | 10.1 | 11.1 | 10.8 | 8.4 | 6.2 | 5.8 | 5.7 | 5.8 | 7.75 |
| 30. | 7.45 | ..... | 11.1 | 10.0 | 10.75 | 11.2 | 8.15 | 6.2 | 5.75 | 5.7 | 5.8 | 7.45 |
| 31. | 7.3 | ..... | 13.55 | ..... | 10.6 | ..... | 7.95 | 6.3 | ..... | 5.7 | ..... | 8.3 |

Rating table for Stanislaus River at Knights Ferry, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 5.60 | 65 | 6.70 | 640 | 7.80 | 1,540 | 8.90 | 2,800 | 11.00 | 6,140 |
| 5.70 | 95 | 6.80 | 710 | 7.90 | 1,640 | 9.00 | 2,930 | 11.20 | 6,540 |
| 5.80 | 130 | 6.90 | 790 | 8.00 | 1,740 | 9.20 | 3,200 | 11.40 | 6,970 |
| 5.90 | 170 | 7.00 | 870 | 8.10 | 1,850 | 9.40 | 3,480 | 11.60 | 7,410 |
| 6.00 | 220 | 7.10 | 950 | 8.20 | 1,960 | 9.60 | 3,760 | 11.80 | 7,880 |
| 6.10 | 270 | 7.20 | 1,030 | 8.30 | 2,070 | 9.80 | 4,060 | 12.00 | 8,390 |
| 6.20 | 320 | 7.30 | 1,110 | 8.40 | 2,190 | 10.00 | 4,380 | 13.00 | 11,110 |
| 6.30 | 380 | 7.40 | 1,190 | 8.50 | 2,310 | 10.20 | 4,710 | 14.00 | 14,020 |
| 6.40 | 440 | 7.50 | 1,270 | 8.60 | 2,430 | 10.40 | 5,050 | 15.00 | 17,180 |
| 6.50 | 500 | 7.60 | 1,360 | 8.70 | 2,550 | 10.60 | 5,400 | | |
| 6.60 | 570 | 7.70 | 1,450 | 8.80 | 2,670 | 10.80 | 5,760 | | |

NOTE.—This table is based on 40 discharge measurements made during 1906 and is well defined.

Monthly discharge of Stanislaus River at Knights Ferry, Cal., for 1906.

[Drainage area, 935 square miles.]

| Month. | Discharge in second-feet | | | Run-off. | | |
|------------|--------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | Total in acre-feet. | Sec.-ft. per sq. mile. | Depth in inches. |
| January. | 14,400 | 386 | 2,470 | 152,000 | 2.64 | 3.04 |
| February. | 4,290 | 1,060 | 2,070 | 115,000 | 2.21 | 2.30 |
| March. | 14,900 | 2,200 | 5,330 | 338,000 | 5.70 | 6.57 |
| April. | 8,110 | 3,920 | 5,330 | 317,000 | 5.70 | 6.36 |
| May. | 12,200 | 4,920 | 8,090 | 497,000 | 8.65 | 9.97 |
| June. | 14,400 | 5,590 | 9,540 | 556,000 | 9.99 | 11.15 |
| July. | 9,600 | 1,790 | 5,210 | 320,000 | 5.57 | 6.42 |
| August. | 1,600 | 415 | 910 | 56,000 | .973 | 1.12 |
| September. | 490 | 207 | 309 | 18,400 | .330 | .37 |
| October. | 251 | 162 | 193 | 11,900 | .206 | .24 |
| November. | 551 | 87 | 181 | 10,800 | .194 | .22 |
| December. | 11,400 | 141 | 1,270 | 78,100 | 1.36 | 1.57 |
| The year. | 14,900 | 87 | 3,390 | 2,460,000 | 3.63 | 49.33 |

NOTE.—The discharge of Stanislaus Water Company's canal and Schell ditch is included above. The discharge of Schell ditch has been assumed as 7 second-feet. Values are excellent, except January to April, which are rated as fair, because measurements made during that period give a discharge somewhat less than the rating.

STANISLAUS WATER COMPANY'S CANAL AT KNIGHTS FERRY, CALIF.

This station was established June 11, 1904. It is located below point where Schell ditch diverts its water, about 1 mile below Stanislaus Milling and Power Company's power house and 200 below the place where it passes under the Schell-ditch flume. Water diverted by this ditch is used for irrigation in the vicinity Oakdale, Cal.

Discharge measurements of Stanislaus Water Company's canal at Knights Ferry, in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Channel height. |
|--------------|-------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| May 15..... | C. H. Lee..... | 9 | 25.0 | 3.35 | |
| May 26..... | W. C. Sawyer..... | 9 | 26.3 | 3.48 | |
| June 15..... | do..... | 9 | 26.6 | 3.60 | |
| July 10..... | do..... | 9 | 29.0 | 3.77 | |

Daily gage height, in feet, of Stanislaus Water Company's canal at Knights Ferry, for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|-------|-------|-------|-------|------|-------|-------|------|-------|------|-------|
| 1..... | 2.3 | 2.9 | ..... | 1.65 | 3.5 | 3.6 | 3.75 | 2.55 | 3.4 | 3.1 | 2.95 |
| 2..... | 1.9 | 2.65 | ..... | 1.5 | 3.5 | 3.7 | 3.8 | 3.3 | 3.15 | 3.0 | 2.95 |
| 3..... | 2.15 | 2.7 | ..... | 2.0 | 3.5 | 3.8 | 3.7 | 3.25 | 3.25 | 3.1 | 2.95 |
| 4..... | 2.25 | 2.75 | ..... | 2.45 | 3.3 | 3.7 | 3.85 | 2.8 | 3.2 | 3.05 | 3.0 |
| 5..... | 2.25 | 2.75 | ..... | 2.15 | 3.4 | 3.7 | 3.8 | 2.95 | 3.2 | 3.0 | 3.0 |
| 6..... | 2.4 | 2.8 | ..... | ..... | 3.4 | 3.85 | 3.75 | 3.4 | 3.1 | 2.95 | 2.9 |
| 7..... | 2.4 | 2.75 | ..... | ..... | 3.2 | 3.6 | 3.8 | 3.45 | 3.2 | 3.0 | 2.85 |
| 8..... | 2.15 | 2.8 | 3.1 | ..... | 3.5 | 3.8 | 3.8 | 3.45 | 3.1 | 2.9 | 2.7 |
| 9..... | 2.3 | 3.1 | 3.35 | 3.1 | 3.7 | 3.8 | 3.8 | 3.4 | 3.2 | 3.0 | 2.9 |
| 10..... | 2.25 | 3.05 | 3.55 | 2.1 | 3.6 | 3.9 | 3.5 | 3.4 | 3.05 | 3.0 | 2.95 |
| 11..... | 2.2 | 3.0 | 3.2 | 2.05 | 3.3 | 3.8 | 3.8 | 3.4 | 3.0 | 3.05 | 2.95 |
| 12..... | 2.35 | 2.5 | 3.0 | 2.65 | 3.5 | 3.6 | 2.7 | 3.3 | 2.95 | 3.0 | 2.5 |
| 13..... | 2.45 | 2.2 | 2.85 | 2.7 | 3.6 | 3.65 | 3.75 | 3.2 | 2.95 | 3.0 | 2.5 |
| 14..... | 2.65 | 2.6 | 2.7 | 2.8 | 3.5 | 3.7 | 3.8 | 3.1 | 2.9 | 3.15 | 2.22 |
| 15..... | 2.6 | 3.0 | 2.45 | 3.0 | 3.55 | 3.7 | 3.2 | 3.15 | 3.1 | 3.05 | 1.9 |
| 16..... | 2.6 | 3.05 | 2.45 | 3.3 | 3.35 | 3.75 | 2.85 | 3.3 | 3.1 | 3.0 | 2.12 |
| 17..... | 2.75 | 3.1 | 2.2 | 3.4 | 3.6 | 3.55 | 3.2 | 3.3 | 2.85 | 3.05 | 2.05 |
| 18..... | 2.1 | 3.15 | 2.2 | 3.5 | 3.3 | 3.6 | 2.95 | 3.1 | 3.1 | 2.9 | 1.4 |
| 19..... | 2.5 | 2.75 | 2.6 | 3.55 | 3.6 | 3.6 | 3.5 | 3.2 | 3.1 | 2.95 | 1.45 |
| 20..... | 2.2 | 2.8 | 3.0 | 3.6 | 3.65 | 3.6 | 3.0 | 3.5 | 3.15 | 2.8 | 1.7 |
| 21..... | 2.15 | 2.9 | 2.8 | 3.55 | 3.65 | 3.6 | 3.55 | 3.5 | 3.2 | 2.8 | 1.1 |
| 22..... | 1.5 | 2.8 | 3.0 | 3.65 | 3.75 | 3.55 | 2.8 | 3.4 | 3.2 | 2.85 | 1.15 |
| 23..... | 1.35 | 2.75 | 3.0 | 3.35 | 3.75 | 3.6 | 3.6 | 3.4 | 3.15 | 2.9 | 1.15 |
| 24..... | ..... | 2.8 | 2.1 | ..... | 3.75 | 3.25 | 3.7 | 3.4 | 3.1 | 2.9 | 1.65 |
| 25..... | ..... | 2.45 | ..... | 3.6 | 3.7 | 3.6 | 3.7 | 3.15 | 3.05 | 2.9 | 1.65 |
| 26..... | ..... | ..... | ..... | 3.7 | 3.6 | 3.7 | 3.7 | 3.4 | 3.0 | 2.95 | 2.25 |
| 27..... | ..... | ..... | ..... | 3.6 | 3.6 | ..... | 3.7 | 3.3 | 3.15 | 2.9 | 2.3 |
| 28..... | ..... | ..... | ..... | 3.5 | 3.1 | ..... | 3.2 | 3.25 | 3.2 | 2.9 | 2.3 |
| 29..... | ..... | ..... | ..... | 3.3 | 3.3 | 3.0 | 3.65 | 3.2 | 3.05 | 2.85 | 2.35 |
| 30..... | ..... | ..... | ..... | 3.3 | 3.5 | 3.25 | 3.45 | 3.2 | 3.2 | 2.95 | 2.15 |
| 31..... | 2.65 | ..... | ..... | ..... | 3.5 | ..... | 3.3 | 3.4 | ..... | 3.0 | ..... |

NOTE.—Canal was dry on days when gage was not read.

Rating table for Stanislaus Water Company's canal at Knights Ferry for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 0.70 | 0 | 1.40 | 9 | 2.10 | 27 | 2.80 | 60 | 3.50 | 111 |
| 0.80 | 0.7 | 1.50 | 11 | 2.20 | 31 | 2.90 | 67 | 3.60 | 119 |
| 0.90 | 1.5 | 1.60 | 13 | 2.30 | 35 | 3.00 | 74 | 3.70 | 127 |
| 1.00 | 2.5 | 1.70 | 15 | 2.40 | 39 | 3.10 | 81 | 3.80 | 135 |
| 1.10 | 4.0 | 1.80 | 17 | 2.50 | 44 | 3.20 | 88 | 3.90 | 143 |
| 1.20 | 5.5 | 1.90 | 20 | 2.60 | 49 | 3.30 | 95 | 4.00 | 151 |
| 1.30 | 7 | 2.00 | 23 | 2.70 | 54 | 3.40 | 103 | | |

NOTE.—This table is based on 13 discharge measurements made during 1905-6 and is well defined. Discharges have been included in those for Stanislaus River, p. 170. The total discharge of the canal in 1906 was 50,300 acre-feet.

MOKELUMNE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Mokelumne River drains an area of 657 square miles of the western slope of the Sierra Nevada. It has numerous tributaries, North, South, and Middle forks being the most important. This stream heads well back in the main crest of the Sierra Nevada at an elevation of 8,000 feet.

The formation is of granite, with good soil covering and heavy timber growth on the middle and higher elevations. On the lower elevations the slopes are less rugged and the soil covering is of brush and scattering oak timber, with large areas of cultivated land and pasture. There are numerous small glacial lakes and moraines in the upper reaches of this basin. The precipitation varies from 25 inches on the lower to 50 inches on the higher elevations, where it falls in the form of snow, which melts in the early spring. The greatest discharge usually occurs in April, May, and June. There is some artificial storage in this basin, but not enough to have much effect on the discharge.

Several diversions are made for mining and power purposes within the drainage basin, and this water is returned to the river above the gaging station, which is located at Clements, a few miles above Lodi, Cal.

MOKELUMNE RIVER NEAR CLEMENTS, CAL.

This station was established October 28, 1904. It is located at the highway bridge, 1 mile north of Clements. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 223, where are given also references to publications that contain data for previous years.

Discharge measurements of Mokelumne River near Clements, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | c |
|------------------|------------------------|--------------|------------------|--------------|---|
| | | <i>Fect.</i> | <i>Sq. ft.</i> | <i>Fect.</i> | |
| February 11..... | F. R. S. Buttemer..... | 122 | 212 | 4.00 | S |
| February 27..... | do..... | 248 | 584 | 6.50 | |
| March 12..... | do..... | 251 | 1,310 | 9.15 | |
| March 19..... | do..... | 247 | 616 | 6.48 | |
| April 14..... | W. C. Sawyer..... | 255 | 962 | 8.28 | |
| April 20..... | do..... | 248 | 1,260 | 9.40 | |
| April 21..... | do..... | 250 | 1,400 | 10.00 | |
| April 28..... | do..... | 248 | 1,000 | 8.40 | |
| May 9..... | do..... | 251 | 1,710 | 11.55 | |
| May 10..... | do..... | 249 | 1,870 | 12.18 | |
| May 22..... | do..... | 252 | 1,220 | 10.02 | |
| May 23..... | do..... | 248 | 1,090 | 9.50 | |
| June 12..... | do..... | 263 | 2,470 | 14.35 | |
| June 13..... | do..... | 263 | 2,460 | 14.29 | |
| June 19..... | do..... | 251 | 1,970 | 12.20 | |
| June 20..... | do..... | 256 | 2,330 | 13.68 | |
| June 27..... | do..... | 249 | 1,390 | 9.80 | |
| June 28..... | do..... | 249 | 1,320 | 9.60 | |
| July 7..... | do..... | 250 | 1,610 | 10.75 | |
| July 17..... | do..... | 248 | 1,080 | 8.69 | |
| July 18..... | do..... | 258 | 1,060 | 8.46 | |
| July 28..... | do..... | 236 | 602 | 6.52 | |
| July 30..... | do..... | 204 | 392 | 5.65 | |
| August 7..... | Sawyer and Martin..... | 131 | 188 | 4.52 | |
| September 3..... | W. F. Martin..... | 77 | 141 | 4.05 | |
| November 24..... | do..... | 57 | 113 | 3.77 | |
| November 27..... | R. S. Hawley..... | 55 | 107 | 3.75 | |

Daily gage height, in feet, of Mokelumne River near Clements, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|
| 1..... | 3.05 | 4.5 | 6.05 | 11.2 | 8.45 | 9.45 | 10.95 | 5.15 | 3.8 | 3.8 | 4.0 |
| 2..... | 3.1 | 4.4 | 5.6 | 9.95 | 9.05 | 9.9 | 12.25 | 5.0 | 3.9 | 3.9 | 3.95 |
| 3..... | 3.1 | 4.45 | 5.85 | 8.75 | 10.5 | 10.45 | 12.15 | 5.2 | 3.8 | 3.85 | 3.95 |
| 4..... | 3.15 | 4.4 | 6.45 | 8.3 | 10.85 | 12.2 | 13.2 | 5.1 | 3.75 | 3.75 | 4.1 |
| 5..... | 3.15 | 4.45 | 5.75 | 7.95 | 11.6 | 12.15 | 12.4 | 4.95 | 3.75 | 3.95 | 5.15 |
| 6..... | 3.15 | 4.5 | 5.7 | 7.9 | 12.45 | 10.45 | 12.2 | 4.7 | 3.85 | 4.0 | 4.5 |
| 7..... | 3.15 | 4.5 | 5.75 | 7.75 | 12.5 | 9.6 | 11.35 | 5.15 | 4.0 | 3.85 | 4.4 |
| 8..... | 3.1 | 4.45 | 5.75 | 7.6 | 12.1 | 10.05 | 11.45 | 4.6 | 3.9 | 3.7 | 4.15 |
| 9..... | 3.1 | 4.5 | 5.95 | 7.75 | 12.4 | 11.6 | 11.15 | 4.8 | 4.05 | 4.0 | 4.1 |
| 10..... | 3.1 | 4.65 | 6.05 | 8.3 | 12.1 | 13.8 | 10.7 | 4.6 | 4.2 | 3.95 | 4.1 |
| 11..... | 3.15 | 4.7 | 6.05 | 8.5 | 12.2 | 14.3 | 10.4 | 4.9 | 4.4 | 3.85 | 3.75 |
| 12..... | 3.3 | 4.55 | 8.4 | 8.0 | 11.15 | 14.4 | 10.05 | 5.0 | ..... | 3.95 | 3.8 |
| 13..... | 5.6 | 4.5 | 8.1 | 7.8 | 10.2 | 13.8 | 10.05 | 4.55 | 3.9 | 3.9 | 3.9 |
| 14..... | 7.95 | 4.6 | 7.5 | 7.9 | 10.4 | 12.2 | 10.1 | 4.4 | 3.95 | 3.85 | 3.8 |
| 15..... | 6.05 | 5.05 | 11.5 | 8.3 | 10.9 | 11.7 | 9.65 | 4.4 | 4.0 | 3.9 | 4.1 |
| 16..... | 6.6 | 5.75 | 8.15 | 8.6 | 9.55 | 13.3 | 9.4 | 4.15 | 3.95 | 3.95 | 4.2 |
| 17..... | 7.75 | 5.15 | 7.4 | 8.6 | 9.15 | 12.9 | 8.9 | 3.9 | 4.05 | 3.95 | 4.0 |
| 18..... | 11.45 | 5.45 | 6.8 | 8.75 | 10.15 | 11.95 | 8.2 | 3.9 | 3.85 | 3.95 | 4.2 |
| 19..... | 12.7 | 6.75 | 6.45 | 8.95 | 10.75 | 12.55 | 7.55 | 3.9 | 3.85 | 3.9 | 4.2 |
| 20..... | 7.9 | 6.2 | 6.25 | 9.45 | 10.9 | 12.6 | 7.9 | 3.95 | 3.9 | 3.9 | 4.2 |
| 21..... | 7.0 | 7.45 | 6.65 | 9.9 | 10.45 | 12.45 | 7.85 | 3.85 | 3.9 | 3.75 | 4.2 |
| 22..... | 5.7 | 7.3 | 7.2 | 10.3 | 10.35 | 12.7 | 7.0 | 3.85 | 3.9 | 3.75 | 4.2 |
| 23..... | 5.3 | 6.5 | 8.1 | 10.3 | 9.4 | 12.2 | 7.5 | 3.95 | 3.9 | 3.95 | 4.2 |
| 24..... | 5.15 | 6.2 | 11.55 | 9.15 | 9.15 | 11.75 | 7.0 | 3.95 | 3.85 | 3.9 | 3.85 |
| 25..... | 4.9 | 6.1 | 12.05 | 8.55 | 9.15 | 12.25 | 6.65 | 4.2 | 3.95 | 3.95 | 3.85 |
| 26..... | 4.85 | 6.0 | 11.85 | 8.1 | 10.5 | 11.55 | 6.45 | 4.0 | 3.9 | 4.0 | 3.6 |
| 27..... | 4.7 | 6.25 | 10.45 | 8.25 | 10.5 | 10.9 | 6.25 | 3.8 | 4.0 | 3.85 | 3.95 |
| 28..... | 4.6 | 6.45 | 9.15 | 8.5 | 10.75 | 10.1 | 6.25 | 3.85 | 4.0 | 4.05 | 3.95 |
| 29..... | 4.55 | ..... | 8.5 | 8.05 | 10.2 | 10.45 | 5.65 | 3.8 | 3.9 | 3.8 | 4.1 |
| 30..... | 4.5 | ..... | 8.7 | 8.0 | 9.35 | 10.5 | 5.45 | 3.95 | 3.85 | 3.95 | 3.9 |
| 31..... | 4.45 | ..... | 13.45 | ..... | 9.25 | ..... | 5.3 | 3.85 | ..... | 4.05 | ..... |

Rating table for Mokeumne River near Clements, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 3.00 | 50 | 4.10 | 250 | 5.20 | 680 | 6.60 | 1,450 | 8.80 | 3,010 |
| 3.10 | 60 | 4.20 | 280 | 5.30 | 730 | 6.80 | 1,570 | 9.00 | 3,180 |
| 3.20 | 70 | 4.30 | 315 | 5.40 | 780 | 7.00 | 1,690 | 10.00 | 4,125 |
| 3.30 | 80 | 4.40 | 350 | 5.50 | 830 | 7.20 | 1,830 | 11.00 | 5,175 |
| 3.40 | 90 | 4.50 | 390 | 5.60 | 880 | 7.40 | 1,970 | 12.00 | 6,225 |
| 3.50 | 105 | 4.60 | 430 | 5.70 | 930 | 7.60 | 2,110 | 13.00 | 7,275 |
| 3.60 | 120 | 4.70 | 470 | 5.80 | 980 | 7.80 | 2,250 | 14.00 | 8,325 |
| 3.70 | 140 | 4.80 | 510 | 5.90 | 1,030 | 8.00 | 2,390 | | |
| 3.80 | 160 | 4.90 | 550 | 6.00 | 1,080 | 8.20 | 2,530 | | |
| 3.90 | 190 | 5.00 | 590 | 6.20 | 1,210 | 8.40 | 2,690 | | |
| 4.00 | 220 | 5.10 | 630 | 6.40 | 1,330 | 8.60 | 2,850 | | |

NOTE.—This table is based on 27 discharge measurements made during 1906, and is well defined between gage heights 3.7 feet and 14.3 feet.

Monthly discharge of Mokelumne River near Clements, Cal., for 1906.

[Drainage area, 642 square miles.]

| Month. | Discharge in second-feet. | | | Total in acre-feet. | Run-off. | |
|----------------|---------------------------|----------|-------|---------------------|------------------------|------------------|
| | Maximum. | Minimum. | Mean. | | Sec.-ft. per sq. mile. | Depth in inches. |
| January..... | 6,960 | 55 | 996 | 61,200 | 1.55 | 1.79 |
| February..... | 2,000 | 350 | 808 | 44,900 | 1.26 | 1.31 |
| March..... | 7,750 | 880 | 2,520 | 155,000 | 3.92 | 4.52 |
| April..... | 5,380 | 2,110 | 2,940 | 175,000 | 4.57 | 5.10 |
| May..... | 6,750 | 2,730 | 4,700 | 289,000 | 7.32 | 8.44 |
| June..... | 8,740 | 3,580 | 6,020 | 358,000 | 9.38 | 10.46 |
| July..... | 7,480 | 730 | 3,540 | 218,000 | 5.51 | 6.35 |
| August..... | 680 | 160 | 356 | 21,900 | .554 | .64 |
| September..... | 350 | 150 | 202 | 12,000 | .315 | .35 |
| October..... | 235 | 140 | 190 | 11,700 | .296 | .34 |
| November..... | 655 | 120 | 248 | 14,800 | .386 | .43 |
| December..... | 4,960 | 150 | 876 | 53,900 | 1.36 | 1.57 |
| The year..... | 5,740 | 55 | 1,950 | 1,420,000 | 3.04 | 41.30 |

NOTE.—These values are excellent, except January to March, which are rated as good because the measurements made during that period give a discharge somewhat in excess of the rating.

NORTHERN PACIFIC OCEAN DRAINAGE.

KLAMATH RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Klamath River drains a large area in California and Oregon, lying between the basins of Sacramento River on the south, Deschutes and Rogue rivers on the north, and the minor streams of the Great Basin on the east. Its headwaters lie at elevations of from 7,000 to 9,000 feet. The region contains many flat valleys in which the soil is favorable to irrigation. Many of the streams flow through marshes, which are susceptible of drainage and cultivation. The water surface in the basin is large, comprising three large lakes and many smaller ones.

Link River rises in Upper Klamath Lake and flows through a large swamp area, feeding Lower Klamath Lake by overflow at high water and receiving water from the lake at low stages. Below Keno it is

known as Klamath River, and flows southwestward through Siskiyou, Humboldt, and Del Norte counties, in California emptying into the Pacific.

Important power possibilities exist on the stream, notably Klamath Falls and at the rapids below Keno. Upper Klamath Lake is fed by Williamson River, and several smaller streams. Sprague River flows into Sprague River, a tributary of Williamson River.

Tule Lake lies just east of Lower Klamath Lake and has no surface outlet, but may have underground ones. Evaporation records at Keno indicate an annual loss of about 38 inches, while the rainfall and inflow amount to about 60 inches over the lake surface. The formation of the country is of a volcanic nature, showing many fissures where the rock is exposed, and this, together with the fact that many springs exist in the country to the southwest, tend to confirm the existence of such passages.

Lost River rises in Clear Lake and forms the principal supply for Tule Lake. Miller Creek enters Lost River from the east.

LINK RIVER AT KLAMATH FALLS, OREG.^a

This station was established May 15, 1904. It is located at the county bridge at Klamath Falls, Oreg., $1\frac{1}{2}$ miles below the outlet of Klamath Lake. The conditions at this station and the bench mark are described in Water Supply Paper No. 177, page 226, where are given also references to publications that contain data for previous years.

Discharge measurements of Link River at Klamath Falls, Oreg., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|--------------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec. ft.</i> |
| May 11..... | L. F. Hendricks..... | 288 | 1,900 | 5.06 | 3.3 |
| June 20..... | do..... | 290 | 1,650 | 4.65 | 3.4 |
| June 22..... | Clapp and Hendricks..... | 290 | 1,650 | 4.65 | 3.4 |
| July 9..... | L. F. Hendricks..... | 285 | 1,530 | 4.25 | 3.0 |
| July 24..... | do..... | 280 | 1,420 | 3.80 | 2.95 |
| August 22..... | do..... | 269 | 1,190 | 3.00 | 2.85 |
| December 20..... | do..... | 279 | 1,310 | 3.48 | 2.95 |

Daily gage height, in feet, of Link River at Klamath Falls, Oreg., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|------|------|------|------|-------|-------|------|-------|--------|--------|
| 1..... | 3.5 | 3.65 | 3.75 | 4.25 | 5.0 | 4.85 | 4.4 | 3.5 | 2.9 | 2.85 | 3.0 |
| 2..... | 3.45 | 3.65 | 3.9 | 4.2 | 5.05 | 4.85 | 4.35 | 3.5 | 2.85 | 2.9 | 3.3 |
| 3..... | 3.4 | 3.65 | 3.85 | 4.2 | 5.0 | 4.9 | 4.4 | 3.5 | 2.9 | 2.8 | 3.4 |
| 4..... | 3.5 | 3.65 | 3.7 | 4.2 | 4.95 | 4.9 | 4.4 | 3.45 | 2.9 | 2.8 | b 2.95 |
| 5..... | 3.5 | 3.65 | 3.7 | 4.2 | 5.0 | 4.95 | 4.3 | 3.45 | 2.9 | 2.85 | 2.95 |
| 6..... | 3.45 | 3.6 | 3.7 | 4.3 | 5.0 | 4.8 | 4.3 | 3.4 | 2.85 | b 2.85 | 2.95 |
| 7..... | 3.45 | 3.6 | 3.7 | 4.35 | 4.95 | 4.8 | 4.25 | 3.35 | 2.95 | b 2.85 | 2.95 |
| 8..... | 3.45 | 3.6 | 3.7 | 4.45 | 4.95 | 4.85 | 4.3 | 3.3 | 2.95 | 2.85 | 3.0 |
| 9..... | 3.5 | 3.6 | 3.75 | 4.4 | 5.0 | 4.8 | 4.25 | 3.3 | b 2.9 | 2.85 | 3.05 |
| 10..... | 3.5 | 3.6 | 3.75 | 4.5 | 5.05 | 4.95 | 4.2 | 3.3 | 2.8 | 2.85 | 3.05 |

^a This station was known as Klamath River at Klamath Falls, Oreg., in report for 1904.

^b Estimated.

Daily gage height, in feet, of Link River at Klamath Falls, Oreg., for 1906—Continued.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|------|-------|------|
| 11..... | 3.5 | 3.6 | 3.7 | 4.5 | 5.05 | 5.0 | 4.15 | 3.3 | 2.8 | 2.85 | 3.05 | 3.4 |
| 12..... | 3.5 | 3.6 | 3.85 | 4.5 | 4.9 | 4.9 | 4.15 | 3.2 | 2.85 | 2.8 | 3.1 | 3.4 |
| 13..... | 3.5 | 3.6 | 3.9 | 4.55 | 4.9 | 4.75 | 4.15 | 3.15 | 2.8 | 2.8 | 3.15 | 3.4 |
| 14..... | 3.6 | 3.6 | 3.9 | 4.6 | 5.1 | 4.7 | 4.05 | 3.2 | 2.8 | 2.9 | 3.1 | 3.4 |
| 15..... | 3.55 | 3.65 | 3.95 | 4.65 | 5.0 | 4.8 | 4.05 | 3.15 | 2.8 | 2.85 | 3.2 | 3.5 |
| 16..... | 3.8 | 3.6 | 3.9 | 4.75 | 4.9 | 4.75 | 4.05 | 3.15 | 2.85 | 2.85 | 3.2 | 3.45 |
| 17..... | 3.8 | 3.65 | 3.9 | 4.8 | 4.9 | 4.7 | 4.05 | 3.15 | 2.85 | 2.85 | 3.25 | 3.5 |
| 18..... | 3.8 | 3.75 | 3.95 | 4.8 | 5.15 | 4.65 | 4.00 | 3.1 | 2.85 | 2.85 | 3.2 | 3.45 |
| 19..... | 3.85 | 3.65 | 3.9 | 4.8 | 4.95 | 4.6 | 3.95 | 3.1 | 2.85 | 2.85 | 3.2 | 3.4 |
| 20..... | 3.8 | 3.65 | 3.95 | 4.85 | 4.9 | 4.65 | 3.95 | 3.05 | 2.85 | 2.9 | 3.2 | 3.5 |
| 21..... | 3.85 | 3.7 | 4.0 | 4.9 | 4.85 | 4.55 | 3.95 | 3.1 | 2.85 | 2.9 | 3.25 | 3.5 |
| 22..... | 3.7 | 3.7 | 3.95 | 4.95 | 4.8 | 4.6 | 3.85 | 3.0 | 2.8 | 2.9 | 3.15 | 3.6 |
| 23..... | 3.75 | 3.75 | 4.15 | 5.0 | 4.85 | 4.6 | 3.8 | 2.95 | 2.8 | 2.9 | 3.25 | a3.5 |
| 24..... | 3.75 | 3.7 | 3.95 | 4.95 | 4.9 | 4.6 | 3.75 | 3.0 | 2.9 | 2.9 | 3.3 | 3.5 |
| 25..... | 3.7 | 3.7 | 4.05 | 4.95 | 5.1 | 4.55 | 3.75 | 3.0 | 2.9 | 2.9 | a3.3 | a3.5 |
| 26..... | 3.7 | 3.85 | 4.0 | 4.95 | 5.0 | 4.55 | 3.7 | 3.05 | 2.85 | 2.9 | 3.3 | 3.6 |
| 27..... | 3.7 | 3.7 | 4.0 | 5.05 | 4.95 | 4.9 | 3.65 | 3.0 | 2.85 | 2.95 | 3.3 | 3.6 |
| 28..... | 3.7 | 3.6 | 4.05 | 5.1 | 5.0 | 4.5 | 3.7 | 2.9 | 2.85 | 2.95 | 3.3 | 3.6 |
| 29..... | 3.7 | ..... | 4.1 | 5.0 | 4.9 | 4.45 | 3.6 | 3.0 | 2.85 | 2.95 | 3.3 | 3.6 |
| 30..... | 3.7 | ..... | 4.2 | 4.95 | 4.9 | 4.45 | 3.55 | 2.9 | 2.85 | 2.9 | 3.3 | 3.6 |
| 31..... | 3.65 | ..... | 4.2 | ..... | 4.9 | ..... | 3.55 | 2.9 | ..... | 3.0 | ..... | 3.6 |

a Estimated.

Rating table for Link River at Klamath Falls, Oreg., for 1904-1906.

| Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. | Gage height. | Discharge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 2.80 | 1,150 | 3.30 | 1,585 | 3.80 | 2,175 | 4.30 | 2,900 | 4.80 | 3,770 |
| 2.90 | 1,200 | 3.40 | 1,690 | 3.90 | 2,310 | 4.40 | 3,060 | 4.90 | 3,960 |
| 3.00 | 1,300 | 3.50 | 1,800 | 4.00 | 2,450 | 4.50 | 3,250 | 5.00 | 4,150 |
| 3.10 | 1,390 | 3.60 | 1,920 | 4.10 | 2,590 | 4.60 | 3,400 | 5.10 | 4,340 |
| 3.20 | 1,485 | 3.70 | 2,045 | 4.20 | 2,740 | 4.70 | 3,580 | 5.20 | 4,530 |

NOTE.—This table is based on discharge measurements made during 1904-1906 and is fairly well defined.

Monthly discharge of Link River at Klamath Falls, Oreg., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|-------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 2,240 | 1,690 | 1,950 | 120,000 |
| February..... | 2,240 | 1,920 | 1,950 | 111,000 |
| March..... | 2,740 | 2,040 | 2,320 | 143,600 |
| April..... | 4,340 | 2,740 | 3,520 | 209,000 |
| May..... | 4,440 | 3,770 | 4,080 | 251,000 |
| June..... | 4,150 | 3,140 | 3,620 | 215,000 |
| July..... | 3,060 | 1,860 | 2,460 | 153,000 |
| August..... | 1,800 | 1,220 | 1,470 | 90,400 |
| September..... | 1,260 | 1,150 | 1,190 | 70,800 |
| October..... | 1,300 | 1,150 | 1,200 | 73,800 |
| November..... | 1,690 | 1,260 | 1,460 | 86,900 |
| December..... | 1,920 | 1,540 | 1,740 | 107,000 |
| The year..... | 4,440 | 1,150 | 2,250 | 1,630,000 |

NOTE.—These values are good.

UPPER KLAMATH LAKE NEAR KLAMATH FALLS, OREG.

This station was established in January, 1906, for recording the water level in Upper Klamath Lake. It is located at the southeast end of the lake and above the upper riffle at the head of Link River.

The gage is a vertical timber, graduated to feet and tenths fastened to posts driven in the lake bed a short distance from shore of the lake.

On February 16, 1906, a Friez's automatic water-stage register was installed and the mean daily gage height record has been computed from its register sheets.

Daily gage height, in feet, of Upper Klamath Lake at Klamath Falls, Oreg., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|
| 1..... | | | 5.30 | | 7.00 | 6.30 | 5.70 | 4.95 | 4.50 | 4.50 | 4.70 |
| 2..... | | | 5.25 | | 6.80 | 6.20 | 5.75 | 4.90 | 4.55 | 4.65 | 4.30 |
| 3..... | | | 5.35 | | 6.80 | 6.10 | 5.70 | 4.90 | 4.50 | 4.65 | 4.50 |
| 4..... | | 5.21 | 5.35 | | 6.80 | 6.20 | 5.75 | 4.85 | 4.50 | 4.60 | 4.50 |
| 5..... | | | 5.40 | | 6.70 | 6.30 | 5.70 | 4.90 | 4.50 | 4.55 | 4.60 |
| 6..... | | | 5.40 | | 6.60 | 6.20 | 5.65 | 4.90 | 4.50 | 4.50 | 4.60 |
| 7..... | 5.02 | | 5.40 | 6.15 | 6.50 | 6.20 | 5.60 | 4.90 | 4.35 | 4.50 | 4.70 |
| 8..... | | | 5.40 | 6.10 | 6.50 | 6.10 | 5.65 | 4.90 | 4.50 | 4.50 | 4.80 |
| 9..... | | | 5.40 | 6.20 | 6.40 | 6.20 | 5.60 | 4.80 | 4.60 | 4.50 | 4.80 |
| 10..... | | | 5.51 | 6.40 | 6.30 | 5.90 | 5.55 | 4.75 | 4.65 | 4.50 | 4.80 |
| 11..... | | 5.02 | | 6.40 | 6.60 | 5.70 | 5.50 | 4.70 | 4.55 | 4.50 | 4.85 |
| 12..... | | | | 6.30 | 6.60 | 6.20 | 5.40 | 4.80 | 4.40 | 4.55 | 4.75 |
| 13..... | | | | 6.40 | 6.40 | 6.20 | 5.45 | 4.70 | 4.60 | 4.50 | 4.90 |
| 14..... | 5.10 | | | 6.50 | 6.20 | 6.10 | 5.40 | 4.75 | 4.65 | 4.55 | 4.85 |
| 15..... | | | | 6.30 | 6.40 | 6.00 | 5.45 | 4.70 | 4.50 | 4.45 | 4.80 |
| 16..... | | 5.20 | | 6.50 | 6.40 | 6.20 | 5.35 | 4.75 | 4.55 | 4.50 | 5.00 |
| 17..... | | 5.20 | 5.50 | 6.50 | 6.30 | 6.10 | 5.35 | 4.70 | 4.50 | 4.65 | 5.30 |
| 18..... | | 5.21 | 5.50 | 6.50 | 6.30 | 6.20 | 5.30 | 4.75 | 4.55 | 4.70 | 5.15 |
| 19..... | | 5.21 | 5.50 | 6.50 | 6.40 | 6.20 | 5.25 | 4.70 | 4.55 | 4.80 | 5.95 |
| 20..... | | 5.20 | 5.40 | 6.30 | 6.50 | 6.20 | 5.20 | 4.70 | 4.55 | 4.75 | 5.85 |
| 21..... | 4.38 | 5.22 | 5.20 | 6.50 | 6.40 | 6.10 | 5.30 | 4.70 | 4.50 | 4.65 | 5.00 |
| 22..... | | 5.23 | 5.20 | 6.60 | 6.30 | 6.10 | 5.20 | 4.60 | 4.35 | 4.60 | 5.15 |
| 23..... | | 5.25 | 5.00 | 6.80 | 6.30 | 6.10 | 5.20 | 4.55 | 4.50 | 4.55 | 5.20 |
| 24..... | | 5.26 | 5.52 | 6.70 | 6.10 | 6.00 | 5.15 | 4.50 | 4.55 | 4.55 | 5.05 |
| 25..... | | 5.35 | 5.45 | 6.80 | 5.90 | 6.00 | 5.20 | 4.45 | 4.55 | 4.60 | 5.15 |
| 26..... | | 5.35 | 5.50 | 6.70 | 6.20 | 6.05 | 5.15 | 4.55 | 4.55 | 4.55 | 5.15 |
| 27..... | | 5.40 | 5.60 | 6.90 | 6.20 | 6.00 | 5.10 | 4.55 | 4.55 | 4.60 | 5.10 |
| 28..... | 5.29 | 5.35 | 5.55 | 7.00 | 6.50 | 5.95 | 5.10 | 4.55 | 4.50 | 4.60 | 5.05 |
| 29..... | | | 5.55 | 7.00 | 6.50 | 5.90 | 5.00 | 4.50 | 4.50 | 4.65 | 5.00 |
| 30..... | | | 5.50 | 6.80 | 6.40 | 5.80 | 5.10 | 4.50 | 4.55 | 4.70 | 5.00 |
| 31..... | | | 6.45 | | 6.40 | | 5.00 | 4.50 | | 4.75 | |

KLAMATH RIVER AT KENO, OREG.

This station was established August 13, 1904. It is located a fourth mile below the county bridge at Keno, Oreg. The conditions at this station and the bench marks are described in Water Supply Paper No. 177, page 229, where are given also references to publications that contain data for previous years.

Discharge measurements of Klamath River at Keno, Oreg, in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|------------------|----------------------|--------------|------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec. ft.</i> |
| May 8..... | L. F. Hendricks..... | 456 | 4,110 | 13.7 | |
| June 30..... | do..... | 430 | 3,840 | 13.1 | |
| July 23..... | do..... | 420 | 3,630 | 12.9 | |
| September 5..... | do..... | 405 | 3,300 | 12.05 | |

Daily gage height, in feet, of Klamath River at Keno, Oreg., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|------|-------|------|
| 1..... | 12.5 | 12.8 | 12.8 | 13.1 | 13.6 | 13.7 | 13.4 | 12.6 | 12.1 | 12.0 | 12.2 | 12.4 |
| 2..... | 12.5 | 12.8 | 12.9 | 13.1 | 13.6 | 13.7 | 13.4 | 12.6 | 12.1 | 12.0 | 12.2 | 12.4 |
| 3..... | 12.5 | 12.8 | 12.9 | 13.1 | 13.6 | 13.7 | 13.4 | 12.6 | 12.1 | 12.0 | 12.2 | 12.5 |
| 4..... | 12.5 | 12.8 | 12.8 | 13.1 | 13.7 | 13.7 | 13.3 | 12.6 | 12.1 | 12.0 | 12.2 | 12.5 |
| 5..... | 12.5 | 12.8 | 12.8 | 13.1 | 13.7 | 13.7 | 13.3 | 12.6 | 12.1 | 12.0 | 12.2 | 12.5 |
| 6..... | 12.5 | 12.8 | 12.8 | 13.2 | 13.7 | 13.7 | 13.3 | 12.6 | 12.1 | 12.0 | 12.2 | 12.5 |
| 7..... | 12.5 | 12.8 | 12.8 | 13.2 | 13.7 | 13.7 | 13.3 | 12.5 | 12.1 | 12.0 | 12.2 | 12.5 |
| 8..... | 12.5 | 12.7 | 12.8 | 13.2 | 13.7 | 13.7 | 13.3 | 12.5 | 12.1 | 12.0 | 12.2 | 12.5 |
| 9..... | 12.5 | 12.7 | 12.8 | 13.2 | 13.7 | 13.7 | 13.3 | 12.5 | 12.1 | 12.0 | 12.2 | 12.5 |
| 10..... | 12.5 | 12.7 | 12.8 | 13.2 | 13.7 | 13.7 | 13.2 | 12.5 | 12.1 | 12.0 | 12.2 | 12.5 |
| 11..... | 12.4 | 12.7 | 12.8 | 13.3 | 13.7 | 13.7 | 13.2 | 12.5 | 12.1 | 12.0 | 12.2 | 12.5 |
| 12..... | 12.5 | 12.7 | 12.8 | 13.3 | 13.7 | 13.6 | 13.2 | 12.5 | 12.0 | 12.0 | 12.3 | 12.5 |
| 13..... | 12.6 | 12.7 | 12.8 | 13.3 | 13.7 | 13.6 | 13.2 | 12.5 | 12.0 | 12.0 | 12.3 | 12.5 |
| 14..... | 12.7 | 12.7 | 12.8 | 13.3 | 13.7 | 13.6 | 13.2 | 12.4 | 12.0 | 12.0 | 12.3 | 12.5 |
| 15..... | 12.6 | 12.7 | 12.9 | 13.3 | 13.7 | 13.6 | 13.2 | 12.4 | 12.0 | 12.0 | 12.3 | 12.5 |
| 16..... | 12.7 | 12.7 | 12.9 | 13.4 | 13.7 | 13.6 | 13.2 | 12.4 | 12.0 | 12.0 | 12.3 | 12.5 |
| 17..... | 12.7 | 12.7 | 12.9 | 13.4 | 13.7 | 13.6 | 13.1 | 12.3 | 12.0 | 12.0 | 12.3 | 12.6 |
| 18..... | 12.7 | 12.7 | 12.9 | 13.4 | 13.7 | 13.6 | 13.1 | 12.3 | 12.0 | 12.0 | 12.3 | 12.6 |
| 19..... | 12.8 | 12.7 | 12.9 | 13.5 | 13.7 | 13.6 | 13.1 | 12.3 | 12.0 | 12.0 | 12.4 | 12.6 |
| 20..... | 12.8 | 12.7 | 12.9 | 13.5 | 13.7 | 13.5 | 13.1 | 12.3 | 12.0 | 12.1 | 12.4 | 12.6 |
| 21..... | 12.8 | 12.7 | 12.9 | 13.5 | 13.7 | 13.5 | 13.1 | 12.3 | 12.0 | 12.1 | 12.4 | 12.6 |
| 22..... | 12.8 | 12.8 | 12.9 | 13.5 | 13.7 | 13.5 | 13.0 | 12.2 | 12.0 | 12.1 | 12.4 | 12.7 |
| 23..... | 12.8 | 12.8 | 12.9 | 13.5 | 13.7 | 13.5 | 12.9 | 12.2 | 12.0 | 12.1 | 12.4 | 12.6 |
| 24..... | 12.8 | 12.8 | 12.9 | 13.5 | 13.7 | 13.5 | 12.9 | 12.2 | 12.0 | 12.1 | 12.4 | 12.6 |
| 25..... | 12.8 | 12.8 | 13.0 | 13.5 | 13.7 | 13.5 | 12.8 | 12.2 | 12.0 | 12.1 | 12.4 | 12.6 |
| 26..... | 12.8 | 12.8 | 13.0 | 13.5 | 13.7 | 13.5 | 12.8 | 12.2 | 12.0 | 12.1 | 12.4 | 12.6 |
| 27..... | 12.8 | 12.8 | 13.0 | 13.6 | 13.7 | 13.5 | 12.8 | 12.2 | 12.0 | 12.1 | 12.4 | 12.6 |
| 28..... | 12.8 | 12.8 | 13.0 | 13.6 | 13.7 | 13.4 | 12.8 | 12.2 | 12.0 | 12.1 | 12.4 | 12.6 |
| 29..... | 12.8 | ..... | 13.0 | 13.6 | 13.7 | 13.4 | 12.7 | 12.2 | 12.0 | 12.1 | 12.4 | 12.6 |
| 30..... | 12.8 | ..... | 13.0 | 13.6 | 13.7 | 13.4 | 12.7 | 12.2 | 12.0 | 12.1 | 12.4 | 12.7 |
| 31..... | 12.8 | ..... | 13.0 | ..... | 13.7 | ..... | 12.7 | 12.1 | ..... | 12.2 | ..... | 12.7 |

Rating table for Klamath River at Keno, Oreg., for 1904-1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 12.00 | 1,240 | 12.40 | 1,700 | 12.80 | 2,250 | 13.20 | 2,910 | 13.60 | 3,730 |
| 12.10 | 1,350 | 12.50 | 1,830 | 12.90 | 2,400 | 13.30 | 3,100 | 13.70 | 3,960 |
| 12.20 | 1,460 | 12.60 | 1,960 | 13.00 | 2,560 | 13.40 | 3,300 | | |
| 12.30 | 1,580 | 12.70 | 2,100 | 13.10 | 2,730 | 13.50 | 3,510 | | |

NOTE. This table is based on discharge measurements made during 1904-1906 and is well defined.

Monthly discharge of Klamath River at Keno, Oreg., for 1906.

| Month. | Discharge in second-feet. | | | Total in acre-feet. |
|----------------|---------------------------|----------|-------|---------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 2,250 | 1,700 | 2,050 | 126,000 |
| February..... | 2,250 | 2,100 | 2,180 | 121,000 |
| March..... | 2,560 | 2,250 | 2,380 | 146,000 |
| April..... | 3,730 | 2,730 | 3,220 | 192,000 |
| May..... | 3,960 | 3,730 | 3,940 | 242,000 |
| June..... | 3,960 | 3,300 | 3,710 | 221,000 |
| July..... | 3,300 | 2,100 | 2,750 | 169,000 |
| August..... | 1,960 | 1,350 | 1,680 | 103,000 |
| September..... | 1,350 | 1,240 | 1,280 | 76,200 |
| October..... | 1,460 | 1,240 | 1,290 | 79,300 |
| November..... | 1,700 | 1,460 | 1,580 | 94,000 |
| December..... | 2,100 | 1,700 | 1,900 | 117,000 |
| The year..... | 3,960 | 1,240 | 2,330 | 1,690,000 |

NOTE.—These values are excellent.

SYCAN RIVER NEAR SILVERLAKE, OREG.

This station was established May 2, 1905, and discontinued October 12, 1905. It is located about 30 miles south of Silverlake, Ore., in sec. 19, T. 32 S., R. 14 E. The conditions at this station and the bench marks are described in Water-Supply Paper No. 1, page 232.

Discharge measurements of Sycan River near Silverlake, Oreg., in 1905-6.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Discharge. |
|-----------------|------------------|--------------|------------------|--------------|-----------------|
| 1905. | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec. ft.</i> |
| March 16..... | Ivan Landes..... | 21 | 27.6 | 2.40 | 3.65 |
| April 10..... | do..... | 30 | 46.5 | 3.45 | 2.32 |
| May 2..... | do..... | 36 | 92.6 | 1.27 | 1.70 |
| June 12..... | do..... | 52 | 43.9 | 1.12 | |
| July 3..... | H. W. King..... | 19 | 11.9 | | |
| October 3..... | Ivan Landes..... | 14 | 14.9 | | |
| November 7..... | do..... | 12 | 7.1 | | |
| 1906. | | | | | |
| May 9..... | Ivan Landes..... | 62 | 238 | 6.20 | |
| May 31..... | do..... | 59 | 167 | 4.80 | |

Daily discharge, in second-feet, of Sycan River near Silverlake, Oreg., for 1905.

| Day. | May. | June. | July. | Aug. | Sept. | Oct. | Day. | May. | June. | July. | Aug. | Sept. | Oct. |
|---------|------|-------|-------|------|-------|------|---------|------|-------|-------|------|-------|------|
| 1..... | 160 | 87 | 33 | 10 | 6 | 8 | 17..... | 177 | 57 | 17 | 1 | 10 | |
| 2..... | 163 | 87 | 33 | 10 | 6 | 5 | 18..... | 164 | 50 | 17 | 2 | 12 | |
| 3..... | 150 | 87 | 30 | 6 | 8 | 9 | 19..... | 160 | 58 | 12 | 2 | 12 | |
| 4..... | 138 | 130 | 30 | 7 | 8 | 5 | 20..... | 172 | 51 | 14 | 3 | 10 | |
| 5..... | 132 | 142 | 28 | 1 | 9 | 9 | 21..... | 112 | 45 | 15 | 3 | 10 | |
| 6..... | 132 | 142 | 28 | 1 | 9 | 8 | 22..... | 122 | 34 | 15 | 4 | 10 | |
| 7..... | 138 | 155 | 28 | 1 | 9 | 14 | 23..... | 134 | 39 | 15 | 4 | 10 | |
| 8..... | 183 | 140 | 24 | 0 | 9 | 11 | 24..... | 122 | 39 | 15 | 5 | 10 | |
| 9..... | 164 | 140 | 24 | 0 | 11 | 12 | 25..... | 112 | 39 | 11 | 2 | 10 | |
| 10..... | 158 | 85 | 20 | 0 | 12 | 9 | 26..... | 146 | 42 | 10 | 2 | 10 | |
| 11..... | 158 | 76 | 20 | 0 | 9 | 9 | 27..... | 192 | 39 | 10 | 3 | 14 | |
| 12..... | 151 | 68 | 20 | 0 | 9 | 12 | 28..... | 134 | 39 | 10 | 3 | 11 | |
| 13..... | 164 | 76 | 19 | 0 | 10 | 9 | 29..... | 118 | 37 | 10 | 5 | 8 | |
| 14..... | 145 | 94 | 19 | 1 | 10 | 9 | 30..... | 107 | 37 | 10 | 5 | 8 | |
| 15..... | 151 | 76 | 19 | 1 | 10 | 8 | 31..... | 97 | | 10 | 6 | | |
| 16..... | 158 | 60 | 19 | 1 | 10 | 12 | | | | | | | |

NOTE.—These discharges were obtained by the indirect method for shifting channels.

Monthly discharge of Sycan River near Silverlake, Oreg., for 1905.

| Month. | Discharge in second-feet. | | | Total acre-ft. |
|-----------------|---------------------------|----------|-------|----------------|
| | Maximum. | Minimum. | Mean. | |
| May..... | 192 | 97 | 146 | |
| June..... | 155 | 34 | 75.0 | |
| July..... | 33 | 10 | 18.9 | |
| August..... | 10 | 0 | 2.87 | |
| September..... | 14 | 6 | 9.67 | |
| October..... | 24 | 5 | 13.4 | |
| The period..... | | | | 10 |

NOTE.—These values are fair.

LOST RIVER NEAR CLEAR LAKE, CAL.

This station was established September 1, 1904. It is located about 2 miles downstream from Jessie D. Carr's Clear Lake dam, a short distance below the dam site for Clear Lake reservoir, about 20 miles from Tule Lake post-office, Cal. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 233, where are given also references to publications that contain data for previous years.

Discharge measurements of Lost River near Clear Lake, Cal., in 1906.

| Date. | Hydrographer. | Width. | Area of section. | Gage height. | Dis-charge. |
|-----------------|----------------------|--------------|------------------|--------------|-----------------|
| | | <i>Fect.</i> | <i>Sq. ft.</i> | <i>Fect.</i> | <i>Sec.-ft.</i> |
| March 2..... | C. T. Darley..... | 192 | 95 | 6.18 | 146 |
| March 3..... | do..... | 192 | 93 | 6.25 | 157 |
| March 6..... | do..... | 125 | 141 | 6.60 | 235 |
| March 7..... | do..... | 127 | 203 | 7.18 | 452 |
| March 8..... | do..... | 135 | 238 | 7.35 | 554 |
| March 9..... | do..... | 126 | 204 | 7.18 | 460 |
| March 27..... | do..... | 148 | 407 | 8.80 | 1,330 |
| April 3..... | do..... | 150 | 421 | 9.00 | 1,480 |
| April 6..... | do..... | 150 | 449 | 9.10 | 1,610 |
| April 17..... | do..... | 148 | 376 | 8.50 | 1,270 |
| April 24..... | L. F. Hendricks..... | 135 | 246 | 7.50 | 626 |
| May 2..... | do..... | 125 | 168 | 6.90 | 365 |
| June 14..... | do..... | 65 | 60 | 5.80 | 58 |
| July 15..... | do..... | 10 | 10 | 5.20 | 13.9 |
| October 30..... | do..... | 18 | 13 | 5.20 | 10.2 |

Daily gage height, in feet, of Lost River near Clear Lake, Cal., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|------|-------|-------|-------|------|
| 1..... | 5.2 | 5.5 | 6.45 | 9.3 | 6.95 | 6.45 | 5.25 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 |
| 2..... | 5.2 | 5.5 | 6.15 | 9.1 | 6.85 | 6.3 | 5.2 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 |
| 3..... | 5.2 | 5.5 | 6.2 | 9.0 | 6.8 | 6.3 | 5.2 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 |
| 4..... | 5.2 | 5.5 | 6.15 | 9.0 | 6.75 | 6.3 | 5.1 | 5.1 | 5.1 | 5.2 | 5.3 | 5.3 |
| 5..... | 5.2 | 5.5 | 6.2 | 9.05 | 6.5 | 6.3 | 5.05 | 5.1 | 5.1 | 5.2 | 5.3 | 5.3 |
| 6..... | 5.2 | 5.5 | 6.55 | 9.1 | 6.45 | 6.4 | 5.0 | 5.1 | 5.1 | 5.2 | 5.3 | 5.3 |
| 7..... | 5.2 | 5.5 | 7.1 | 9.25 | 6.4 | 6.6 | 5.0 | 5.1 | 5.1 | 5.2 | 5.3 | 5.3 |
| 8..... | 5.2 | 5.5 | 7.25 | 9.3 | 6.35 | 6.55 | 5.0 | 5.1 | 5.1 | 5.2 | 5.3 | 5.3 |
| 9..... | 5.2 | 5.5 | 7.2 | 9.4 | 6.3 | 6.45 | 5.0 | 5.1 | 5.1 | 5.2 | 5.3 | 5.3 |
| 10..... | 5.2 | 5.5 | 7.4 | 9.4 | 6.25 | 6.2 | 5.0 | 5.1 | 5.1 | 5.2 | 5.3 | 5.35 |
| 11..... | 5.3 | 5.5 | 7.8 | 9.3 | 6.25 | 6.2 | 5.3 | 5.1 | 5.1 | 5.2 | 5.3 | 5.4 |
| 12..... | 5.3 | 5.5 | 7.75 | 9.3 | 6.2 | 6.1 | 5.25 | 5.1 | 5.1 | 5.2 | 5.3 | 5.45 |
| 13..... | 5.3 | 5.5 | 7.75 | 9.2 | 6.2 | 6.1 | 5.2 | 5.1 | 5.2 | 5.2 | 5.3 | 5.45 |
| 14..... | 5.4 | 5.5 | 7.75 | 9.0 | 6.2 | 6.0 | 5.2 | 5.1 | 5.2 | 5.2 | 5.3 | 5.5 |
| 15..... | 5.4 | 5.75 | 7.75 | 8.75 | 6.2 | 5.9 | 5.2 | 5.1 | 5.2 | 5.2 | 5.3 | 5.5 |
| 16..... | 5.5 | 5.85 | 7.75 | 8.5 | 6.2 | 5.85 | 5.2 | 5.1 | 5.2 | 5.2 | 5.3 | 5.5 |
| 17..... | 5.55 | 5.8 | 7.75 | 8.4 | 6.2 | 5.85 | 5.2 | 5.1 | 5.2 | 5.2 | 5.3 | 5.6 |
| 18..... | 5.55 | 5.8 | 7.85 | 8.2 | 6.2 | 5.8 | 5.2 | 5.1 | 5.2 | 5.2 | 5.3 | 5.6 |
| 19..... | 5.55 | 6.0 | 8.0 | 8.0 | 6.1 | 5.7 | 5.15 | 5.1 | 5.2 | 5.2 | 5.3 | 5.7 |
| 20..... | 5.55 | 6.7 | 8.1 | 7.8 | 6.1 | 5.6 | 5.15 | 5.1 | 5.2 | 5.2 | 5.3 | 5.7 |
| 21..... | 5.55 | 6.8 | 8.2 | 7.7 | 6.05 | 5.5 | 5.15 | 5.1 | 5.2 | 5.2 | 5.3 | 5.8 |
| 22..... | 5.55 | 6.85 | 8.3 | 7.65 | 6.05 | 5.5 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 | 5.8 |
| 23..... | 5.55 | 6.55 | 8.4 | 7.55 | 6.05 | 5.4 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 | 5.8 |
| 24..... | 5.5 | 6.25 | 8.5 | 7.55 | 6.0 | 5.35 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 | 6.15 |
| 25..... | 5.5 | 6.0 | 8.7 | 7.4 | 6.0 | 5.3 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 | 6.8 |
| 26..... | 5.5 | 6.2 | 8.8 | 7.25 | 6.0 | 5.4 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 | 7.2 |
| 27..... | 5.5 | 6.9 | 8.8 | 7.2 | 6.2 | 5.45 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 | 7.35 |
| 28..... | 5.5 | 6.6 | 8.8 | 7.1 | 6.4 | 5.35 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 | 7.3 |
| 29..... | 5.5 | ..... | 8.75 | 7.0 | 6.5 | 5.35 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 | 7.15 |
| 30..... | 5.5 | ..... | 8.8 | 7.0 | 6.6 | 5.35 | 5.1 | 5.1 | 5.2 | 5.2 | 5.3 | 7.0 |
| 31..... | 5.5 | ..... | 9.3 | ..... | 6.6 | ..... | 5.1 | 5.1 | ..... | ..... | ..... | 7.0 |

Rating table for Lost River near Clear Lake, Cal., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 5.00 | 5 | 5.80 | 66 | 6.60 | 252 | 7.40 | 562 | 8.40 | 1,100 |
| 5.10 | 8 | 5.90 | 81 | 6.70 | 286 | 7.50 | 608 | 8.60 | 1,230 |
| 5.20 | 12 | 6.00 | 98 | 6.80 | 320 | 7.60 | 654 | 8.80 | 1,360 |
| 5.30 | 17 | 6.10 | 118 | 6.90 | 356 | 7.70 | 702 | 9.00 | 1,500 |
| 5.40 | 23 | 6.20 | 140 | 7.00 | 392 | 7.80 | 755 | 9.20 | 1,640 |
| 5.50 | 30 | 6.30 | 164 | 7.10 | 432 | 7.90 | 810 | 9.40 | 1,785 |
| 5.60 | 40 | 6.40 | 191 | 7.20 | 474 | 8.00 | 865 | | |
| 5.70 | 52 | 6.50 | 220 | 7.30 | 518 | 8.20 | 980 | | |

NOTE.—This table is based on 15 discharge measurements made during 1906 and is well defined between gage heights 5.2 feet and 9.1 feet.

Monthly discharge of Lost River near Clear Lake, Cal., for 1906.

| Month. | Discharge in second-feet. | | | Total acre- ² |
|----------------|---------------------------|----------|-------|--------------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 35 | 12 | 23.6 | |
| February..... | 356 | 30 | 106 | |
| March..... | 1,710 | 129 | 797 | 4 |
| April..... | 1,780 | 392 | 1,150 | 6 |
| May..... | 374 | 98 | 177 | 1 |
| June..... | 252 | 17 | 99.2 | |
| July..... | 17 | 5 | 9.4 | |
| August..... | 8 | 8 | 8.0 | |
| September..... | 12 | 8 | 10.4 | |
| October..... | 12 | 12 | 12.0 | |
| November..... | 17 | 12 | 16.5 | |
| December..... | 540 | 17 | 127 | |
| The year..... | 1,780 | 5 | 211 | 15 |

NOTE.—Values are rated as follows: March to May, excellent; August to November, fair; remainder of 1906, good.

LOST RIVER NEAR MERRILL, OREG.

This station was established July 26, 1904. It is located about $1\frac{1}{2}$ miles downstream from the Stukel Bridge, 4 miles northwest of Merrill, Oreg. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 236, where are given also references to publications that contain data for previous years.

Discharge measurements of Lost River near Merrill, Oreg., in 1906.

| Date. | Hydrographer. | Width | Area of section. | Gage height. | Discharge |
|-------------------|----------------------|--------------|------------------|--------------|-------------|
| | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.</i> |
| February 27..... | C. T. Darley..... | 91 | 168 | 4.30 | |
| March 25..... | do..... | 130 | 908 | 10.75 | |
| March 27..... | R. Hubbard..... | 146 | 1,120 | 12.08 | |
| March 27..... | do..... | 146 | 1,140 | 12.22 | |
| March 28..... | do..... | 146 | 1,150 | 12.17 | |
| March 28..... | do..... | 145 | 1,110 | 12.06 | |
| March 28..... | do..... | 145 | 1,119 | 12.02 | |
| March 29..... | do..... | 144 | 1,090 | 11.62 | |
| March 29..... | do..... | 142 | 1,030 | 11.34 | |
| March 30..... | do..... | 142 | 970 | 11.04 | |
| April 1..... | do..... | 149 | 1,260 | 13.05 | |
| April 1..... | do..... | 149 | 1,270 | 13.18 | |
| April 2..... | do..... | 152 | 1,350 | 13.65 | |
| April 2..... | do..... | 152 | 1,350 | 13.66 | |
| April 10..... | C. T. Darley..... | 149 | 1,300 | 13.02 | |
| April 13..... | do..... | 145 | 1,100 | 11.92 | |
| April 14..... | do..... | 136 | 984 | 11.23 | |
| April 18..... | do..... | 138 | 824 | 9.80 | |
| April 19..... | do..... | 136 | 735 | 9.26 | |
| April 20..... | L. F. Hendricks..... | 132 | 563 | 8.32 | |
| April 25..... | C. T. Darley..... | 112 | 414 | 6.60 | |
| April 26..... | do..... | 112 | 406 | 6.50 | |
| April 30..... | L. F. Hendricks..... | 110 | 379 | 5.90 | |
| May 5..... | do..... | 105 | 241 | 4.80 | |
| May 29..... | do..... | 96 | 184 | 4.10 | |
| June 19..... | do..... | 92 | 146 | 3.98 | |
| September 10..... | do..... | 87 | 83 | 3.50 | |

Daily gage height, in feet, of Lost River near Merrill, Oreg., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|-------|-------|------|-------|-------|------|-------|------|-------|------|
| 1..... | 3.3 | 3.3 | 4.55 | 12.9 | 5.6 | 4.45 | 3.7 | 3.55 | 3.5 | 3.5 | 3.4 | 3.4 |
| 2..... | 3.3 | 3.3 | 5.2 | 13.6 | 5.3 | 4.45 | 3.7 | 3.55 | 3.5 | 3.5 | 3.4 | 3.4 |
| 3..... | 3.3 | 3.3 | 5.0 | 12.7 | 5.05 | 4.5 | 3.7 | 3.55 | 3.5 | 3.5 | 3.4 | 3.4 |
| 4..... | 3.3 | 3.3 | 4.6 | 11.5 | 5.0 | 4.3 | 3.7 | 3.55 | 3.5 | 3.5 | 3.4 | 3.4 |
| 5..... | 3.3 | 3.3 | 4.35 | 10.6 | 4.85 | 4.3 | 3.7 | 3.55 | 3.5 | 3.5 | 3.4 | 3.4 |
| 6..... | 3.3 | 3.4 | 4.2 | 10.45 | 4.65 | 4.25 | 3.7 | 3.55 | 3.5 | 3.5 | 3.4 | 3.4 |
| 7..... | 3.3 | 3.4 | 4.1 | 11.0 | 4.6 | 4.2 | 3.7 | 3.5 | 3.5 | 3.5 | 3.4 | 3.4 |
| 8..... | 3.3 | 3.4 | 4.1 | 11.75 | 4.6 | 4.3 | 3.65 | 3.5 | 3.5 | 3.5 | 3.4 | 3.4 |
| 9..... | 3.3 | 3.4 | 4.65 | 12.4 | 4.5 | 4.3 | 3.65 | 3.5 | 3.5 | 3.5 | 3.4 | 3.4 |
| 10..... | 3.3 | 3.4 | 5.8 | 13.0 | 4.45 | 4.3 | 3.6 | 3.5 | 3.5 | 3.5 | 3.4 | 3.4 |
| 11..... | 3.3 | 3.4 | 6.3 | 13.5 | 4.35 | 4.4 | 3.6 | 3.5 | 3.5 | 3.5 | 3.4 | 3.4 |
| 12..... | 3.3 | 3.4 | 6.7 | 13.05 | 4.25 | 4.15 | 3.7 | 3.5 | 3.5 | 3.5 | 3.4 | 3.45 |
| 13..... | 3.3 | 3.4 | 5.85 | 12.1 | 4.2 | 4.15 | 3.7 | 3.55 | 3.5 | 3.5 | 3.4 | 3.45 |
| 14..... | 3.3 | 3.45 | 5.5 | 11.2 | 4.3 | 4.1 | 3.6 | 3.55 | 3.5 | 3.5 | 3.4 | 3.45 |
| 15..... | 3.3 | 3.45 | 5.9 | 10.55 | 4.2 | 4.2 | 3.6 | 3.55 | 3.5 | 3.5 | 3.4 | 3.45 |
| 16..... | 3.3 | 3.5 | 5.2 | 10.1 | 4.15 | 4.2 | 3.6 | 3.5 | 3.5 | 3.5 | 3.4 | 3.45 |
| 17..... | 3.3 | 3.5 | 4.9 | 9.95 | 4.2 | 4.0 | 3.6 | 3.55 | 3.5 | 3.5 | 3.4 | 3.45 |
| 18..... | 3.3 | 3.6 | 4.5 | 9.9 | 4.25 | 3.9 | 3.6 | 3.55 | 3.5 | 3.5 | 3.4 | 3.45 |
| 19..... | 3.3 | 3.8 | 4.4 | 9.25 | 4.15 | 3.95 | 3.6 | 3.55 | 3.5 | 3.5 | 3.4 | 3.45 |
| 20..... | 3.3 | 4.0 | 4.35 | 8.45 | 4.05 | 3.85 | 3.6 | 3.55 | 3.5 | 3.5 | 3.4 | 3.45 |
| 21..... | 3.3 | 4.45 | 4.45 | 7.95 | 4.1 | 3.85 | 3.6 | 3.55 | 3.5 | 3.5 | 3.4 | 3.45 |
| 22..... | 3.3 | 5.15 | 4.75 | 7.4 | 4.05 | 3.8 | 3.6 | 3.5 | 3.5 | 3.5 | 3.4 | 3.45 |
| 23..... | 3.3 | 5.2 | 5.5 | 7.1 | 4.1 | 3.85 | 3.6 | 3.5 | 3.5 | 3.5 | 3.4 | 3.45 |
| 24..... | 3.3 | 5.3 | 8.9 | 6.85 | 4.0 | 3.85 | 3.55 | 3.55 | 3.5 | 3.5 | 3.4 | 3.45 |
| 25..... | 3.3 | 4.9 | 10.8 | 6.6 | 4.2 | 3.8 | 3.55 | 3.55 | 3.5 | 3.5 | 3.4 | 3.5 |
| 26..... | 3.3 | 4.5 | 11.4 | 6.5 | 4.1 | 3.8 | 3.55 | 3.55 | 3.5 | 3.5 | 3.4 | 3.5 |
| 27..... | 3.3 | 4.3 | 12.1 | 6.5 | 4.05 | 3.8 | 3.55 | 3.55 | 3.5 | 3.5 | 3.4 | 3.65 |
| 28..... | 3.3 | 4.3 | 12.1 | 6.25 | 4.05 | 3.8 | 3.55 | 3.55 | 3.5 | 3.5 | 3.4 | 4.85 |
| 29..... | 3.3 | ..... | 11.5 | 5.85 | 4.1 | 3.7 | 3.55 | 3.5 | 3.5 | 3.5 | 3.4 | 5.6 |
| 30..... | 3.3 | ..... | 11.05 | 5.9 | 4.15 | 3.7 | 3.55 | 3.5 | 3.5 | 3.5 | 3.4 | 5.2 |
| 31..... | 3.3 | ..... | 11.5 | ..... | 4.25 | ..... | 3.55 | 3.5 | ..... | 3.5 | ..... | 4.8 |

^a Estimated.

Rating tables for Lost River near Merrill, Oreg.

JANUARY 1 TO MAY 17, 1906.^a

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 3.30 | 102 | 4.50 | 467 | 5.70 | 887 | 6.50 | 1,272 | 8.50 | 2,006 |
| 3.40 | 125 | 4.60 | 502 | 5.80 | 922 | 6.60 | 1,307 | 9.00 | 2,080 |
| 3.50 | 150 | 4.70 | 537 | 5.90 | 957 | 7.00 | 1,342 | 9.20 | 2,160 |
| 3.60 | 176 | 4.80 | 572 | 6.00 | 992 | 7.20 | 1,414 | 9.40 | 2,240 |
| 3.70 | 203 | 4.90 | 607 | 6.10 | 1,027 | 7.40 | 1,488 | 9.60 | 2,320 |
| 3.80 | 232 | 5.00 | 642 | 6.20 | 1,062 | 7.60 | 1,562 | 9.80 | 2,400 |
| 3.90 | 262 | 5.10 | 677 | 6.30 | 1,097 | 7.80 | 1,636 | 10.00 | 2,480 |
| 4.00 | 294 | 5.20 | 712 | 6.40 | 1,132 | 8.00 | 1,710 | 11.00 | 2,930 |
| 4.10 | 328 | 5.30 | 747 | 6.50 | 1,167 | 8.20 | 1,784 | 12.00 | 3,440 |
| 4.20 | 362 | 5.40 | 782 | 6.60 | 1,202 | 8.40 | 1,858 | 13.00 | 4,000 |
| 4.30 | 397 | 5.50 | 817 | 6.70 | 1,237 | 8.60 | 1,932 | 14.00 | 4,630 |
| 4.40 | 432 | 5.60 | 852 | ..... | ..... | ..... | ..... | ..... | ..... |

MAY 18 TO DECEMBER 31, 1906.^b

| | | | | | | | | | |
|------|-----|------|-----|------|-----|-------|-------|-------|-------|
| 3.40 | 66 | 3.90 | 185 | 4.40 | 342 | 4.90 | 511 | 5.30 | 650 |
| 3.50 | 87 | 4.00 | 215 | 4.50 | 375 | 5.00 | 545 | 5.40 | 685 |
| 3.60 | 108 | 4.10 | 246 | 4.60 | 409 | 5.10 | 580 | 5.50 | 720 |
| 3.70 | 131 | 4.20 | 278 | 4.70 | 443 | 5.20 | 615 | 5.60 | 755 |
| 3.80 | 157 | 4.30 | 310 | 4.80 | 477 | ..... | ..... | ..... | ..... |

^a This table is based on discharge measurements made during 1904-1906 and is well defined.

^b This table is based on 3 discharge measurements made during 1906 and is well defined between gage heights 3.5 feet and 4.1 feet.

Monthly discharge of Lost River near Merrill, Oreg., for 1906.

| Month. | Discharge in second-feet. | | | Total acre-fe |
|----------------|---------------------------|----------|-------|------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 102 | 102 | 102 | 6 |
| February..... | 747 | 102 | 259 | 14 |
| March..... | 3,500 | 328 | 1,260 | 77 |
| April..... | 4,380 | 940 | 2,540 | 151 |
| May..... | 852 | 215 | 386 | 23 |
| June..... | 375 | 131 | 240 | 14 |
| July..... | 131 | 98 | 113 | 6 |
| August..... | 98 | 87 | 93.7 | 5 |
| September..... | 87 | 87 | 87.0 | 5 |
| October..... | 87 | 87 | 87.0 | 5 |
| November..... | 66 | 66 | 66.0 | 3 |
| December..... | 755 | 66 | 130 | 7 |
| The year..... | 4,380 | 66 | 447 | 186 |

NOTE.—These values are excellent except for May, which is good.

TULE LAKE NEAR MERRILL, OREG.

This station was established May 17, 1904, for recording the water level in Tule Lake. It is located on Tule Lake at the mouth of Lost River about 3 miles east of Merrill, Oreg., 25 miles south from Klamath Falls, and near the Oregon-California line. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 238.

Daily gage height, in feet, of Tule Lake near Merrill, Oreg., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|------|------|------|------|-------|-------|------|-------|------|------|------|
| 1..... | | | | 7.75 | | 9.0 | 8.85 | 8.4 | 7.75 | 7.4 | 7.15 | |
| 2..... | | 6.05 | 6.8 | | | | | | | | | |
| 3..... | | | | | | | | | | | | |
| 4..... | 6.5 | | | | | | | | | | | |
| 5..... | | | | 8.4 | | | | | 7.7 | | | |
| 6..... | | | | | 9.1 | | | 8.2 | | | | |
| 7..... | | 6.05 | 6.95 | | | 9.0 | 8.8 | | | 7.3 | | |
| 8..... | | | | | | | | | | | 7.15 | |
| 9..... | 6.5 | | | | | | | | | | | |
| 10..... | | | | | | 9.0 | | | | | | |
| 11..... | | | | | | | | | 7.6 | | | |
| 12..... | | | 7.1 | 8.85 | 9.1 | | 8.7 | 8.05 | | | | |
| 13..... | | | | | | | | | | | | |
| 14..... | | | | | | | | | | 7.2 | | |
| 15..... | | | | | | | | | | | 7.15 | |
| 16..... | | | | | | 8.9 | | | | | | |
| 17..... | | | | 9.0 | | | | 7.85 | 7.5 | | | |
| 18..... | 6.7 | | | | | | 8.45 | | | | | |
| 19..... | | | 7.3 | | 9.05 | | | | | | | |
| 20..... | | | 7.3 | | | | | | | | | |
| 21..... | | | | | | | | 7.8 | | | | |
| 22..... | | | 7.7 | 9.1 | | 8.85 | 8.4 | | 7.4 | | 7.0 | |
| 23..... | | | | | 9.0 | | | 7.8 | | 7.15 | | |
| 24..... | | | | | | | | | | | | |
| 25..... | | | | | | | | | | | | |
| 26..... | | | | | | | | | | | | |
| 27..... | | | | | | | | | | | | |
| 28..... | | | | | | | | | | | | |
| 29..... | | | | | | | | | | | | |
| 30..... | | | | | | | | | | | | |
| 31..... | | | | | | | | | | | | |

MILLER CREEK NEAR LORELLA, OREG.

This station was established August 10, 1904. It is located at the Horsefly dam site, 10 miles northeast of Lorella, Oreg. The conditions at this station and the bench marks are described in Water-Supply Paper No. 177, page 239, where are given also references to publications that contain data for previous years.

Discharge measurements of Miller Creek near Lorella, Oreg., by L. F. Hendricks, in 1906.

| Date. | Width. | Area of section. | Gage height. | Dis-charge. | Date. | Width. | Area of section. | Gage height. | Dis-charge. |
|-----------------------------|--------------|------------------|--------------|-----------------|---------------|--------------|------------------|--------------|-----------------|
| | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | | <i>Feet.</i> | <i>Sq. ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| March 27..... | 140 | 225 | 8.65 | 883 | April 6..... | 140 | 298 | 9.28 | 1,240 |
| March 28 ^a | 140 | 243 | 8.65 | 884 | April 9..... | 100 | 517 | 10.65 | 2,550 |
| March 29..... | 140 | 271 | 8.80 | 1,040 | April 10..... | 150 | 389 | 9.72 | 1,690 |
| March 30..... | 140 | 340 | 9.50 | 1,440 | April 22..... | 125 | 127 | 7.55 | 308 |
| March 30..... | 150 | 431 | 10.10 | 1,940 | April 25..... | 130 | 129 | 7.62 | 309 |
| April 4..... | 140 | 188 | 8.25 | 629 | July 14..... | | | 5.80 | 0 |
| April 5..... | 140 | 284 | 9.00 | 1,110 | | | | | |

^a Measured by C. T. Darley.

Daily gage height, in feet, of Miller Creek near Lorella, Oreg., for 1906.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Nov. | Dec. |
|---------|------|-------|------|-------|------|-------|-------|-------|------|
| 1..... | 6.2 | 6.3 | 7.0 | 8.1 | 7.0 | 7.2 | 6.15 | ..... | 6.1 |
| 2..... | 6.2 | 6.3 | 7.1 | 8.1 | 7.0 | 7.0 | 6.15 | ..... | 6.1 |
| 3..... | 6.2 | 6.3 | 7.1 | 8.4 | 6.9 | 6.9 | 6.1 | ..... | 6.1 |
| 4..... | 6.2 | 6.3 | 7.05 | 8.15 | 6.8 | 6.9 | 6.1 | ..... | 6.1 |
| 5..... | 6.2 | 6.3 | 7.0 | 9.2 | 6.7 | 7.0 | 6.05 | ..... | 6.2 |
| 6..... | 6.2 | 6.3 | 7.05 | 9.5 | 6.7 | 7.3 | 6.05 | ..... | 6.2 |
| 7..... | 6.3 | 6.3 | 7.2 | 9.9 | 6.7 | 7.2 | 6.0 | ..... | 6.35 |
| 8..... | 6.3 | 6.3 | 7.5 | 9.9 | 6.6 | 7.2 | 6.0 | ..... | 6.4 |
| 9..... | 6.4 | 6.3 | 7.7 | 10.5 | 6.6 | 7.1 | ..... | ..... | 6.3 |
| 10..... | 6.4 | 6.3 | 7.8 | 10.0 | 6.5 | 7.0 | ..... | ..... | 6.3 |
| 11..... | 6.4 | 6.3 | 7.7 | 9.1 | 6.5 | 6.9 | ..... | ..... | 6.3 |
| 12..... | 6.3 | 6.3 | 7.6 | 8.8 | 6.5 | 6.8 | ..... | ..... | 6.2 |
| 13..... | 6.3 | 6.3 | 7.5 | 8.8 | 6.6 | 6.8 | ..... | ..... | 6.2 |
| 14..... | 6.3 | 6.3 | 7.3 | 8.7 | 6.7 | 6.7 | ..... | ..... | 6.2 |
| 15..... | 6.3 | 6.3 | 7.1 | 8.7 | 6.7 | 6.6 | ..... | ..... | 6.2 |
| 16..... | 6.3 | 6.3 | 6.9 | 8.9 | 6.7 | 6.5 | ..... | ..... | 6.2 |
| 17..... | 6.3 | 6.3 | 6.7 | 8.5 | 6.7 | 6.5 | ..... | ..... | 6.2 |
| 18..... | 6.3 | 6.3 | 6.7 | 8.1 | 6.6 | 6.4 | ..... | 6.1 | 6.2 |
| 19..... | 6.3 | 6.3 | 6.7 | 7.9 | 6.6 | 6.4 | ..... | 6.1 | 6.2 |
| 20..... | 6.3 | 6.3 | 6.7 | 7.8 | 6.5 | 6.3 | ..... | 6.1 | 6.25 |
| 21..... | 6.3 | 6.3 | 7.2 | 7.7 | 6.5 | 6.3 | ..... | 6.1 | 6.3 |
| 22..... | 6.3 | 6.3 | 7.8 | 7.5 | 6.5 | 6.2 | ..... | 6.1 | 6.3 |
| 23..... | 6.3 | 6.3 | 8.3 | 7.5 | 6.5 | 6.2 | ..... | 6.1 | 6.4 |
| 24..... | 6.3 | 6.2 | 8.8 | 7.4 | 6.5 | 6.1 | ..... | 6.1 | 6.6 |
| 25..... | 6.3 | 6.4 | 9.7 | 7.5 | 6.4 | 6.1 | ..... | 6.1 | 7.65 |
| 26..... | 6.3 | 6.6 | 9.0 | 7.4 | 6.5 | 6.1 | ..... | 6.1 | 8.35 |
| 27..... | 6.3 | 6.7 | 8.6 | 7.3 | 6.8 | 6.1 | ..... | 6.1 | 7.95 |
| 28..... | 6.3 | 6.8 | 8.65 | 7.4 | 7.1 | 6.15 | ..... | 6.1 | 7.4 |
| 29..... | 6.3 | ..... | 8.65 | 7.4 | 7.5 | 6.15 | ..... | 6.1 | 7.4 |
| 30..... | 6.3 | ..... | 9.7 | 7.2 | 7.5 | 6.15 | ..... | 6.1 | 6.8 |
| 31..... | 6.3 | ..... | 9.6 | ..... | 7.4 | ..... | ..... | ..... | 6.6 |

NOTE.—The creek was dry July 7 to November 17.

Rating table for Miller Creek near Lorella, Oreg., for 1906.

| Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. | Gage height. | Dis-charge. |
|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|
| <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> | <i>Feet.</i> | <i>Sec.-ft.</i> |
| 6.00 | 0 | 6.50 | 52 | 7.00 | 290 | 8.40 | 715 | 9.40 | 1,415 |
| 6.10 | 1.5 | 6.60 | 67 | 7.70 | 337 | 8.50 | 775 | 9.60 | 1,575 |
| 6.20 | 4 | 7.00 | 86 | 7.80 | 387 | 8.60 | 835 | 9.80 | 1,745 |
| 6.30 | 8 | 7.10 | 109 | 7.90 | 437 | 8.70 | 900 | 10.00 | 1,915 |
| 6.40 | 13 | 7.20 | 136 | 8.00 | 490 | 8.80 | 965 | 10.20 | 2,085 |
| 6.50 | 20 | 7.30 | 168 | 8.10 | 545 | 8.90 | 1,035 | 10.40 | 2,265 |
| 6.60 | 29 | 7.40 | 205 | 8.20 | 600 | 9.00 | 1,110 | | |
| 6.70 | 39 | 7.50 | 245 | 8.30 | 655 | 9.20 | 1,260 | | |

NOTE.—This table is based on discharge measurements made during 1904-1906 and is well defined.

Monthly discharge of Miller Creek near Lorella, Oreg., for 1906.

| Month. | Discharge in second-feet. | | | Total acre-feet |
|----------------|---------------------------|----------|-------|--------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 13 | 4 | 7.7 | |
| February..... | 52 | 4 | 11.5 | |
| March..... | 1,660 | 39 | 445 | 27 |
| April..... | 2,360 | 136 | 779 | 46 |
| May..... | 245 | 13 | 56.7 | 3 |
| June..... | 168 | 1.5 | 47.3 | 2 |
| July..... | 2.8 | 0 | 0.3 | |
| August..... | 0 | 0 | 0 | |
| September..... | 0 | 0 | 0 | |
| October..... | 0 | 0 | 0 | |
| November..... | 1.5 | 0 | 0.6 | |
| December..... | 685 | 1.5 | 68.1 | 4 |
| The year..... | 2,360 | 0 | 118 | 85 |

NOTE.—Values are rated as follows: March to May and December, excellent; January, February and June, good; July and November, fair.

MISCELLANEOUS MEASUREMENTS IN KLAMATH RIVER DRAINAGE BASIN

Cherry Creek (North Fork) near Crystal, Oreg.—This stream is tributary to Upper Klamath Lake from the west. A measurement was made September 1, 1906, near the crossing on the road from Fort Klamath to Pelican Bay:

Width, 9.5 feet; area, 5.8 square feet; discharge, 9.4 second-feet.

Cottonwood Creek near Brownell, Cal.—Cottonwood Creek is tributary to Lower Klamath Lake from the south. The following measurements were made during 1906 at Brownell's "F" ranch:

February 13: Width, 22 feet; area, 25 square feet; discharge, 14 second-feet.

September 26: Width, 25 feet; area, 32 square feet; discharge, 12.2 second-feet.

Crooked Creek near Klamath Agency, Oreg.—This stream is a tributary of Wood River. A measurement was made August 31, 1906, at the bridge $1\frac{1}{2}$ miles from Klamath Agency on the road to Fort Klamath:

Width, 31 feet; area, 94 square feet; discharge, 59 second-feet.

Doris Creek near Doris, Cal.—Doris Creek is tributary to Lower Klamath Lake from the southwest. The following measurements were made during 1906 at Doris ranch:

March 22: Width, 5.4 feet; area, 7.4 square feet; discharge, 11.6 second-feet.

February 14: Width, 5.5 feet; area, 5.1 square feet; discharge, 8 second-feet.

September 26: Width, 13 feet; area, 13.7 square feet; discharge, 8.4 second-feet.

Fort Creek near Fort Klamath, Oreg.—This stream is a tributary of Wood River. A measurement was made August 31, 1906, at bridge 2 miles southeast from Fort Klamath on the road between Klamath Agency and Fort Klamath:

Width, 42 feet; area, 104 square feet; discharge, 115 second-feet.

Rock Creek near Odessa, Oreg.—This stream is tributary to Upper Klamath Lake from the west. A measurement was made September 3, 1906, at road crossing 7 miles below Odessa on the road from Odessa to Klamath Falls:

Width, 14 feet; area, 9.8 square feet; discharge, 12.8 second-feet.

Sevenmile Creek near Fort Klamath, Oreg.—This creek is tributary to Upper Klamath Lake. A measurement was made September 1, 1906, at the bridge on the road between Fort Klamath and Pelican Bay:

Width, 29 feet; area, 99 square feet; discharge, 83 second-feet.

Spring Creek near Klamath Agency, Oreg.—This stream is a small tributary of Crooked Creek. A measurement was made August 31, 1906, at the bridge 1 mile from Klamath Agency on the road to Fort Klamath:

Width, 22 feet; area, 42 square feet; discharge, 27 second-feet.

Willow Creek near Brownell, Cal.—Willow Creek is tributary to Lower Klamath Lake from the south. The following measurements were made during 1906 near the bridge on the Merrill and Brownell road:

February 13: Width, 18 feet; area, 13 square feet; discharge, 18 second-feet.

March 24: Width, 20.5 feet; area, 15.5 square feet; discharge, 17.2 second-feet.

September 26: Width, 35 feet; area, 26 square feet; discharge, 13 second-feet.

Wood River near Fort Klamath, Oreg.—Wood River is tributary to Upper Klamath Lake from the north. The following measurements were made August 30, 1906, at the bridge at Fort Klamath, Oreg.:

Width, 54 feet; area, 175 square feet; discharge, 257 second-feet.

At the bridge on the county road 4 miles below Fort Klamath, Oreg.:

Width, 55 feet; area, 313 square feet; discharge, 462 second-feet.

Williamson River near Klamath Agency, Oreg.—This stream is tributary to Upper Klamath Lake from the north. A measurement was made August 29 at the bridge on the county road between Klamath Falls and Fort Klamath, Oreg.:

Width, 162 feet; area, 1,348 square feet; discharge, 880 second-feet.

PRECIPITATION AND EVAPORATION DATA.

The following table gives the total precipitation and evaporation in inches, by months, and also the annual totals, for 1906:

Precipitation and evaporation in Klamath River basin.

PRECIPITATION.

| | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Annual |
|-----------------------------------|------|------|------|------|------|-------|-------|------|-------|-------|-------|-------|--------|
| Keno, Oreg. | 6.94 | 1.40 | 2.94 | 0.67 | 2.33 | 1.18 | 1.26 | 0.14 | 0.66 | 0.89 | 1.90 | 2.79 | 23.1 |
| Clear Lake, Oreg. | 4.00 | 2.07 | 3.62 | .09 | 2.7 | 1.05 | .60 | .00 | .76 | .41 | 2.05 | 3.70 | 21.1 |
| Horse-fly, near Lorella, Oreg. | 9.47 | 4.00 | 6.65 | .52 | 1.88 | 1.45 | .00 | .00 | .67 | ..... | ..... | ..... | ..... |

EVAPORATION.

| Keno, Oreg. | (a) | (a) | (a) | 3.03 | 4.58 | 4.04 | 5.87 | 4.69 | 3.27 | 2.22 | (a) | (a) | |
|------------------|-----|-----|-----|------|------|------|------|------|------|------|-----|-----|-------|
|------------------|-----|-----|-----|------|------|------|------|------|------|------|-----|-----|-------|

a Wind and ice destroys record.

b October 1 to 27, inclusive.

FLUCTUATIONS IN GROUND-WATER LEVELS IN THE VALLEY OF SOUTHERN CALIFORNIA.

By W. C. MENDENHALL.

In the summer of 1903 the United States Geological Survey undertook a systematic study of the occurrence, distribution, and proper use of the ground waters in the valley of southern California. During the preceding decade the underground waters of this part of California had been extensively drawn on as a source of supply for irrigation and for municipal use. Many independent enterprises were established which depended entirely on them, while older systems dependent in the beginning on gravity waters had found it necessary to augment their supply by utilizing subsurface waters. As a result of all this development—greater in the citrus regions, where the large values of the products raised by irrigation made it possible to pay high prices for water; somewhat less in the lower lands, suitable only for the cultivation of alfalfa or other farm products, which yield less profits than those from the horticultural lands—marked effects were produced on ground-water levels and on the yield of wells. It became evident, therefore, that any thorough study of conditions controlling the proper use of ground waters should involve the consideration of definite evidence as to their fluctuations and as to the relation of the fluctuations to development on the one hand and to the supply derived from annual rainfall on the other. During the decade of dry years which preceded 1903 it was evident that artesian areas had decreased, that the flow of individual wells had lessened, and that ground-water levels had been generally lowered; but definite observations as to the amount of these shrinkages for comparison with rainfall records were lacking except for a few wells. The Riverside Trust Company, the present owners of the Gage canal system and of the wells from which its water supplies are drawn, had maintained since 1892 a series of systematic measurements of variations of water level in the Williams well on the Victoria tract, and Mr. J. B. Neff,

of Anaheim, had maintained a similar series of measurements since 1898. Here and there throughout the valley of southern California scattered data were found bearing on the problem, but only in these two localities had systematic and continuous observations been made.

Because the ground waters of southern California occur not in one great basin but in a series of more or less completely separated subterranean reservoirs, the supply in each being dependent upon the relation between local development and local tributary rainfall, general conclusions that were applicable everywhere could not safely be based on the records furnished by the Williams and Neff wells. It was therefore decided, in the autumn of 1904, to begin an independent series of measurements in wells so selected that they would be evenly distributed over the various basins which together make up the lowland areas of southern California and would thus give an adequate basis for conclusions as to conditions in each of these basins. For this purpose a number of wells were selected in localities distributed from Santa Monica to San Bernardino and San Jacinto. The attempt was made to select wells in each of the important local ground-water districts which would adequately represent the various conditions that exist in each of these districts. Wells have been selected which are close to the larger river beds and therefore fluctuate rapidly through a wide range with flood-water and low-water periods, and other wells have been selected which are remote from these local sources of supply and which on this account exhibit comparatively minor variations. Some of these observation wells are situated in the vicinity of groups of large pumping plants; others are at points which are comparatively remote from these centers of great development, while still others were so selected as to form a series, like that in the El Monte basin, extending back from a stream channel, the line of most effective recharge, thereby enabling the student of ground-water supplies to trace the percolation wave and observe its diminishing intensity and amplitude as it advances from its point of origin. It is believed, therefore, that practically all conditions are well represented in the measurements which have been obtained.

At the time of the beginning of these measurements southern California was near the end of a long period of low rainfall, during which ground-water levels had materially declined. Since the beginning of measurements, however, there have been two winters in which the rainfall reached from 20 to 30 per cent above the average, and the present winter—that of 1906-7—it seems, will maintain this high average. Under these conditions, since ground waters are dependent as absolutely if not as obviously on rainfall as are surface waters, there should be a marked and general rise of the ground-water plan

if withdrawals are not in excess of the average annual restoration. Under conservative use of these waters the ground-water levels will decline during the dry periods but will recover correspondingly during the wet years. Continuous declines during seasons of excessive precipitation mean overuse.

A few of the results of these measurements have been discussed in Water-Supply Paper No. 218, which treats of ground-water conditions in the foothill belt only; but in order that all the observations made may be available for engineers and others who are interested in ground-water problems in southern California, they are more fully presented in the tables that follow.

A simple black and white index map (Pl. IV), on which the location of each record well is shown, accompanies the tables. On this map the wells are numbered, and corresponding numbers are given each record.

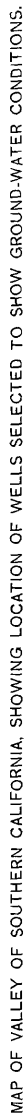
In order to facilitate still further the identification of the wells the name of the owner of nearly everyone of them is given, as well as the approximate position of each in relation to a near-by town.

Tables showing variations of water level in wells in southern California.

| 1. R. Kidson, $\frac{3}{4}$ mile NE. of Slauson. | | 2. Chinese gardeners, $\frac{1}{2}$ mile SW. of Slauson. | | 3. Eliza Connelly, $1\frac{1}{2}$ miles N. of Sunnyside. | |
|--|-------------------|--|-------------------|--|-------------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1905. | | 1904. | | 1905. | |
| Jan. 3. | 44 1 | Sept. 1. | 25 $2\frac{1}{2}$ | Jan. 3. | 22 5 |
| Feb. 6. | 44 6 | Oct. 3. | 22 $4\frac{1}{2}$ | Feb. 6. | 22 6 |
| Mar. 14. | 44 4 | Nov. 4. | 22 $7\frac{1}{2}$ | Mar. 14. | 21 11 |
| Apr. 10. | 44 1 | Dec. 6. | 22 2 | Apr. 10. | 21 6 |
| June 9. | 44 4 | | | May 3. | 21 5 |
| July 10. | 44 9 | 1905. | | June 9. | 22 $7\frac{1}{2}$ |
| Aug. 8. | 45 3 | Jan. 3. | 21 10 | July 10. | 23 6 |
| Sept. 11. | 45 11 | Feb. 6. | 21 9 | Nov. 3. | 23 10 |
| Nov. 3. | 46 2 | Mar. 14. | 21 $1\frac{1}{2}$ | Dec. 14. | 23 $\frac{1}{2}$ |
| Dec. 14. | 45 10 | Apr. 10. | 20 5 | | |
| 1906. | | May 3. | 20 5 | 1906. | |
| Jan. 22. | 46 10 | June 10. | 24 6 | Mar. 19. | 22 6 |
| Mar. 19. | 47 $7\frac{1}{2}$ | July 10. | 23 0 | May 2. | 22 $7\frac{1}{2}$ |
| May 2. | 44 11 | Aug. 8. | 24 0 | June 21. | 23 $9\frac{1}{2}$ |
| June 21. | 47 10 | Sept. 11. | 24 7 | Sept. 17. | 24 $4\frac{1}{2}$ |
| July 27. | 46 2 | Nov. 3. | 23 6 | Dec. 14. | 23 7 |
| Sept. 17. | 46 $6\frac{1}{2}$ | Dec. 14. | 23 $\frac{1}{2}$ | | |
| Dec. 14. | 46 8 | 1906. | | | |
| | | Jan. 22. | 22 6 | | |
| | | Mar. 19. | 22 1 | | |
| | | June 21. | 23 $6\frac{1}{2}$ | | |
| | | May 2. | 23 1 | | |
| | | July 27. | 24 $\frac{1}{2}$ | | |
| | | Sept. 17. | 25 3 | | |
| | | Dec. 14. | 23 $8\frac{1}{2}$ | | |

Tables showing variations of water level in wells in southern California—Continued

| 4. Mr. Till, $\frac{2}{3}$ miles S. of Slauson. | | 5. J. P. Brockley, $\frac{3}{4}$ mile N. of Howard Summit. | | 6. F. H. Carrell, $\frac{1}{4}$ miles S. of Gardena. | |
|---|-------------------------|--|-------------------|--|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Sept. 1..... | <i>Ft. in.</i> 29 10 | Oct. 3..... | 83 7 | Dec. 6..... | <i>Ft.</i> 2 |
| Oct. 3..... | 32 $1\frac{1}{2}$ | Nov. 4..... | 83 9 | | |
| Dec. 6..... | 31 11 | Dec. 6..... | 83 9 | | |
| 1905. | | 1905. | | 1905. | |
| Jan. 2..... | 29 7 | Jan. 3..... | 83 8 | Jan. 3..... | 2 |
| Feb. 6..... | 29 6 | Feb. 6..... | 83 8 | Feb. 6..... | 2 |
| Mar. 14..... | 29 1 | Mar. 14..... | 83 5 | Mar. 14..... | 2 |
| Apr. 10..... | 28 7 | Apr. 10..... | 83 5 | Apr. 12..... | 2 |
| May 3..... | 28 8 | May 3..... | 83 4 | May 3..... | 2 |
| June 9..... | 29 4 | June 9..... | 83 8 | June 9..... | 2 |
| July 10..... | 29 5 | July 10..... | 84 2 | July 10..... | 2 |
| Aug. 8..... | 30 1 | Aug. 8..... | 84 $7\frac{1}{2}$ | Aug. 8..... | 2 |
| Sept. 11..... | 30 6 | Sept. 11..... | 84 11 | Sept. 11..... | 2 |
| Nov. 3..... | 30 6 | Nov. 3..... | 85 1 | Nov. 3..... | 2 |
| Dec. 14..... | 30 6 | Dec. 14..... | 84 9 | Dec. 14..... | 2 |
| 1906. | | 1906. | | 1906. | |
| Jan. 22..... | 30 5 | Jan. 22..... | 84 $4\frac{1}{2}$ | Jan. 22..... | 2 |
| Mar. 19..... | 30 $7\frac{1}{2}$ | Mar. 19..... | 84 $6\frac{1}{2}$ | Mar. 19..... | 2 |
| May 2..... | 30 9 | May 2..... | 83 4 | May 2..... | 2 |
| June 21..... | 30 7 | June 21..... | 85 $2\frac{1}{2}$ | June 21..... | 2 |
| July 27..... | 31 0 | July 27..... | 85 1 | July 27..... | 3 |
| Sept. 17..... | 32 8 | Sept. 17..... | 85 9 | Sept. 17..... | 2 |
| Dec. 14..... | 31 $4\frac{1}{2}$ | Dec. 14..... | 87 2 | Dec. 14..... | 2 |
| 7. A. B. Caldwell, $\frac{1}{4}$ mile S. of Moneta. | | 8. H. J. Harris, $\frac{1}{4}$ mile N. of Moneta. | | 9. Stanley Bates, $\frac{3}{4}$ mile N. of Moneta. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Sept. 1..... | <i>Ft. in.</i> 41 11 | Sept. 1..... | 39 3 | Dec. 6..... | <i>Ft.</i> 3 |
| Oct. 3..... | 32 6 | Oct. 3..... | 37 9 | | |
| Nov. 4..... | 38 11 | Nov. 4..... | 35 0 | | |
| Dec. 6..... | 25 7 | Dec. 6..... | 32 4 | | |
| 1905. | | 1905. | | 1905. | |
| Jan. 3..... | 26 5 | Jan. 3..... | 26 $5\frac{1}{2}$ | Jan. 3..... | 3 |
| Feb. 6..... | 41 9 | Feb. 6..... | 25 11 | Feb. 6..... | 3 |
| Mar. 14..... | 23 10 | Mar. 14..... | 25 $8\frac{1}{2}$ | Mar. 14..... | 3 |
| Apr. 10..... | 48 2 | Apr. 10..... | 32 8 | Apr. 10..... | 3 |
| May 3..... | 42 10 | May 3..... | 28 3 | May 3..... | 3 |
| June 9..... | 32 2 | June 9..... | 35 2 | June 9..... | 3 |
| July 10..... | 33 0 | July 10..... | 33 9 | July 10..... | 3 |
| Aug. 8..... | 32 6 | Aug. 8..... | 33 7 | Aug. 8..... | 3 |
| Sept. 11..... | 33 0 | Sept. 11..... | 34 5 | Sept. 11..... | 3 |
| Nov. 3..... | 28 4 | Dec. 14..... | 26 7 | Nov. 3..... | 3 |
| Dec. 14..... | 24 11 | | | Dec. 14..... | 3 |
| 1906. | | 1906. | | 1906. | |
| Jan. 22..... | 24 6 | Jan. 22..... | 26 0 | Jan. 22..... | 3 |
| Mar. 19..... | 23 8 | Mar. 19..... | 23 7 | Mar. 19..... | 3 |
| May 2..... | 27 11 | May 2..... | 28 0 | May 2..... | 3 |
| June 21..... | 32 3 | June 21..... | 28 6 | June 21..... | 2 |
| July 27..... | 32 $6\frac{1}{2}$ | July 27..... | 34 0 | July 27..... | 2 |
| Sept. 17..... | 30 $8\frac{1}{2}$ | Sept. 17..... | 34 0 | Sept. 17..... | 2 |
| Dec. 14..... | 25 0 | Dec. 14..... | 26 2 | Dec. 14..... | 3 |



Tables showing variations of water level in wells in southern California—Continued.

| 10. Post and Lockhart, 2 miles W. of Howard Summit. | | 11. William Bayley, Chester place, Los Angeles. | | 12. Tony Fright, W. Jefferson street, Los Angeles. | |
|---|-----------------|---|-----------------|--|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> |
| Dec. 6. | 35 7½ | Dec. 9. | 69 0 | Dec. 9. | 48 6 |
| 1905. | | 1905. | | 1905. | |
| Jan. 3. | 36 9 | Jan. 6. | 69 2½ | Jan. 6. | 48 8 |
| Feb. 6. | 38 6 | Feb. 10. | 69 5 | Feb. 10. | 48 10 |
| Mar. 14. | 27 4 | Mar. 18. | 69 9 | Mar. 18. | 48 8½ |
| Apr. 10. | 35 8 | Apr. 10. | 69 8 | Apr. 10. | 48 4 |
| May 3. | 35 9 | May 6. | 69 8 | May 6. | 48 1 |
| July 10. | 38 6 | June 10. | 69 8 | June 10. | 48 6 |
| Aug. 8. | 40 3 | July 11. | 69 10 | July 11. | 48 10½ |
| Sept. 11. | 47 4 | Aug. 9. | 70 0 | Aug. 9. | 49 1½ |
| Dec. 14. | 39 3 | Sept. 12. | 70 1½ | Sept. 12. | 49 4½ |
| | | Nov. 4. | 70 4 | Nov. 4. | 49 6 |
| 1906. | | Dec. 15. | 70 5½ | Dec. 15. | 49 8½ |
| Jan. 22. | 36 0 | | | 1903. | |
| Mar. 19. | 34 3 | Jan. 23. | 70 6½ | Jan. 23. | 49 8 |
| May 2. | 35 4½ | Mar. 20. | 70 4 | Mar. 20. | 49 4 |
| June 21. | 38 2 | May 3. | 70 6½ | May 3. | 49 4 |
| July 27. | 37 10 | June 23. | 70 7 | June 22. | 49 6½ |
| Sept. 17. | 37 10½ | July 28. | 70 7 | July 28. | 49 10 |
| Dec. 14. | 37 1½ | Sept. 18. | 70 9 | Sept. 18. | 50 1 |
| | | Dec. 15. | 71 0 | Dec. 15. | 50 0 |

| 13. Mrs. Showers, W. Jefferson st., Los Angeles. | | 14. Artesian Land and Water Co., ¼ mile N. of Cienega station. | | 15. Los Angeles County, Ivy station. | |
|--|-----------------|--|-----------------|--------------------------------------|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | <i>Ft. in.</i> | 1905. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> |
| Oct. 3. | 33 8 | Feb. 10. | 6 11 | Dec. 9. | 13 11 |
| Nov. 7. | 33 9 | Mar. 17. | 5 8½ | | |
| Dec. 9. | 33 6 | Apr. 13. | 5 10 | 1905. | |
| 1905. | | May 6. | 6 1 | Jan. 6. | 13 0 |
| Jan. 6. | 33 6 | June 10. | 7 2 | Mar. 18. | 12 1 |
| Feb. 10. | 33 0 | July 11. | 7 9 | Apr. 13. | 12 0 |
| Mar. 18. | 32 2½ | Aug. 9. | 8 4 | June 10. | 12 3 |
| Apr. 12. | 32 1 | Sept. 12. | 8 9 | July 11. | 12 7 |
| May 6. | 32 9 | Dec. 15. | 8 1 | Aug. 9. | 13 0 |
| June 10. | 33 0 | | | Sept. 12. | 13 4½ |
| July 11. | 33 9 | 1906. | | Nov. 4. | 13 3 |
| Aug. 9. | 34 4 | Jan. 23. | 7 1 | Dec. 15. | 13 3½ |
| Sept. 12. | 34 7 | Mar. 20. | 7 10 | | |
| Nov. 4. | 34 9 | May 3. | 7 3½ | 1906. | |
| Dec. 15. | 34 3 | June 22. | 7 10 | Jan. 23. | 13 1 |
| 1906. | | July 28. | 9 0 | Mar. 20. | 12 5 |
| Jan. 23. | 34 1 | Sept. 18. | 9 6 | May 3. | 12 2 |
| Mar. 20. | 33 3 | Dec. 15. | 8 5½ | June 22. | 9 8½ |
| May 3. | 33 6 | | | July 28. | 12 10 |
| June 22. | 33 11 | | | Sept. 18. | 13 3 |
| May 3. | 33 6 | | | Dec. 15. | 13 3½ |
| June 22. | 33 11 | | | | |
| July 28. | 34 7½ | | | | |
| Sept. 18. | 35 3 | | | | |
| Dec. 15. | 34 9 | | | | |

Tables showing variations of water level in wells in southern California—Continued

| 16. M. P. Kane, Palms. | | 17. F. P. Bojorquez, Palms. | | 18. Jose Sesma, 1 mile N. of I station. | |
|---|-----------------|--|-----------------|---|--------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of Measurement. | Depth water. |
| 1904. | | 1904. | | 1904. | |
| Sept. 1..... | 50 8 | Oct. 13..... | 42 2½ | Dec. 2..... | 43 |
| Oct. 12..... | 49 6 | Nov. 7..... | 42 4 | | |
| Nov. 7..... | 49 6 | Dec. 9..... | 45 5 | 1905. | |
| Dec. 9..... | 50 2 | | | Jan. 6..... | 43 |
| 1905. | | 1905. | | Feb. 10..... | 43 |
| Jan. 6..... | 49 9 | Jan. 6..... | 42 9½ | Mar. 18..... | 43 |
| Mar. 18..... | 49 4 | Mar. 18..... | 43 3 | Apr. 13..... | 43 |
| Apr. 13..... | 49 4 | Apr. 13..... | 43 4½ | June 10..... | 43 |
| July 11..... | 49 8 | May 6..... | 43 6 | July 11..... | 43 |
| Aug. 9..... | 49 11 | June 10..... | 43 6 | Aug. 9..... | 43 |
| Sept. 12..... | 49 7 | July 11..... | 43 8 | Sept. 12..... | 43 |
| Dec. 15..... | 49 5½ | Aug. 9..... | 43 11 | Nov. 4..... | 42 |
| | | Sept. 12..... | 44 1 | Dec. 15..... | 43 |
| 1906. | | Nov. 4..... | 43 6 | | |
| Jan. 23..... | 49 6 | Dec. 15..... | 45 7 | 1906. | |
| Mar. 20..... | 49 2½ | | | May 3..... | 44 |
| June 22..... | 49 5 | 1906. | | June 22..... | 45 |
| July 28..... | 49 5½ | Jan. 23..... | 44 5 | July 28..... | 44 |
| Sept. 18..... | 49 10 | Mar. 20..... | 44 2 | Dec. 15..... | 44 |
| Dec. 15..... | 49 11 | May 3..... | 44 7 | | |
| | | June 22..... | 46 7 | | |
| | | July 28..... | 44 6½ | | |
| | | Sept. 18..... | 44 6 | | |
| | | Dec. 15..... | 44 8 | | |
| 19. J. H. Whitworth, 2 miles S. of Sherman. | | 20. Hammel and Decker, 1 mile S. of Sherman. | | 21. William Niles, ¾ mile of Sherman. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth water. |
| 1904. | | 1904. | | 1904. | |
| Dec. 9..... | 10 9 | Dec. 9..... | 13 6 | Oct. 14..... | 9 |
| 1905. | | 1905. | | Nov. 7..... | 9 |
| Jan. 6..... | 10 6 | Jan. 6..... | 13 6 | Dec. 9..... | 9 |
| Feb. 10..... | 9 9 | Feb. 10..... | 12 11½ | 1905. | |
| Mar. 18..... | 8 2 | Mar. 18..... | 11 9 | Jan. 6..... | 7 |
| Apr. 13..... | 8 0 | Apr. 13..... | 11 6 | Feb. 10..... | 6 |
| May 6..... | 8 4 | May 6..... | 11 7 | Mar. 18..... | 4 |
| June 10..... | 9 2 | June 10..... | 11 10 | Apr. 13..... | 6 |
| July 11..... | 9 0 | July 11..... | 12 1 | May 6..... | 6 |
| Aug. 9..... | 8 8 | Aug. 9..... | 12 4 | June 10..... | 7 |
| Nov. 4..... | 9 7½ | Sept. 12..... | 12 10 | July 11..... | 8 |
| Dec. 15..... | 9 4 | Nov. 4..... | 13 0 | Aug. 9..... | 8 |
| | | Dec. 15..... | 12 10 | Sept. 12..... | 9 |
| 1906. | | | | Dec. 15..... | 7 |
| Jan. 23..... | 8 9 | 1906. | | 1906. | |
| Mar. 20..... | 8 8 | Jan. 23..... | 12 4½ | Jan. 23..... | 7 |
| May 3..... | 7 8½ | Mar. 20..... | 12 1½ | Mar. 20..... | 7 |
| June 22..... | 9 5½ | May 3..... | 11 9½ | May 3..... | 7 |
| July 28..... | 9 8½ | June 22..... | 12 1 | June 22..... | 8 |
| Sept. 18..... | 10 1 | July 28..... | 12 7½ | July 28..... | 8 |
| Dec. 15..... | 8 7 | Sept. 18..... | 12 10½ | Sept. 18..... | 9 |
| | | Dec. 15..... | 12 6 | Dec. 15..... | 7 |

Tables showing variations of water level in wells in southern California—Continued.

| 22. Los Angeles County, 1 mile E. of Sherman. | | 23. Mr. Hurlbut, Pasadena. | | 24. L. V. Harkness, 1½ mile SE. of Pasadena. | |
|---|-----------------|--|-----------------|--|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> |
| Dec. 9..... | 84 3½ | Sept. 2..... | 73 3 | Sept. 2..... | 122 4 |
| 1905. | | Oct. 5..... | 73 10 | Oct. 5..... | 122 2½ |
| Jan. 6..... | 84 5½ | Nov. 8..... | 73 11 | Nov. 8..... | 122 7 |
| Feb. 10..... | 84 6 | Dec. 10..... | 74 6 | Dec. 10..... | 122 6½ |
| Mar. 18..... | 84 6 | 1905. | | 1905. | |
| Apr. 13..... | 84 4 | Jan. 4..... | 74 6 | Feb. 9..... | 122 2 |
| May 6..... | 84 3 | Feb. 9..... | 74 4 | Mar. 17..... | 122 2 |
| June 10..... | 84 6 | Apr. 12..... | 73 8 | Apr. 12..... | 122 2 |
| July 11..... | 84 6 | May 10..... | 73 5 | May 10..... | 122 1 |
| Aug. 9..... | 84 10 | June 13..... | 73 5 | June 13..... | 122 4 |
| Sept. 12..... | 85 2 | July 12..... | 74 0 | July 12..... | 123 3 |
| Nov. 4..... | 86 0 | Aug. 10..... | 74 5 | Aug. 10..... | 123 5 |
| Dec. 15..... | 86 9 | Sept. 13..... | 75 0 | Sept. 13..... | 124 0 |
| 1906. | | Nov. 7..... | 75 0 | Nov. 7..... | 124 1 |
| Jan. 23..... | 84 6 | Dec. 18..... | 75 9 | Dec. 18..... | 123 7 |
| Mar. 20..... | 86 3 | 1906. | | 1906. | |
| May 3..... | 86 5 | Mar. 22..... | 74 6 | Jan. 24..... | 123 3½ |
| June 22..... | 86 8½ | May 5..... | 74 9 | Mar. 22..... | 123 2½ |
| July 28..... | 87 5½ | June 25..... | 74 6 | May 5..... | 122 11 |
| Sept. 18..... | 87 8½ | July 31..... | 75 3½ | June 25..... | 122 8 |
| Dec. 15..... | 88 1 | Sept. 20..... | 76 1½ | July 31..... | 123 6½ |
| | | Dec. 17..... | 77 1 | Sept. 20..... | 123 10 |
| | | | | Dec. 17..... | 123 1½ |
| 25. Titus ranch, Sunny Slope station. | | 26. John McClain estate, 1 mile S. of San Gabriel. | | 27. F. E. Wilson, 2 miles S. of San Gabriel. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> |
| Dec. 10..... | 13 6 | Dec. 10..... | 72 11 | Dec. 10..... | 23 5½ |
| 1905. | | 1905. | | 1905. | |
| Jan. 4..... | 10 4½ | Jan. 4..... | 72 10 | Jan. 4..... | 23 6 |
| Feb. 9..... | 8 7 | Feb. 9..... | 73 0 | Feb. 7..... | 23 3 |
| Mar. 17..... | 8 6 | Mar. 17..... | 72 10 | Mar. 17..... | 22 8½ |
| Apr. 12..... | 7 8 | Apr. 12..... | 72 7 | Apr. 12..... | 21 0 |
| May 10..... | 8 1 | June 13..... | 73 4 | July 12..... | 21 4 |
| June 13..... | 11 6 | July 12..... | 73 3 | Aug. 10..... | 22 6 |
| July 12..... | 16 1 | Aug. 10..... | 74 1 | Sept. 13..... | 22 3 |
| Aug. 10..... | 19 2 | Dec. 18..... | 73 0 | Nov. 17..... | 22 8 |
| Sept. 13..... | 16 2 | 1906. | | Dec. 18..... | 22 11 |
| Nov. 7..... | 12 10 | Mar. 22..... | 72 8½ | 1906. | |
| Dec. 18..... | 10 7 | May 5..... | 72 7½ | Jan. 24..... | 22 3 |
| 1906. | | June 25..... | 72 8 | Mar. 22..... | 23 0 |
| Jan. 24..... | 10 9 | July 31..... | 72 3½ | May 5..... | 22 8 |
| Mar. 22..... | 10 0 | Sept. 20..... | 72 1 | June 25..... | 21 8 |
| June 25..... | 8 6 | Dec. 17..... | 71 4 | July 31..... | 21 4 |
| May 5..... | 8 4 | | | Dec. 17..... | 21 11 |
| May 5..... | 8 4 | | | | |
| July 31..... | 18 3 | | | | |
| Sept. 20..... | 16 9½ | | | | |
| Dec. 17..... | 14 2½ | | | | |

Tables showing variations of water level in wells in southern California—Continued

| 28. G. B. Renfro, $\frac{1}{4}$ mile SW. of Savannah. | | 29. J. A. Law, $\frac{1}{2}$ mile W. of El Monte. | | 30. M. Ritter, El Monte. | |
|---|--------------------|---|---------------------|--|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> | 1904. | <i>Ft.</i> |
| Dec. 9..... | 19 6 | Dec. 10..... | 16 2 | Nov. 8..... | 22 |
| 1905. | | 1905. | | Dec. 10..... | 22 |
| Jan. 4..... | 20 1 $\frac{1}{2}$ | Jan. 4..... | 16 1 $\frac{1}{2}$ | 1905. | |
| Feb. 9..... | 20 0 | Feb. 9..... | 16 3 | Jan. 4..... | 22 |
| Mar. 17..... | 19 3 | Mar. 17..... | 13 8 | Feb. 9..... | 21 |
| Apr. 12..... | 18 4 | Apr. 12..... | 13 2 | Mar. 17..... | 20 |
| May 10..... | 17 8 | July 12..... | 13 1 | Apr. 12..... | 18 |
| June 13..... | 18 7 | Aug. 10..... | 13 5 $\frac{1}{2}$ | May 10..... | 16 |
| July 12..... | 18 11 | Sept. 13..... | 14 4 | June 13..... | 16 |
| Aug. 10..... | 19 2 | Nov. 7..... | 14 1 | July 12..... | 17 |
| Sept. 13..... | 20 0 | Dec. 18..... | 13 9 | Aug. 10..... | 16 |
| Nov. 7..... | 20 3 | 1906. | | Sept. 13..... | 17 |
| 1906. | | Jan. 24..... | 13 8 $\frac{1}{2}$ | Nov. 7..... | 18 |
| Jan. 24..... | 19 10 | Mar. 22..... | 12 6 | Dec. 18..... | 18 |
| Mar. 22..... | 18 11 | May 5..... | 11 8 | 1906. | |
| May 5..... | 18 1 | June 25..... | 11 5 | Jan. 24..... | 18 |
| June 25..... | 18 4 | July 31..... | 11 10 $\frac{1}{2}$ | Mar. 22..... | 17 |
| July 31..... | 18 8 | Sept. 20..... | 12 2 $\frac{1}{2}$ | May 5..... | 14 |
| Dec. 17..... | 18 8 | Dec. 17..... | 11 9 | June 25..... | 12 |
| | | | | July 31..... | 12 |
| | | | | Sept. 20..... | 14 |
| | | | | Dec. 17..... | 14 |
| | | | | | |
| 31. Mrs. McClure, $\frac{3}{4}$ mile S. of El Monte. | | 32. T. D. Andrews, $1\frac{1}{2}$ mile SE. of El Monte. | | 33. Jackson Frees, 2 miles S. of El Monte. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1905. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> | 1905. | <i>Ft.</i> |
| Jan. 4..... | 16 6 | Dec. 10..... | 21 5 $\frac{1}{2}$ | Feb. 9..... | 27 |
| Feb. 9..... | 15 10 | 1905. | | Mar. 17..... | 23 |
| Mar. 17..... | 14 2 | Jan. 4..... | 21 5 | Apr. 12..... | 20 |
| July 12..... | 12 5 | Feb. 9..... | 20 8 | May 10..... | 20 |
| Aug. 10..... | 13 9 | Mar. 17..... | 17 10 | June 13..... | 18 |
| Sept. 13..... | 14 8 | Apr. 12..... | 15 10 | July 12..... | 19 |
| Nov. 7..... | 13 6 | May 10..... | 14 8 | Aug. 10..... | 21 |
| Dec. 18..... | 13 6 | June 12..... | 13 8 | Sept. 13..... | 22 |
| 1906. | | July 12..... | 13 9 | Nov. 7..... | 23 |
| Jan. 24..... | 13 1 | Aug. 10..... | 15 9 | Dec. 18..... | 22 |
| Mar. 22..... | 12 10 | Sept. 13..... | 16 10 | 1906. | |
| May 5..... | 10 6 | Nov. 7..... | 17 3 | Jan. 24..... | 19 |
| June 25..... | 10 0 | Dec. 17..... | 17 0 | Mar. 22..... | 22 |
| July 31..... | 10 4 $\frac{1}{2}$ | 1907. | | May 5..... | 18 |
| Sept. 20..... | 12 3 $\frac{1}{2}$ | Jan. 24..... | 17 4 | June 25..... | 18 |
| Dec. 17..... | 10 7 | Mar. 22..... | 15 4 | July 31..... | 17 |
| | | May 5..... | 12 8 | Sept. 20..... | 18 |
| | | June 25..... | 11 9 | Dec. 17..... | 19 |
| | | July 31..... | 12 2 | | |
| | | Sept. 20..... | 13 5 $\frac{1}{2}$ | | |
| | | Dec. 17..... | 13 8 | | |

Tables showing variations of water level in wells in southern California—Continued.

| 34. E. Gurado 3 miles W. of Whittier. | | 35. Mrs. Mary Pheland, 2 miles SW. of Whittier. | | 36. H. C. Faldwin, $\frac{1}{2}$ mile SE. of Whittier. | |
|--|-------------------|---|--------------------|---|--------------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Oct. 4. | 14 2 | Nov. 9. | 15 3 | Sept. 8. | 129 2 |
| Nov. 8. | 13 4 | | | Oct. 4. | 128 $4\frac{1}{2}$ |
| Dec. 7. | 12 1 | | | Nov. 8. | 128 5 |
| 1905. | | 1905. | | Dec. 7. | 128 $7\frac{1}{2}$ |
| Jan. 5. | 11 6 | Jan. 5. | 14 $11\frac{1}{2}$ | 1905. | |
| Feb. 7. | 11 2 | Feb. 7. | 14 $2\frac{1}{2}$ | Jan. 5. | 128 6 |
| Mar. 15. | 10 3 | Mar. 15. | 13 4 | Feb. 7. | 128 7 |
| Apr. 11. | 10 $5\frac{1}{2}$ | Apr. 10. | 13 4 | March 15. | 128 8 |
| May 5. | 10 $7\frac{1}{2}$ | May 5. | 13 4 | Apr. 11. | 128 4 |
| June 12. | 11 8 | June 12. | 13 $8\frac{1}{2}$ | May 5. | 128 3 |
| July 14. | 12 $\frac{1}{2}$ | July 14. | 14 5 | June 12. | 128 $4\frac{1}{2}$ |
| Aug. 11. | 12 6 | Aug. 11. | 15 0 | July 14. | 128 8 |
| Sept. 14. | 13 0 | Sept. 14. | 15 8 | Aug. 11. | 128 10 |
| Nov. 6. | 11 10 | Nov. 6. | 14 5 | Sept. 14. | 128 11 |
| Dec. 16. | 11 3 | Dec. 16. | 13 10 | Nov. 6. | 129 0 |
| 1906. | | 1906. | | Dec. 16. | 128 10 |
| Jan. 25. | 11 11 | June 23. | 12 3 | 1906. | |
| Mar. 10. | 10 $3\frac{1}{2}$ | July 30. | 14 9 | Jan. 20. | 128 8 |
| May 4. | 9 $6\frac{1}{2}$ | Sept. 19. | 17 10 | Mar. 10. | 128 8 |
| June 23. | 11 3 | Dec. 18. | 12 $6\frac{1}{2}$ | May 4. | 127 $5\frac{1}{2}$ |
| July 30. | 9 $8\frac{1}{2}$ | | | June 23. | 128 6 |
| Sept. 19. | 10 0 | | | July 30. | 128 6 |
| Dec. 18. | 9 $9\frac{1}{2}$ | | | Sept. 19. | 128 $6\frac{1}{2}$ |
| | | | | Dec. 18. | 128 6 |
| 37. C. A. Landreth, 1 mile S. of Whittier. | | 38. J. W. Sharp, Santa Fe Springs. | | 39. John H. Borden, $1\frac{1}{2}$ miles N. of Norwalk. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Sept. 6. | 33 $5\frac{1}{2}$ | Sept. 6. | 27 $3\frac{1}{2}$ | Nov. 9. | 7 10 |
| Oct. 4. | 33 $7\frac{1}{2}$ | Oct. 4. | 26 $9\frac{1}{2}$ | Dec. 7. | 8 5 |
| Nov. 9. | 33 5 | Nov. 9. | 27 2 | 1905. | |
| Dec. 7. | 33 $5\frac{1}{2}$ | Dec. 7. | 27 7 | Jan. 5. | 7 11 |
| 1905. | | 1905. | | Feb. 7. | 6 10 |
| Jan. 5. | 33 8 | Jan. 5. | 27 0 | Mar. 15. | 5 $10\frac{1}{2}$ |
| Feb. 7. | 33 3 | Feb. 7. | 26 2 | Apr. 11. | 5 4 |
| Mar. 15. | 32 6 | Mar. 15. | 25 7 | May 5. | 5 1 |
| Apr. 11. | 31 10 | Apr. 11. | 25 0 | June 12. | 6 6 |
| May 5. | 31 8 | May 5. | 25 $1\frac{1}{2}$ | July 14. | 7 2 |
| June 12. | 31 7 | June 12. | 26 0 | Aug. 11. | 8 0 |
| July 14. | 32 4 | July 14. | 26 8 | Sept. 14. | 8 8 |
| Aug. 11. | 33 2 | Aug. 11. | 27 2 | Nov. 6. | 8 7 |
| Sept. 14. | 33 4 | Sept. 14. | 27 4 | Dec. 16. | 7 1 |
| Nov. 6. | 33 1 | Nov. 6. | 27 3 | 1906. | |
| Dec. 16. | 32 10 | Dec. 16. | 26 1 | Jan. 25. | 6 7 |
| 1906. | | 1906. | | Mar. 10. | 6 8 |
| Jan. 25. | 32 8 | Jan. 25. | 25 4 | May 4. | 4 $10\frac{1}{2}$ |
| Mar. 10. | 31 8 | Mar. 10. | 24 6 | June 23. | 5 $6\frac{1}{2}$ |
| May 4. | 31 $6\frac{1}{2}$ | May 4. | 24 $5\frac{1}{2}$ | July 30. | 7 $3\frac{1}{2}$ |
| June 23. | 31 $5\frac{1}{2}$ | June 23. | 24 9 | Sept. 19. | 6 $9\frac{1}{2}$ |
| July 30. | 33 4 | July 30. | 25 $8\frac{1}{2}$ | Dec. 18. | 5 10 |
| Sept. 19. | 32 6 | Sept. 19. | 26 9 | | |
| Dec. 18. | 32 1 | Dec. 18. | 25 1 | | |

Tables showing variations of water level in wells in southern California—Continued.

| 40. Norwalk Builders' Association, Norwalk. | | 41. J. B. Neff, 1½ miles S. of Anaheim. | | 42. Vineland district school, Vineland. | |
|---|-----------------|---|-----------------|--|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Sept. 6..... | 19 5 | Aug. 31..... | 50 10 | Dec. 14..... | 104 |
| Oct. 4..... | 15 8 | Oct. 1..... | 50 8 | | |
| Nov. 9..... | 16 4 | Oct. 31..... | 50 8 | 1905. | |
| Dec. 7..... | 17 4 | Dec. 1..... | 50 9 | Jan. 12..... | 104 |
| 1905. | | 1905. | | Feb. 21..... | 102 |
| Jan. 5..... | 15 3½ | Jan. 1..... | 51 0 | Mar. 10..... | 98 |
| Feb. 7..... | 14 1½ | Feb. 1..... | 50 11 | Apr. 15..... | 93 1 |
| Mar. 15..... | 13 4½ | Mar. 1..... | 50 7 | May 17..... | 90 |
| May 5..... | 13 7 | Mar. 31..... | 49 10 | June 22..... | 90 |
| June 12..... | 14 6 | May 18..... | 49 7 | July 21..... | 91 |
| July 14..... | 15 10 | July 1..... | 51 4 | Aug. 16..... | 92 |
| Aug. 11..... | 16 11 | July 31..... | 51 7 | Sept. 20..... | 93 |
| Sept. 14..... | 17 9 | Aug. 31..... | 52 7 | Nov. 12..... | 95 |
| Nov. 6..... | 15 4 | Sept. 30..... | 52 4 | Dec. 21..... | 96 |
| Dec. 16..... | 14 7 | Nov. 1..... | 51 10 | 1906. | |
| 1906. | | Dec. 1..... | 51 5 | Jan. 27..... | 97 |
| Jan. 25..... | 13 8 | 1906. | | Mar. 15..... | 95 |
| Mar. 10..... | 16 11 | Jan. 6..... | 51 4 | May 8..... | 83 |
| May 4..... | 16 3 | Mar. 3..... | 51 2 | June 7..... | 81 |
| June 23..... | 15 6½ | Mar. 31..... | 50 10 | Aug. 1..... | 82 |
| July 30..... | 15 4½ | Apr. 30..... | 49 5 | Sept. 25..... | 85 |
| Dec. 18..... | 15 0 | May 19..... | 49 2 | Dec. 11..... | 88 |
| | | July 1..... | 49 7 | | |
| | | July 30..... | 50 6 | | |
| | | Sept. 2..... | 51 1 | | |
| | | Sept. 27..... | 50 9 | | |
| | | Nov. 1..... | 50 2 | | |
| | | Nov. 30..... | 49 5 | | |
| 43. G. F. Chamberlain, 2 miles SW. of Covina. | | 44. H. Heinze, Puente. | | 45. William Rowland, ½ mile S. of Rowland. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Oct. 8..... | 119 0 | Oct. 8..... | 30 0 | Oct. 8..... | 27 |
| Nov. 17..... | 119 6 | Nov. 17..... | 29 10 | Nov. 17..... | 26 |
| Dec. 14..... | 120 9 | Dec. 14..... | 30 0 | Dec. 14..... | 25 |
| 1905. | | 1905. | | 1905. | |
| Jan. 12..... | 120 11 | Feb. 21..... | 29 2 | Jan. 12..... | 24 |
| Feb. 20..... | 120 9 | Mar. 11..... | 28 4 | Feb. 21..... | 23 |
| Mar. 11..... | 120 1 | Apr. 15..... | 25 7 | Apr. 15..... | 22 |
| Apr. 15..... | 118 1 | June 22..... | 28 6 | June 22..... | 23 |
| May 17..... | 117 9 | July 21..... | 27 2 | July 21..... | 24 |
| July 21..... | 112 6 | Aug. 16..... | 27 11 | Aug. 16..... | 24 |
| Aug. 16..... | 111 6 | Sept. 20..... | 28 3 | Sept. 20..... | 26 |
| Sept. 21..... | 111 6 | Dec. 21..... | 28 4½ | Nov. 12..... | 24 |
| Nov. 12..... | 112 6 | 1906. | | Dec. 21..... | 23 |
| Dec. 21..... | 112 11 | Mar. 15..... | 23 9 | 1906. | |
| 1906. | | May 9..... | 25 6 | Jan. 27..... | 23 |
| Mar. 15..... | 113 7 | June 27..... | 23 7½ | May 9..... | 22 |
| May 9..... | 109 6 | Sept. 25..... | 26 4½ | June 27..... | 27 |
| June 27..... | 105 3½ | | | Aug. 2..... | 25 |
| Sept. 25..... | 104 4½ | | | Sept. 25..... | 27 |
| Dec. 11..... | 108 1 | | | Dec. 11..... | 23 |

Tables showing variations of water in wells in southern California—Continued.

| 46. B. Yorba, 1½ miles E. of Rowland. | | 47. F. Bowers, Lemon. | | 48. S. E. Hicks, ¼ mile W. of Spadra. | |
|---|-------------------------|---|-------------------------|---|------------------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Oct. 8. | <i>Ft. in.</i> 35 6 | Oct. 8. | <i>Ft. in.</i> 27 10 | Oct. 8. | <i>Ft. in.</i> 33 8 |
| Nov. 17. | 35 10½ | Nov. 16. | 25 4 | Nov. 17. | 32 9 |
| Dec. 14. | 33 5 | Dec. 14. | 25 5½ | Dec. 14. | 32 9 |
| 1905. | | 1905. | | 1905. | |
| Jan. 12. | 30 8 | Jan. 12. | 24 4 | Jan. 12. | 32 0 |
| Feb. 20. | 29 9 | Feb. 20. | 23 10 | Feb. 21. | 31 8½ |
| Mar. 11. | 30 10 | Mar. 11. | 23 6 | Mar. 11. | 31 5½ |
| Apr. 15. | 31 0 | Apr. 15. | 20 5½ | June 22. | 32 7 |
| June 22. | 32 11 | June 22. | 23 5 | July 21. | 34 2 |
| July 21. | 33 2 | July 21. | 24 0 | Aug. 16. | 35 2 |
| May 20. | 33 11 | Aug. 16. | 25 10 | Sept. 20. | 36 6 |
| Nov. 12. | 33 0 | Sept. 20. | 25 ½ | Nov. 12. | 36 2 |
| Dec. 21. | 31 5 | Nov. 12. | 23 4 | Dec. 21. | 35 7 |
| 1906. | | 1906. | | 1906. | |
| Jan. 27. | 31 7 | Jan. 27. | 21 6 | Mar. 15. | 35 5 |
| Mar. 15. | 28 2½ | Mar. 15. | 21 4 | May 9. | 34 8 |
| May 9. | 31 6 | May 9. | 21 6 | June 27. | 34 8 |
| June 27. | 30 8 | May 9. | 21 10 | Aug. 2. | 38 7½ |
| Aug. 2. | 31 11 | June 27. | 24 8½ | Sept. 25. | 40 2 |
| Sept. 25. | 32 11 | Aug. 2. | 25 8 | Dec. 11. | 39 3 |
| | | Sept. 25. | 25 4½ | | |
| 49. Sidney Deacon, 2 miles W. of San Dimas. | | 50. Wm. Ferry, 1½ miles SW. of San Dimas. | | 51. Azusa Irrigating Co., San Dimas Wash. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Oct. 7. | <i>Ft. in.</i> 124 3 | Oct. 7. | <i>Ft. in.</i> 199 8 | Oct. 7. | <i>Ft. in.</i> 97 2 |
| Nov. 16. | 124 0 | Nov. 16. | 199 10 | Nov. 16. | 97 8 |
| Dec. 13. | 124 0 | Dec. 13. | 199 10½ | Dec. 13. | 98 11 |
| 1905. | | 1905. | | 1905. | |
| Jan. 11. | 123 6 | Jan. 11. | 199 9½ | Jan. 11. | 99 1 |
| Feb. 20. | 123 5 | Feb. 21. | 199 8 | Feb. 20. | 98 4 |
| Mar. 10. | 127 0 | Mar. 10. | 199 8½ | Mar. 11. | 97 4 |
| Apr. 14. | 125 0 | Apr. 14. | 200 4 | Apr. 14. | 95 6 |
| May 17. | 124 8 | June 22. | 200 4½ | May 17. | 94 3 |
| June 22. | 125 1½ | July 23. | 200 6 | June 22. | 94 1 |
| July 21. | 125 5 | Aug. 16. | 200 7 | July 20. | 95 4 |
| Aug. 16. | 125 5 | Sept. 21. | 200 7 | Aug. 16. | 96 4 |
| Sept. 21. | 125 7 | Nov. 11. | 201 0 | Sept. 21. | 97 4 |
| Nov. 11. | 126 0 | Dec. 20. | 201 0 | Nov. 11. | 98 6 |
| 1906. | | 1906. | | 1906. | |
| Jan. 27. | 124 6 | Jan. 27. | 201 3 | Jan. 27. | 97 10 |
| Mar. 15. | 124 3 | Mar. 15. | 201 3 | Mar. 15. | 97 2½ |
| May 8. | 125 2 | May 8. | 201 2 | May 8. | 93 2 |
| June 27. | 124 6 | June 26. | 201 5½ | June 26. | 91 1½ |
| | | Aug. 2. | 201 9 | Aug. 1. | 92 4 |
| | | Sept. 24. | 201 7½ | Sept. 24. | 98 7½ |
| | | | | Dec. 10. | 100 11 |

Tables showing variations of water in wells in southern California—Continued.

| 52. Emil Firth, San Dimas Wash. | | 53. Charles Alley, 1 mile NW. of Lordsburg. | | 54. Mr. Massey, $\frac{3}{4}$ mile NE of Lordsburg. | |
|--|---------------------|---|---------------------|---|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Sept. 7..... | 110 6 $\frac{1}{2}$ | Oct. 7..... | 145 4 | Oct. 7..... | 190 20 |
| Oct. 7..... | 111 7 | Nov. 16..... | 146 10 | Nov. 16..... | 191 20 |
| Nov. 16..... | 113 2 | Dec. 13..... | 146 10 | Dec. 13..... | 192 10 |
| Dec. 13..... | 113 11 | 1905. | | 1905. | |
| 1905. | | 1905. | | 1905. | |
| Jan. 11..... | 114 8 $\frac{1}{2}$ | Jan. 11..... | 146 9 | Jan. 11..... | 193 10 |
| Feb. 20..... | 113 11 | Feb. 20..... | 147 5 $\frac{1}{2}$ | Feb. 20..... | 194 10 |
| Mar. 11..... | 113 7 | Mar. 10..... | 147 6 $\frac{1}{2}$ | Mar. 11..... | 195 10 |
| Apr. 14..... | 106 10 | Apr. 14..... | 147 7 | Apr. 14..... | 196 10 |
| May 17..... | 104 9 | June 22..... | 146 8 | May 17..... | 197 10 |
| June 22..... | 104 4 | July 20..... | 150 8 | June 22..... | 198 10 |
| July 23..... | 105 6 | Aug. 16..... | 150 3 | July 20..... | 199 10 |
| Aug. 16..... | 105 10 | Sept. 21..... | 150 11 | Aug. 16..... | 200 10 |
| Sept. 21..... | 106 7 $\frac{1}{2}$ | Nov. 11..... | 152 7 | Sept. 21..... | 201 10 |
| Nov. 11..... | 108 1 $\frac{1}{2}$ | Dec. 20..... | 152 0 | Nov. 11..... | 202 10 |
| Dec. 20..... | 108 1 | 1906. | | Dec. 20..... | 203 10 |
| 1906. | | 1906. | | 1906. | |
| Jan. 27..... | 107 6 $\frac{1}{2}$ | Jan. 27..... | 151 5 $\frac{1}{2}$ | Jan. 27..... | 204 10 |
| Mar. 15..... | 108 2 | Mar. 15..... | 149 2 $\frac{1}{2}$ | Mar. 15..... | 205 10 |
| May 8..... | 87 10 | May 8..... | 149 6 | Mar. 15..... | 206 10 |
| June 26..... | 92 11 | June 26..... | 149 3 | May 8..... | 207 10 |
| Sept. 24..... | 97 4 $\frac{1}{2}$ | Aug. 1..... | 153 1 $\frac{1}{2}$ | June 26..... | 208 10 |
| Dec. 10..... | 96 11 | Sept. 24..... | 154 4 $\frac{1}{2}$ | Aug. 1..... | 209 10 |
| | | Dec. 10..... | 154 7 | Sept. 24..... | 210 10 |
| | | | | Dec. 10..... | 211 10 |
| 55. Ontario Water Co., 1 mile N. of Claremont. | | 56. R. Bieley, Claremont. | | 57. San Antonio Water Co., 1 mile SW. of Claremont. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Nov. 16..... | 62 1 | Oct. 8..... | 97 4 | Oct. 6..... | 150 15 |
| Dec. 13..... | 61 10 | Nov. 16..... | 97 6 | Nov. 16..... | 151 15 |
| | | Dec. 13..... | 98 1 $\frac{1}{2}$ | Dec. 13..... | 152 15 |
| 1905. | | 1905. | | 1905. | |
| Jan. 11..... | 62 2 | Jan. 11..... | 97 0 | Jan. 11..... | 153 15 |
| Feb. 20..... | 62 1 | Feb. 20..... | 92 5 | Feb. 20..... | 154 15 |
| Mar. 10..... | 61 10 $\frac{1}{2}$ | Mar. 10..... | 91 2 | Mar. 10..... | 155 15 |
| Apr. 14..... | 59 4 | Apr. 14..... | 89 9 | Apr. 14..... | 156 14 |
| May 17..... | 59 1 $\frac{1}{2}$ | May 17..... | 88 10 | May 17..... | 157 14 |
| June 22..... | 57 5 | June 22..... | 92 0 | June 22..... | 158 14 |
| July 20..... | 57 0 | July 20..... | 97 4 | July 20..... | 159 15 |
| Aug. 16..... | 59 7 | Aug. 16..... | 98 7 | Aug. 16..... | 160 15 |
| Sept. 21..... | 58 6 | Sept. 21..... | 99 9 | Sept. 21..... | 161 15 |
| Nov. 11..... | 58 4 $\frac{1}{2}$ | Dec. 20..... | 93 8 | Nov. 11..... | 162 15 |
| Dec. 20..... | 57 3 | 1906. | | Dec. 20..... | 163 14 |
| 1906. | | 1906. | | 1906. | |
| Jan. 26..... | 56 9 $\frac{1}{2}$ | Jan. 27..... | 97 9 $\frac{1}{2}$ | Jan. 26..... | 164 14 |
| Mar. 14..... | 53 2 $\frac{1}{2}$ | Mar. 17..... | 84 10 | Mar. 14..... | 165 14 |
| May 8..... | 54 4 | May 8..... | 82 4 | May 8..... | 166 14 |
| June 26..... | 53 3 $\frac{1}{2}$ | June 26..... | 81 2 | June 26..... | 167 14 |
| Aug. 1..... | 54 1 | Aug. 1..... | 76 3 | Aug. 1..... | 168 14 |
| Sept. 24..... | 53 3 $\frac{1}{2}$ | Sept. 24..... | 65 5 | Sept. 24..... | 169 14 |
| Dec. 10..... | 56 10 | Dec. 10..... | 49 9 | Dec. 10..... | 170 14 |

Tables showing variations of water in wells in southern California—Continued.

| 58. Dr. A. R. Reed, 1½ miles NE. of Pomona. | | 59. B. Linastruth, Pomona. | | 60. J. J. White, Pomona. | |
|---|-----------------|----------------------------|-----------------|--------------------------|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| | <i>Ft. in.</i> | | <i>Ft. in.</i> | | <i>Ft. in.</i> |
| 1904. | | 1904. | | 1904. | |
| Sept. 7..... | 75 2 | Dec. 14..... | 90 6½ | Oct. 6..... | 58 9½ |
| Oct. 6..... | 75 4½ | | | Nov. 16..... | 60 3 |
| Nov. 16..... | 74 6 | 1905. | | Dec. 13..... | 60 6½ |
| Dec. 13..... | 74 3 | Jan. 12..... | 90 9 | | |
| 1905. | | Feb. 21..... | 91 1 | 1905. | |
| Jan. 11..... | 68 10½ | Apr. 15..... | 91 5 | Jan. 11..... | 60 10 |
| Feb. 20..... | 66 1 | May 17..... | 91 6½ | Feb. 20..... | 61 1½ |
| Mar. 10..... | 65 11 | June 22..... | 92 0 | Mar. 10..... | 61 4½ |
| Apr. 14..... | 63 11 | July 21..... | 92 10½ | Apr. 14..... | 60 8 |
| May 17..... | 62 11 | Sept. 20..... | 93 6 | May 17..... | 60 11 |
| June 22..... | 66 8 | Nov. 12..... | 93 4 | June 22..... | 61 1 |
| July 20..... | 70 10 | Dec. 21..... | 93 6 | Aug. 16..... | 61 6 |
| Aug. 16..... | 71 11 | 1906. | | Sept. 20..... | 61 10 |
| Sept. 21..... | 73 5 | Mar. 15..... | 92 6 | Nov. 11..... | 62 4 |
| Nov. 11..... | 70 4½ | June 27..... | 93 6 | Dec. 20..... | 62 5 |
| Dec. 20..... | 67 0 | Aug. 2..... | 95 6 | 1906. | |
| 1906. | | Sept. 25..... | 96 0 | Jan. 26..... | 62 3½ |
| Jan. 26..... | 64 9 | Dec. 11..... | 95 2 | Mar. 14..... | 63 1 |
| Mar. 14..... | 62 10 | | | May 8..... | 63 1½ |
| May 8..... | 62 5 | | | Aug. 1..... | 63 5 |
| June 26..... | 64 5 | | | Sept. 24..... | 64 4½ |
| Aug. 1..... | 67 0 | | | Dec. 10..... | 64 11 |
| Sept. 24..... | 67 ½ | | | | |
| Dec. 10..... | 64 3½ | | | | |

| 61. Mrs. Tieg, 1½ miles SE. of Pomona. | | 62. R. Riemers, 2½ miles SE. of Pomona. | | 63. C. P. Brown, 2¼ miles SE. of Pomona. | |
|--|-----------------|---|-----------------|--|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| | <i>Ft. in.</i> | | <i>Ft. in.</i> | | <i>Ft. in.</i> |
| 1904. | | 1904. | | 1904. | |
| Sept. 8..... | 89 0 | Sept. 8..... | 34 6 | Sept. 7..... | 8 9 |
| Oct. 6..... | 88 10 | Oct. 6..... | 36 6½ | Oct. 6..... | 6 6½ |
| Nov. 16..... | 88 10½ | Nov. 16..... | 34 10 | Nov. 16..... | 3 10 |
| Dec. 13..... | 88 10 | Dec. 13..... | 34 10 | Dec. 13..... | 3 3 |
| 1905. | | 1905. | | 1905. | |
| Jan. 11..... | 88 10 | Jan. 11..... | 34 9½ | Jan. 11..... | 2 5 |
| Feb. 20..... | 89 0 | Feb. 20..... | 34 7½ | Feb. 20..... | 2 0 |
| Mar. 10..... | 89 0 | Apr. 14..... | 32 10 | Mar. 10..... | 2 ½ |
| Apr. 14..... | 88 0 | May 17..... | 32 7 | Apr. 14..... | 1 5 |
| June 22..... | 88 11 | June 22..... | 33 6 | May 17..... | 2 0 |
| July 20..... | 90 1½ | July 20..... | 35 4 | June 22..... | 7 5 |
| Aug. 16..... | 90 5 | Aug. 16..... | 35 0 | July 20..... | 12 10 |
| Sept. 20..... | 90 8½ | Sept. 20..... | 35 6 | Aug. 16..... | 12 2 |
| Nov. 11..... | 90 5 | Nov. 11..... | 35 8 | Sept. 20..... | 11 10½ |
| Dec. 20..... | 90 6 | Dec. 20..... | 35 7½ | Nov. 11..... | 4 7½ |
| 1906. | | 1906. | | Dec. 20..... | 4 1 |
| Jan. 26..... | 89 6 | Jan. 26..... | 36 8½ | 1906. | |
| Mar. 14..... | 90 6 | Mar. 14..... | 35 8 | Jan. 26..... | 4 3½ |
| May 8..... | 89 7 | May 8..... | 33 2½ | Mar. 14..... | 3 10 |
| Aug. 1..... | 92 2 | June 26..... | 34 4½ | May 8..... | 4 4½ |
| Sept. 24..... | 92 2 | Aug. 1..... | 35 5 | June 26..... | 13 10 |
| | | Sept. 24..... | 36 2½ | Aug. 1..... | 15 8 |
| | | Dec. 10..... | 36 2½ | Sept. 24..... | 13 6 |
| | | | | Dec. 10..... | 4 10 |

Tables showing variations of water in wells in southern California—Continued.

| 64. Mr. Haley, $\frac{1}{2}$ mile W. of San Bernardino. | | 65. C. W. Rogers, 1 mile E. of Colton. | | 66. Riverside Water Co., 2 m E. of Colton. | |
|---|--------------------------|---|-----------------|---|------------------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Yield in miner inches. |
| 1904. | | 1904. | | 1904. | |
| July 5..... | <i>Ft.</i> 36.6 | July 1..... | 15.7 | Aug. 1..... | 3 |
| Aug. 4..... | 38.18 | Aug. 4..... | 18.05 | Sept. 1..... | 4 |
| Sept. 1..... | 37.23 | Sept. 1..... | 19.70 | Oct. 3..... | 5 |
| Oct. 3..... | 37.10 | Oct. 3..... | 20.96 | Nov. 1..... | 4 |
| Nov. 1..... | 38.9 | Nov. 1..... | 20.17 | Dec. 1..... | 5 |
| Dec. 1..... | 39.83 | Dec. 1..... | 21.82 | 1905. | |
| 1905. | | 1905. | | 1905. | |
| Jan. 1..... | 37.15 | Jan. 1..... | 17.48 | Jan. 1..... | 5 |
| Feb. 1..... | 33.0 | Feb. 1..... | 12.45 | Feb. 1..... | Capp |
| Mar. 1..... | 30.55 | Mar. 1..... | 7.57 | Mar. 1..... | Capp |
| Apr. 1..... | 29.78 | Apr. 1..... | 5.4 | Apr. 1..... | Capp |
| May 1..... | 30.1 | May 1..... | 5.6 | May 1..... | 5 |
| June 1..... | 37.6 | June 1..... | 6.4 | June 1..... | 5 |
| July 1..... | 39.0 | July 1..... | 9.3 | July 1..... | 7 |
| Oct. 1..... | 40.5 | Aug. 1..... | 12.75 | Aug. 1..... | 5 |
| Nov. 1..... | 36.8 | Sept. 1..... | 15.9 | Sept. 1..... | 3 |
| Dec. 1..... | 33.7 | Oct. 1..... | 18.45 | Oct. 1..... | 4 |
| 1906. | | Nov. 1..... | 18.28 | Nov. 1..... | 4 |
| Jan. 1..... | 33.7 | 1906. | | Dec. 1..... | Capp |
| Feb. 1..... | 33.0 | Jan. 1..... | 14.34 | 1906. | |
| Mar. 1..... | 32.0 | Feb. 1..... | 12.58 | Jan. 1..... | Capp |
| Apr. 1..... | 31.38 | Mar. 1..... | 8.35 | Feb. 1..... | Capp |
| May 1..... | 36.57 | Apr. 1..... | 5.40 | Mar. 1..... | Capp |
| June 1..... | 35.7 | May 1..... | 6.00 | Apr. 1..... | Capp |
| July 1..... | 38.4 | June 1..... | 5.9 | May 1..... | Capp |
| Oct. 22..... | 30.4 | July 1..... | 6.85 | June 1..... | Capp |
| | | Oct. 22..... | 17.2 | July 1..... | Capp |
| | | | | Oct. 22..... | 4 |
| 67. Riverside Water Co., Third and Waterman sts., San Bernardino. | | 68. N. B. Hinkley estate, $\frac{1}{2}$ mile W. of Bryn Mawr. | | 69. Riverside County, $\frac{2}{3}$ m S. of Alessandro. | |
| Date of measurement. | Yield in miner's inches. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Aug. 1..... | 121.5 | July 1..... | <i>Ft.</i> 85.9 | Oct. 18..... | 52 |
| Sept. 1..... | 121.6 | Aug. 4..... | 82.7 | Nov. 18..... | 51 |
| Oct. 3..... | 112.5 | Sept. 1..... | 84.5 | Dec. 15..... | 51 |
| Nov. 1..... | 116.0 | Oct. 3..... | 80.0 | 1905. | |
| Dec. 1..... | 116.3 | Nov. 1..... | 80.6 | Jan. 13..... | 51 |
| 1905. | | Dec. 1..... | 80.8 | Feb. 22..... | 50 |
| Jan. 1..... | 117.0 | 1905. | | Mar. 24..... | 49 |
| Feb. 1..... | Capped. | Jan. 1..... | 81.0 | Apr. 19..... | 49 |
| Mar. 1..... | Capped. | Feb. 1..... | 80.8 | May 19..... | 49 |
| Apr. 1..... | Capped. | Mar. 1..... | 80.7 | July 22..... | 50 |
| May 1..... | Capped. | Apr. 1..... | 79.0 | Aug. 18..... | 50 |
| June 1..... | 117.0 | May 1..... | 78.5 | Sept. 22..... | 50 |
| July 1..... | 118.4 | June 1..... | 78.0 | Nov. 9..... | 51 |
| Aug. 1..... | 116.7 | July 1..... | 78.4 | 1906. | |
| Sept. 1..... | 111.6 | Aug. 1..... | 78.7 | May 11..... | 51 |
| Oct. 1..... | 115.1 | Sept. 1..... | 79.2 | June 29..... | 52 |
| Nov. 1..... | Capped. | Oct. 1..... | 79.35 | Aug. 3..... | 52 |
| Dec. 1..... | Capped. | Nov. 1..... | 81.0 | Sept. 26..... | 52 |
| 1906. | | Dec. 1..... | 79.5 | | |
| Jan. 1..... | Capped. | 1906. | | | |
| Feb. 1..... | Capped. | Jan. 1..... | 79.4 | | |
| Mar. 1..... | Capped. | Feb. 1..... | 78.5 | | |
| Apr. 1..... | Capped. | Mar. 1..... | 77.89 | | |
| May 1..... | Capped. | Apr. 1..... | 77.27 | | |
| June 1..... | Capped. | May 1..... | 74.66 | | |
| July 1..... | 149.5 | June 1..... | 74.4 | | |
| Oct. 22..... | 104.9 | July 1..... | 74.2 | | |
| | | Oct. 22..... | 75.7 | | |

Tables showing variations of water in wells in southern California—Continued.

| 70. 4 miles NE. of Perris. | | 71. C. Lossman, $2\frac{1}{2}$ miles N. of Perris. | | 72. Crawford Carter, Perris. | |
|--|--------------------|--|--------------------|---|--------------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> |
| Dec. 16..... | 32 5 | Dec. 15..... | 63 $3\frac{1}{2}$ | Oct. 18..... | 33 4 |
| 1905. | | 1905. | | Nov. 18..... | 33 3 |
| Jan. 14..... | 32 0 | Jan. 13..... | 63 $4\frac{1}{2}$ | Dec. 15..... | 33 4 |
| Feb. 22..... | 31 6 | Feb. 22..... | 63 0 | 1905. | |
| Sept. 22..... | 28 5 | Mar. 26..... | 62 6 | Jan. 13..... | 32 6 |
| Nov. 9..... | 29 0 | Apr. 19..... | 62 $3\frac{1}{2}$ | Feb. 22..... | 31 $9\frac{1}{2}$ |
| Dec. 23..... | 29 4 | May 19..... | 62 0 | Mar. 26..... | 30 10 |
| 1906. | | June 20..... | 62 0 | Apr. 18..... | 30 7 |
| Jan. 30..... | 29 4 | July 22..... | 62 2 | May 19..... | 30 $2\frac{1}{2}$ |
| Mar. 16..... | 29 3 | Aug. 19..... | 62 2 | June 20..... | 30 1 |
| May 11..... | 29 $7\frac{1}{2}$ | Sept. 22..... | 62 3 | July 23..... | 30 4 |
| Aug. 3..... | 29 $11\frac{1}{2}$ | Nov. 9..... | 62 5 | Sept. 22..... | 30 6 |
| Sept. 20..... | 30 $\frac{1}{2}$ | Dec. 23..... | 62 5 | Nov. 9..... | 30 11 |
| Dec. 20..... | 30 $2\frac{1}{2}$ | 1906. | | Dec. 22..... | 31 $4\frac{1}{2}$ |
| | | Mar. 16..... | 62 4 | 1906. | |
| | | May 11..... | 62 5 | Jan. 29..... | 31 8 |
| | | June 29..... | 62 5 | Mar. 16..... | 31 8 |
| | | Aug. 3..... | 63 2 | June 28..... | 31 $2\frac{1}{2}$ |
| | | Sept. 26..... | 63 4 | Aug. 3..... | 31 9 |
| | | Dec. 20..... | 63 $4\frac{1}{2}$ | Sept. 26..... | 32 $4\frac{1}{2}$ |
| | | | | Dec. 20..... | 32 3 |
| 73. Mrs. L. R. Harford, $3\frac{1}{2}$ miles E. of Perris. | | 74. E. E. Waters, Ethanac. | | 75. Temescal Water Co., $1\frac{1}{2}$ miles W. of Ethanac. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1901. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> | 1904. | <i>Ft. in.</i> |
| May..... | 28 11 | Jan. 29..... | 44 2 | Oct. 18..... | 29 10 |
| 1902. | | Feb. 27..... | 41 4 | Nov. 18..... | 30 4 |
| July..... | 40 2 | Mar. 27..... | 40 $5\frac{1}{2}$ | Dec. 15..... | 30 7 |
| Oct. 25..... | 41 7 | Mar. 27..... | 43 4 | 1905. | |
| Dec. 15..... | 42 9 | May 27..... | 41 $7\frac{1}{2}$ | Jan. 13..... | 30 $3\frac{1}{2}$ |
| 1903. | | July 2..... | 46 0 | Feb. 22..... | 26 $10\frac{1}{2}$ |
| Feb. 28..... | 38 7 | 1905. | | Mar. 26..... | 25 10 |
| Apr. 11..... | 37 6 | Feb. 20..... | 44 8 | June 20..... | 28 0 |
| May 14..... | 38 2 | Apr. 5..... | 43 $1\frac{1}{2}$ | July 23..... | 28 9 |
| Sept. 15..... | 43 4 | June 18..... | 45 $5\frac{1}{2}$ | Aug. 19..... | 29 5 |
| 1904. | | Aug. 5..... | 46 11 | Sept. 23..... | 29 8 |
| Jan. 31..... | 43 4 | Sept. 1..... | 47 6 | Nov. 10..... | 30 3 |
| Feb. 28..... | 41 $11\frac{1}{2}$ | Oct. 1..... | 47 10 | Dec. 22..... | 29 8 |
| Mar. 3..... | 41 9 | Nov. 6..... | 48 2 | 1906. | |
| Mar. 29..... | 40 11 | Dec. 22..... | 44 8 | Jan. 29..... | 29 $7\frac{1}{2}$ |
| May 1..... | 42 10 | 1906. | | Mar. 16..... | 28 $8\frac{1}{2}$ |
| July 3..... | 44 10 | Jan. 29..... | 42 10 | May 12..... | 27 9 |
| Sept. 15..... | 45 5 | Feb. 4..... | 42 4 | June 28..... | 27 9 |
| 1905. | | Mar. 16..... | 42 8 | Aug. 4..... | 28 7 |
| Sept. 23..... | 44 9 | May 12..... | 41 2 | Sept. 27..... | 30 1 |
| Dec. 22..... | 43 0 | June 28..... | 44 $10\frac{1}{2}$ | Dec. 21..... | 30 2 |
| 1906. | | Aug. 4..... | 45 0 | | |
| Jan. 29..... | 42 3 | Sept. 27..... | 47 $6\frac{1}{2}$ | | |
| Mar. 16..... | 42 2 | Dec. 21..... | 45 3 | | |
| May 12..... | 40 $2\frac{1}{2}$ | | | | |
| June 28..... | 38 $8\frac{1}{2}$ | | | | |
| Aug. 4..... | 41 7 | | | | |
| Sept. 27..... | 42 $5\frac{1}{2}$ | | | | |
| Dec. 21..... | 43 $6\frac{1}{2}$ | | | | |

Tables showing variations of water in wells in southern California—Continued

| 76. Doctor Reese, 2½ miles S. of Perris. | | 77. William Newport, 4½ miles S. of Perris. | | 78. William Newport, M Valley. | |
|---|-----------------|---|-----------------|---|-----------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1904. | | 1904. | | 1904. | |
| Oct. 18..... | 21 10 | Oct. 18..... | 37 3 | Oct. 18..... | |
| Nov. 18..... | 19 0 | Nov. 18..... | 37 10 | Nov. 18..... | |
| Dec. 15..... | 18 9½ | Dec. 15..... | 38 3 | Dec. 15..... | |
| 1905. | | 1905. | | 1905. | |
| Jan. 13..... | 18 5 | Jan. 13..... | 38 8 | Jan. 13..... | |
| Feb. 22..... | 10 9 | Feb. 22..... | 38 0 | Feb. 22..... | |
| Mar. 26..... | 9 7½ | Mar. 26..... | 37 ½ | Mar. 26..... | |
| May 19..... | 11 11 | Apr. 18..... | 36 7 | Apr. 18..... | |
| June 20..... | 13 4 | May 19..... | 36 1½ | May 19..... | |
| July 23..... | 13 3 | June 20..... | 36 8½ | June 20..... | |
| Aug. 19..... | 13 4 | July 23..... | 37 9 | July 23..... | |
| Sept. 23..... | 15 6 | Aug. 19..... | 38 2 | Aug. 19..... | |
| Nov. 10..... | 15 8 | Sept. 23..... | 38 7½ | Sept. 23..... | |
| Dec. 22..... | 15 10½ | Nov. 10..... | 39 5 | Nov. 9..... | |
| 1906. | | Dec. 22..... | 39 4 | Dec. 22..... | |
| Jan. 29..... | 15 9 | 1906. | | 1906. | |
| Mar. 16..... | 15 7 | Jan. 29..... | 38 6 | Jan. 29..... | |
| May 12..... | 15 2 | Mar. 16..... | 38 5½ | Mar. 16..... | |
| June 28..... | 15 5 | May 12..... | 37 4½ | May 12..... | |
| Sept. 27..... | 16 2½ | June 28..... | 36 3 | June 28..... | |
| | | Aug. 4..... | 37 0 | Aug. 4..... | |
| | | Sept. 27..... | 38 0 | Sept. 27..... | |
| | | Dec. 21..... | 38 5½ | Dec. 21..... | |
| 79. H. H. Lindenger, 4 miles SW. of Winchester. | | 80. M. M. Patterson, Winchester. | | 81. Mrs. Mand F. Walh miles SW. of Hemet. | |
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| 1905. | | 1904. | | 1905. | |
| Feb. 22..... | 23 4 | Oct. 18..... | 24 3 | Mar. 25..... | |
| Mar. 25..... | 22 5 | Nov. 18..... | 23 5 | Apr. 18..... | |
| Apr. 18..... | 20 3 | Dec. 15..... | 22 6 | May 19..... | |
| May 19..... | 19 0 | 1905. | | June 20..... | |
| July 23..... | 19 0 | Jan. 13..... | 22 3½ | July 23..... | |
| Sept. 23..... | 18 7 | Feb. 22..... | 21 5 | Aug. 19..... | |
| Nov. 10..... | 18 6 | Apr. 18..... | 20 2 | Sept. 23..... | |
| Dec. 22..... | 18 3½ | May 19..... | 20 2 | Nov. 10..... | |
| 1906. | | July 23..... | 19 7 | Dec. 22..... | |
| Jan. 29..... | 18 0 | Aug. 19..... | 19 8 | 1906. | |
| Mar. 16..... | 18 3 | Sept. 23..... | 19 10 | Jan. 30..... | |
| May 12..... | 16 9 | Nov. 9..... | 20 1 | Mar. 16..... | |
| June 28..... | 16 9 | Dec. 22..... | 20 4 | May 12..... | |
| Sept. 27..... | 16 11½ | 1906. | | June 28..... | |
| Dec. 21..... | 16 10 | Jan. 29..... | 19 3 | Aug. 4..... | |
| | | May 12..... | 20 0 | Sept. 27..... | |
| | | Aug. 4..... | 19 11½ | Dec. 21..... | |
| | | Sept. 27..... | 20 1 | | |
| | | Dec. 21..... | 20 2½ | | |

Tables showing variations of water in wells in southern California—Continued.

| 82. J. E. Garrigan, 1 mile W. of Hemet. | | 83. Mrs. Ruby Hewitt, $\frac{1}{2}$ mile E. of Bowers. | | 84. J. Carmichael, Bowers. | |
|---|---------------------|--|-------------------|----------------------------|--------------------|
| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
| | <i>Ft. in.</i> | | <i>Ft. in.</i> | | <i>Ft. in.</i> |
| 1904. | | 1904. | | 1904 | |
| Dec. 15..... | 33 3 | Oct. 19..... | 11 5 | Oct. 19..... | 7 7 $\frac{1}{2}$ |
| | | Nov. 19..... | 11 9 | Nov. 19..... | 7 10 $\frac{1}{2}$ |
| 1905. | | Dec. 16..... | 12 2 | Dec. 16..... | 8 0 |
| Jan. 14..... | 33 5 | | | 1905 | |
| Feb. 23..... | 33 3 | Jan. 14..... | 12 4 | Jan. 14..... | 8 1 |
| Mar. 25..... | 33 1 $\frac{1}{2}$ | Feb. 23..... | 10 1 | Feb. 22..... | 6 8 |
| Apr. 18..... | 33 1 | Mar. 26..... | 5 5 | Mar. 26..... | 4 3 |
| May 18..... | 33 0 | Apr. 19..... | 2 1 | Apr. 18..... | 2 4 |
| June 20..... | 33 2 | May 19..... | (a) | May 19..... | Flowing. |
| July 23..... | 33 1 | June 20..... | (a) | June 21..... | Flowing. |
| Aug. 19..... | 34 0 | July 22..... | 0 7 | July 22..... | Flowing. |
| Sept. 23..... | 33 6 | Aug. 18..... | 1 8 | Aug. 18..... | 3 9 |
| Nov. 10..... | 33 0 | Sept. 22..... | 3 2 | Sept. 22..... | 2 6 |
| | | Nov. 10..... | 4 7 $\frac{1}{2}$ | Nov. 10..... | 2 9 |
| 1906. | | Dec. 22..... | 5 7 $\frac{1}{2}$ | Dec. 22..... | 3 1 |
| Jan. 30..... | 32 9 | | | 1906. | |
| Mar. 17..... | 32 5 | Jan. 30..... | 6 5 | Jan. 30..... | 2 9 |
| May 12..... | 32 10 $\frac{1}{2}$ | Mar. 17..... | 5 6 | Mar. 17..... | 2 8 |
| June 29..... | 32 6 | May 11..... | (b) | May 11..... | Flowing. |
| Aug. 4..... | 32 9 | June 29..... | Flowing. | Aug. 3..... | Flowing. |
| Sept. 27..... | 32 7 $\frac{1}{2}$ | Aug. 3..... | (c) | Sept. 26..... | Flowing. |
| Dec. 20..... | 32 6 $\frac{1}{2}$ | Sept. 26..... | Flowing. | Dec. 20..... | Flowing. |

85. K. D. Harger, Lakeview.

| Date of measurement. | Depth to water. | Date of measurement. | Depth to water. | Date of measurement. | Depth to water. |
|----------------------|--------------------|----------------------|-----------------|----------------------|--------------------|
| | <i>Ft. in.</i> | | <i>Ft. in.</i> | | <i>Ft. in.</i> |
| 1904. | | 1905. | | 1906. | |
| Nov. 19..... | 30 1 | May 19..... | 28 11 | Jan. 30..... | 29 6 |
| Dec. 16..... | 29 10 | June 21..... | 28 10 | May 11..... | 29 2 |
| | | July 22..... | 28 11 | June 29..... | 29 2 |
| 1905. | | Aug. 18..... | 29 1 | Aug. 3..... | 29 3 $\frac{1}{2}$ |
| Feb. 22..... | 29 5 | Sept. 22..... | 29 3 | Sept. 26..... | 29 5 $\frac{1}{2}$ |
| Mar. 26..... | 29 2 $\frac{1}{2}$ | Nov. 9..... | 29 5 | Dec. 20..... | 29 8 |
| Apr. 19..... | 29 0 | Dec. 23..... | 29 7 | | |

^a Flowing good stream.^b Flowing 5 miner's inches.^c Flowing 7 miner's inches.

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[Water-Supply Paper No. 213.]

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1888. Tenth Annual Report, Part II*.

1889. Eleventh Annual Report, Part II*

1890. Twelfth Annual Report, Part II*.

1891. Thirteenth Annual Report, Part III*.

1892. Fourteenth Annual Report, Part II*.

1893. Bulletin No. 131*.

1894. Bulletin No. 131*; Sixteenth Annual Report, Part II*.

1895. Bulletin No. 140*.

1896. Water-Supply Paper No. 11*; Eighteenth Annual Report, Part IV*.

1897. Water-Supply Papers Nos. 15* and 16*; Nineteenth Annual Report, Part IV*.

1898. Water-Supply Papers Nos. 27* and 28*. Twentieth Annual Report, Part IV*.

1899. Water-Supply Papers Nos. 35*, 36*, 37*, 38*, and 39*. Twenty-first Annual Report, Part IV*.

1900. Water-Supply Papers Nos. 47, 48, 49, 50, 51, and 52; Twenty-second Annual Report, Part IV.

1901. East of Mississippi River. Water-Supply Papers Nos. 65* and 75*.

West of Mississippi River, Water-Supply Papers Nos. 66 and 75*.

1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.
1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, and 129.
West of Mississippi River, Water-Supply Papers Nos. 130, 131, 132, 133, 134, and 135.
1905. East of Mississippi River, Water-Supply Papers Nos. 165*, 166*, 167, 168*, 169, 170, and
West of Mississippi River, Water-Supply Papers Nos. 171, 172*, 173*, 174, 175*, 176, 177, and
1906. East of Mississippi River, Water-Supply Papers Nos. 201, 202, 203, 204, 205, 206, and 207.
West of Mississippi River, Water-Supply Papers Nos. 207, 208, 209, 210, 211, 212, 213, and

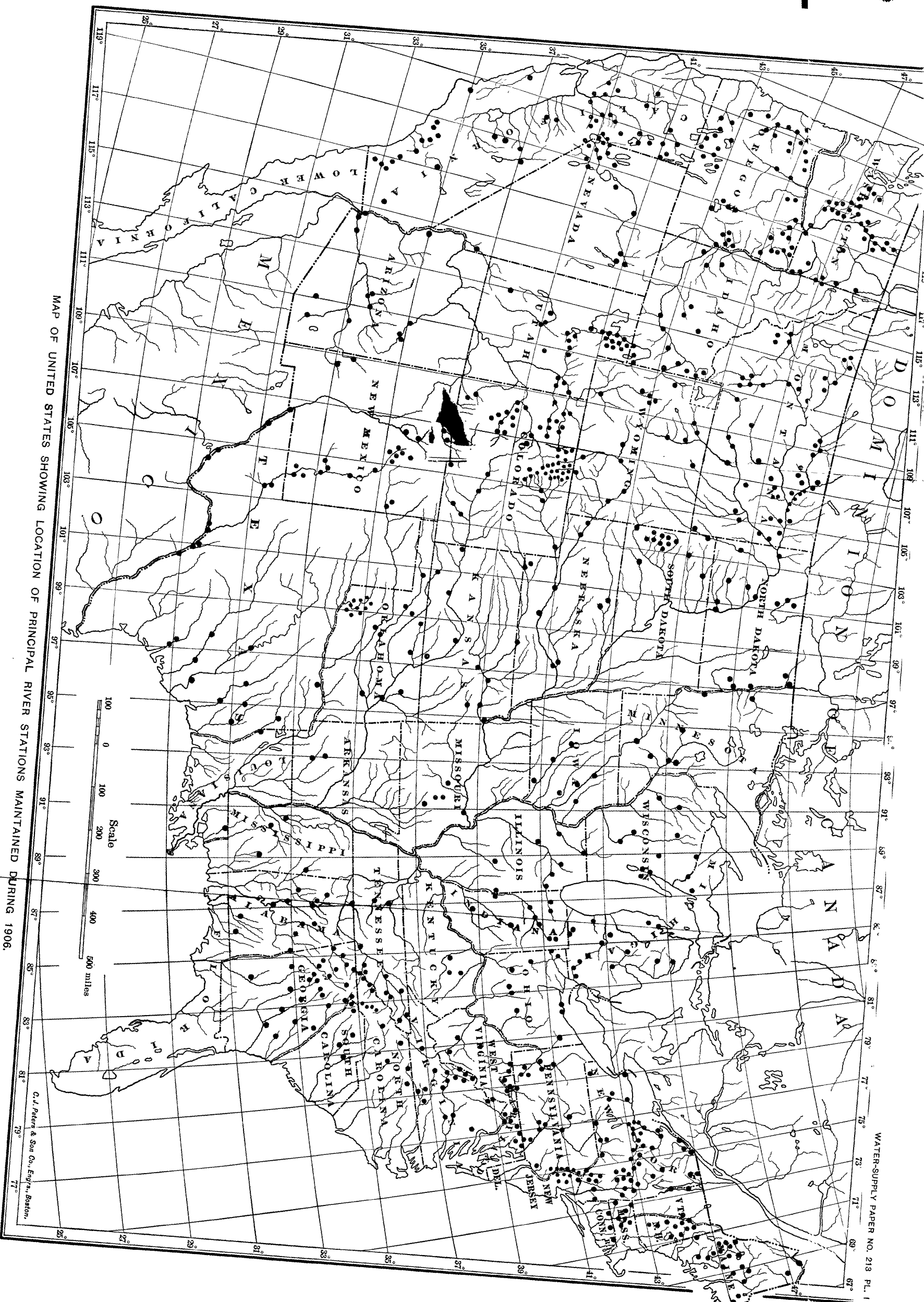
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THE DIRECTOR,

UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D.

OCTOBER, 1907.

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MAP OF UNITED STATES SHOWING LOCATION OF PRINCIPAL RIVER STATIONS MAINTAINED DURING 1906.

Scale
100 0 100 200 300 400 500 miles

C. J. Peters & Son Co., Eng'rs., Boston.