

STATE OF NEVADA

BIENNIAL REPORT

OF THE

STATE ENGINEER

1929=1930

GEORGE W. MALONE
State Engineer of Nevada



CARSON CITY, NEVADA

STATE PRINTING OFFICE . . . JOE FARNSWORTH, SUPERINTENDENT

1931

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MINERAL REPORT

STATE ENGINEER



WILLIAM W. BROWN
Agent for Washoe



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STATE OF MICHIGAN

IN SENATE,
January 10, 1907.

REPORT
OF THE
COMMISSIONER OF THE
LAND OFFICE,
FOR THE YEAR
1906.

ALBION, MICHIGAN,
1907.

LETTER OF TRANSMITTAL

STATE OF NEVADA,
OFFICE OF THE STATE ENGINEER,
CARSON CITY, January 1, 1931.

To His Excellency, F. B. BALZAR, Governor, Carson City, Nevada.

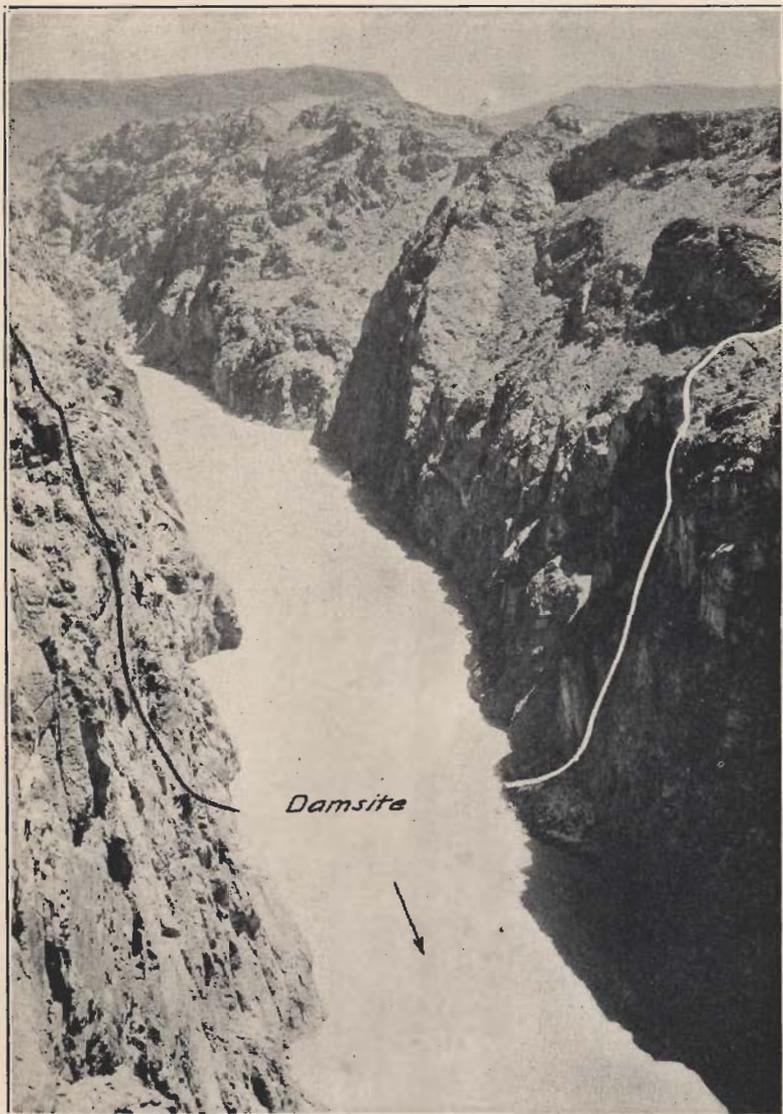
SIR: I herewith submit to you my report as State Engineer of the State of Nevada for the years 1929 and 1930.

Respectfully submitted,

GEO. W. MALONE,
State Engineer.

STATE ENGINEERS SINCE CREATION OF OFFICE

A. E. CHANDLER.....	May 29, 1903, to May 1, 1905
HENRY THURTELL.....	May 1, 1905, to May 1, 1907
FRANK R. NICHOLAS.....	May 1, 1907, to March 2, 1910
EMMET D. BOYLE.....	March 8, 1910, to March 21, 1911
W. M. KEARNEY.....	March 21, 1911, to May 15, 1917
J. G. SCRUGHAM.....	May 16, 1917, to January 10, 1918
SEYMOUR CASE.....	January 25, 1918, to March 28, 1919
J. G. SCRUGHAM.....	March 28, 1919, to October 7, 1922
ROBERT A. ALLEN.....	October 7, 1922, to March 28, 1927
GEO. W. MALONE.....	March 29, 1927—



HOOVER (BOULDER) DAM SITE ON COLORADO RIVER
Located 30 miles southeast of Las Vegas, Nevada. Height of structure
above stream bed, 582 feet. Total cost of project, \$165,000,000.
United States Reclamation Service Project.



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GEO. W. MALONE
State Engineer of Nevada
Member Public Service Commission
Secretary Colorado River Commission



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BIENNIAL REPORT OF STATE ENGINEER, 1929-1930

CHAPTER I Introductory and General

The first irrigation of arid lands in the State of Nevada dates back to the period when the mineral resources of the State were first exploited. This began about the year 1849, and the irrigation of lands lying adjacent to the river channels was made possible by the early construction of diversion canals for the purpose of supplying water for power and milling to the mills that were reducing the ores from the mines into concentrates. During the years 1849 to 1860 practically all the irrigation in Nevada was a by-product of mining development, as the market for agricultural products was limited to demands of the surrounding mining district.

A study of the records on file in the State Engineer's office discloses the fact that the earliest appropriator of water for irrigation purposes was one Nicholas Ambrose, who diverted water from the Carson River, near Empire, Nevada. The diversion of water by this early appropriator was made possible by the construction of a dam in the Carson River by the Brunswick Mill. The authenticity of the date of priority of this water right is still being questioned by other water users diverting water from the Carson River, but there can be no question of the fact that the first irrigation of arid lands in the State of Nevada occurred on lands adjacent to the Carson River, as many proofs have been entered in court proceedings establishing priorities of water rights on this stream during the years 1850 to 1860.

From 1860 to 1870 many settlers, recruited from the ranks of disillusioned miners, settled upon lands in the river bottoms of the various streams in the State and with little effort were enabled to divert water for the subirrigation or freeflooding of these bottom lands. Beginning about the year 1870 the livestock industry began to make itself an important factor in the growth and development of Nevada and, because of the unlimited available free range, grew by leaps and bounds and attracted to the State many bona fide farmers whose first intentions were to produce forage crops for the use of those stockmen who owned stock but no land. This influx of new settlers continued in a more or less desultory way until about 1905, at which time many colonization schemes were promulgated by promoters and railroad companies. By 1905 all of the lands in Nevada susceptible of reclamation by irrigation at a low cost per acre had been taken up and were being irrigated, thus forcing the new settlers to take up land that was at some distance from the main streams. The expense incurred in securing water for irrigation purposes for these outlying lands was prohibitive as far as the individual was concerned, and it became necessary for them to organize canal companies for the purpose of constructing and operating community canals and distribution systems. These canal companies were enabled to fill the need for

Tony Creek

VINCENT FULKERSON, Commissioner, 1929.....Entire Creek
 CHAS. MOULTREE, Commissioner, 1930.....Entire Creek

Muddy River, 1929-1930

S. D. CONGER, Commissioner.....Entire District

Currant Creek and Duckwater Creek

J. M. RYAN, 1929.....Entire District
 L. A. HARRIS, 1930.....Entire District

Pahranagat Lake

A. A. SCHOLE, Commissioner, 1929.....Entire District
 H. T. McQUISTON, Commissioner, 1930.....Entire District

Six-Mile Creek

R. A. KINNE, Commissioner, 1929.....Entire District
 CHAS. BROWN, Commissioner, 1930.....Entire District

**In Cooperation With the Department of State Engineer
 (U. S. Geological Survey, Water Resources Branch)**

A. B. PURTON.....District Engineer in Charge

Nevada Cooperative Snow Surveys

J. E. CHURCH, JR.....In Charge

**BUREAUS AND COMMISSIONS OF WHICH STATE ENGINEER
 IS A MEMBER**

Nevada Colorado River Commission

HON. F. B. BALZAR, Governor.....Chairman
 GEO. W. MALONE, State Engineer.....Secretary
 E. W. CLARK.....Member

Nevada Public Service Commission

J. F. SHAUGHNESSY.....Chairman
 GEO. W. MALONE, State Engineer.....Member
 HOYT R. MARTIN.....Member

State Irrigation District Bond Commission

HON. F. B. BALZAR, Governor.....Chairman
 E. J. SEABORN, Bank Examiner.....Member
 GEO. W. MALONE, State Engineer.....Member

Bureau of Industry, Agriculture and Irrigation

HON. F. B. BALZAR, Governor.....Chairman
 THOS. A. LOTZ, Surveyor General.....Member
 GEO. W. MALONE, State Engineer.....Member

State Range Commission

HON. F. B. BALZAR, Governor.....Chairman
 GEO. W. MALONE, State Engineer.....Member
 J. F. SHAUGHNESSY, Tax Commissioner.....Member

**LIST OF PUBLICATIONS PRINTED FOR DISTRIBUTION BY STATE
ENGINEER'S OFFICE**

Adjudication Publications

Abstract of Claims—

Carson River, 1921.	Little Humboldt River, 1913.*
Currant Creek, 1919.	Little Humboldt River, 1929.
Evans Creek, 1916.	Muddy River, 1906.
Humboldt River, 1909.	Salmon River, 1916.
Humboldt River, 1912.	Walker River, 1907.*
Humboldt River, 1922.	

Preliminary Order of Determination—

Carson River, 1921.*	Little Humboldt River, 1929.
Humboldt River, 1922.	Pahranagat Lake, 1926.*

Objections to Preliminary Order of Determination—

Humboldt River, 1922.*	Little Humboldt River, 1930.
------------------------	------------------------------

Order of Determination—

Carson River, 1927.	Muddy River, 1920.
Humboldt River, 1922.	Pahranagat Lake, 1926.

Objections to Order of Determination—

Humboldt River, 1923.

Priority Index Chart Humboldt River, 1924.

Biennial Reports State Engineer

1903-04;* 1905-06; 1907-08;* 1909-10; 1911-12;* 1913-14; 1915-16;
1917-18; 1919-20; 1921-22; 1923-24; 1925-26;* 1927-28.

Miscellaneous Publications

Cippoletti Weir Discharge Tables.
Colorado River Compact.
Humboldt River Distribution, 1930.
Nevada Drainage District Act.*
Nevada Improvement District Act.*
Nevada Irrigation District Act.
Public Domain Administration.
Regulations for Preparation of Maps.
Stock Watering Act.
Synopsis of Water Law, No. 7.
Water Laws of Nevada.

*Supply exhausted.

PERSONNEL
DEPARTMENT OF STATE ENGINEER
 Carson City Office

GEO. W. MALONE.....	State Engineer
H. W. REPPERT.....	Assistant State Engineer
G. F. ENGLE ¹	Deputy State Engineer
O. L. HUSSMAN ²	Deputy State Engineer
CHAS. K. MCCLELLAND ³	Office Engineer
F. N. DONDERO.....	Office Engineer
O. L. HUSSMAN ⁴	Special Assistant to the State Engineer, Little Humboldt River Adjudication
A. V. TALLMAN ⁵	Special Assistant to State Engineer
ADA F. POINTER.....	Chief Clerk
CHAS. THIEK.....	Clerk
MARJORIE FOTHERGILL.....	Stenographer
ZITA D. MEDER.....	Stenographer

WATER DISTRIBUTION
 Humboldt River, 1929

J. A. MILLAR, Supervising Water Commissioner.....	Entire River
A. M. QUILL, Commissioner.....	Elko District
O. L. HUSSMAN, Commissioner.....	Elko District
G. T. SALZMAN, Commissioner.....	Winnemucca District
WM. BROYLES, Commissioner.....	Battle Mountain District
VINCENT FULKERSON, Commissioner.....	Lovelock District
STEPHEN FULKERSON, Hydrographer.....	Humboldt River
HARRY LIPERELLI, Hydrographer.....	Humboldt River
JAMES DOVE, Hydrographer.....	Humboldt River
OSWALD McDERMOTT, Hydrographer.....	Humboldt River
MAXWELL THOMPSON, Hydrographer.....	Humboldt River
MARSHALL GUSTE, Hydrographer.....	Humboldt River
EIGHT WATCHMEN.....	Humboldt River
SUSIE ABEL, Filing Clerk.....	Winnemucca Office

1930

J. A. MILLAR, Supervising Water Commissioner.....	Entire River
A. M. QUILL, Commissioner.....	Elko District
WM. McCULLOCH, Commissioner.....	Elko District
W. V. HOLLAN, Commissioner.....	Battle Mountain District
ROY WHITACRE, Commissioner.....	Winnemucca District
PETER KRUMMES, ⁶ Commissioner.....	Lovelock District
ROY MEFFELEY, ⁷ Commissioner.....	Lovelock District
O. L. HUSSMAN, ⁸ Commissioner.....	Lovelock District
A. V. TALLMAN, Commissioner.....	Lovelock District
FRED BALDINA, Hydrographer.....	Humboldt River
L. TOLAND, Hydrographer.....	Humboldt River
H. LIPERELLI, Hydrographer.....	Humboldt River
MAXWELL THOMPSON, Hydrographer.....	Humboldt River
EDMUND RECANZONE, Hydrographer.....	Humboldt River
FRED RICH, Hydrographer.....	Humboldt River
JOHN KEPPNER, Hydrographer.....	Humboldt River
LONA LOWRY, Clerk.....	Winnemucca Office

¹January 1, 1929, to January 31, 1930. ²February 1, 1930, to date. ³January 1 to August 15, 1929. ⁴January 1, 1929, to January 31, 1930. ⁵July 1, 1930, to date. ⁶Transferred to South Fork. ⁷Low water period only. ⁸Loaned by State for brief period.

canal construction as long as no ready cash outlay was required on costly structures, and most of the investment represented in these companies was labor performed by the individual stockholders.

As this field of reclamation of arid lands reached its limit of possibilities, larger and more inaccessible areas of arid land demanded reclamation through application of irrigation water. The reclamation of these larger areas called for an expenditure of large sums of moneys for storage reservoirs, diversion dams and distributing canals. Thus it came about that the 1919 session of the Nevada State Legislature was requested to enact a law that would permit landowners owning contiguous areas of land to form an irrigation district which would have a definite boundary and would contain within this boundary arid lands that needed reclamation through the means of the application of irrigation waters.

An Act providing the procedure required for the formation of irrigation districts was passed by the 1919 Legislature and immediately became effective. Since that time several irrigation districts, having a total acreage within their boundaries of 327,662 acres, have been formed and the irrigated acreage of the State has been increased to the extent of 201,223 acres by the passage of this legislation.

During the next decade the State of Nevada will probably reach its ultimate capacity for irrigation development, which will occur only as economic conditions warrant. This future development will be costly and will consist chiefly of storage construction for impoundage of surplus and holdover stream run-off, pumping from wells and artesian flow.

The Legislative Act of 1903 created the office of the State Engineer primarily for the purpose of providing a method for determination and regulation of existing water rights in line with the then modern theory evolved in the western and semiarid States. This Act, while providing a method for adjudication of water rights which had become vested or were then in the process of initiation, neglected to provide a specific method by which future rights could be legally acquired; hence the Twenty-second Session of the Legislature passed an amendatory law, approved March 1, 1905, providing the exclusive method of subsequently initiating and perfecting a water right by application to the State Engineer for permission to appropriate and apply water to beneficial use.

Other amendments to the water law have since been made from time to time; however, they have been primarily for the purpose of facilitating the administration of the fundamental Act of 1903 as amended in 1905.

To begin with, constructive results under the new law were slow of accomplishment, as might be expected, due to the necessity of working out details of administration. Later the State Engineer was hampered by court actions seeking to restrain him from proceeding under the water law and vigorously attacking its constitutionality. These actions are a matter of record and will not be dwelt upon in detail. Throughout this period of constructive evolution, however, the water law emerged triumphant, thus leaving the State Engineer free to carry out the provisions of the statute without further question as to its validity.

From a State officer charged primarily with administering the water law, the State Engineer's duties have gradually increased and expanded to embrace many activities not originally contemplated when the office was created. Thus, in addition to being a member of the Public Service Commission, a post which requires a great deal of extra work and travel, he is a member of the Irrigation District Bond Commission, member of the Bureau of Industry, Agriculture and Irrigation, and member of the Colorado River Commission. These related activities of the State Engineer are covered in detail in Chapter X of this report.

In general, the activities of the office of the State Engineer may be divided into four classes, each of which is more or less separate and distinct:

1. Water right applications.
2. Adjudication of vested water rights.
3. Distribution of water on adjudicated streams.
4. Related activities and miscellaneous.

The office and field personnel has therefore been organized to accord with the aim of placing limited responsibility upon various individuals in conformity with the above grouping. Thus, the Assistant State Engineer, in addition to exercising general supervision over the work included in all groups, handles and is responsible for the department of water right applications; the Deputy State Engineer conducts the adjudication of vested water rights; the various supervising water commissioners are directly responsible for the distribution of water on the larger streams, such as the Humboldt River; while the State Engineer, in addition to supervising all the above, personally conducts work in connection with his related activities.

The considerable volume of miscellaneous work which cannot be grouped exclusively under any one of the above heads is accomplished jointly by the entire office force.

The potential possibilities of the office of the State Engineer as a departmental agency contributing to the permanent economic development of the State water and range resources are limited only by the lack of adequate funds with which to carry on. There can be no question as to the value of the ultimate complete development of the State's water resources, and this can best be accomplished by the speedy and full determination of relative rights. This becomes doubly important since the passage of the Stock Watering Act of 1925, which now makes it possible for the State Engineer to control and stabilize values in public range areas through the administration of stock watering rights. It therefore logically follows that the interests of the State's agricultural and stockraising industries can best be served by making it possible, by adequate legislative appropriation, for the State Engineer to function fully and efficiently.

STATE DEVELOPMENT

In addition to the routine work of the office, such as adjudication of the water rights of the stream systems, the administration of such streams and receiving applications to appropriate the waters of the State, making field examinations and holding hearings on such applications, etc., there were four major problems of vital interest to the

future development of the State, and the State Engineer has given a great amount of personal attention to these matters:

1. Colorado River—
 - a. Revenue in lieu of taxes.
 - b. Power for use in the State.
2. Range Control—
 - a. Range maps.
 - b. State Range Commission.
 - c. President Hoover's Public Domain Committee.
3. Humboldt River—
 - a. Proper records of water distribution.
 - b. Possible storage and river improvement.
4. Truckee and Carson Rivers—
 - a. Completion of Newlands Project.
 - b. Water Storage for Truckee Meadows.
 - c. Water Storage for upper Carson River.

The State administration and our Congressional delegation have worked together on all of the foregoing problems and a wonderful spirit of cooperation has been manifested at all times, which has resulted in the achievement of many of our activities.

The Swing-Johnson Bill for the construction of Hoover (Boulder) Dam was before Congress in the beginning of 1927 when this administration took over the affairs of the State; there was no provision, however, for revenue for Nevada or power for use in the State. Our Colorado River Commission, after full investigation, demanded and secured both revenue, in lieu of taxes, and power for use in the State, details of these activities appearing elsewhere in this report.

Proper range control and the protection of the individual user of such range has been an acute problem for more than twenty-five years. The State Legislature in 1929 created a State Range Commission to study the matter. Necessary hearings were held in order to determine ways and means to best utilize the range resources. The report of this Commission will be rendered to the present Legislature very soon. The State Engineer is a member of the Commission.

President Hoover, in 1929, appointed a Committee on Conservation and Administration of the Public Domain. The report of this Commission will go to the President in the near future and recommends among other things that the Federal Government recognize the State's method of range control; the State Engineer is also a member of this committee; more details of both of these commissions appear later in this report.

Four years' records have been kept on the Humboldt River of the distribution of the water of that stream, which will go far towards solving the difficult problems arising in the administration of the Order of Determination and any subsequent decree on that river. Plans are under way at this time for a review of this stream system by the Bureau of Reclamation officials to determine the possibilities of storage in order to stabilize the flow of the stream; further information on this matter will be found in this report.

The further development of the Truckee and Carson Rivers has been investigated by the Bureau of Reclamation and studies are being

continued at this time by the water users of the two streams, as well as the Bureau of Reclamation, looking to the completion of the Truckee-Carson Irrigation project and of stabilizing the flow of these rivers in such manner that all upstream lands can eventually be developed and that the water supply will care for. Additional information on this development appears later in this report.

It is believed that if the developments outlined hereinbefore can be brought to a successful conclusion the State of Nevada will fully utilize some of its many resources.

CHAPTER II

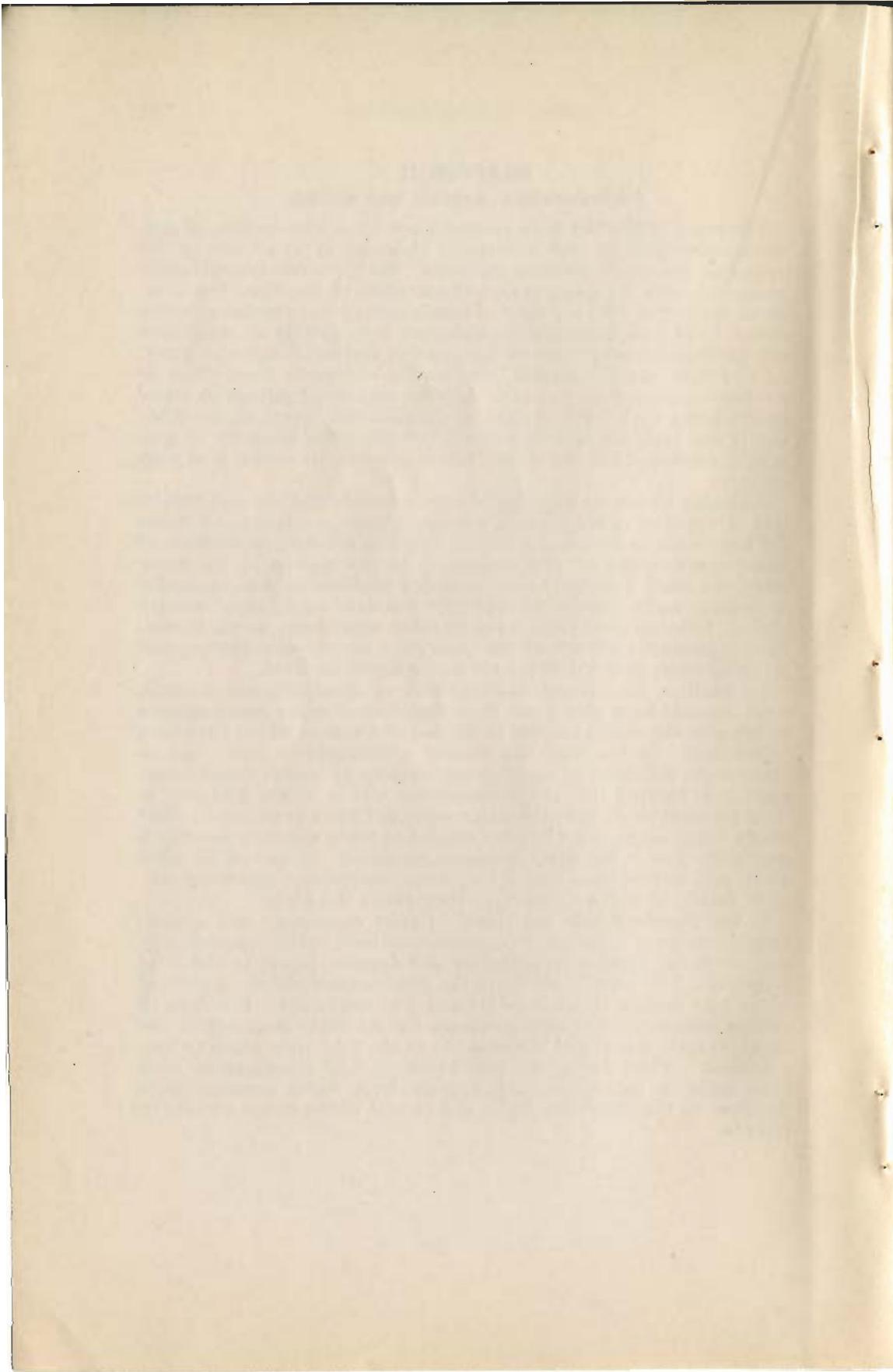
Administration, Appeals and Rulings

The years 1929-1930 were characterized by a continuance of sub-normal precipitation and consequent shortage in water supply for irrigation and stock watering purposes. Such periods are extremely trying for both the water users and the office of the State Engineer, which is charged with the duty of administering and regulating water rights. The past biennium has therefore been prolific of complaints and problems in connection with regulation and distribution of water, all of which required careful investigation and study upon which to predicate administrative action. Appeals requesting rulings on water controversies have come in from every nook and corner of the State and it has been the earnest endeavor of the State Engineer to give careful consideration and relief, where possible, in response to each appeal.

Although he has no legal jurisdiction over distribution and regulation of water on unadjudicated streams, appeals are frequently made for him to act as friend and arbiter to aid in effecting settlements of water controversies on such streams. At the request of the water users, the State Engineer, after extended conferences, was successful in getting many parties to amicably stipulate as to their relative rights. In many cases there being no other water users on the stream, these stipulations will afford the basis for a speedy adjudication and resulting court decree defining the water rights involved.

In addition to settling controversies on unadjudicated streams, many appeals have been made from decisions of water commissioners on streams, the relative rights to the use of water on which have been determined. It has been the general administrative policy not to hamper the activities of water commissioners by undue interference, since it is realized that the commissioner who is in the field and in close personal touch with the water users and their problems is, other things being equal, much better qualified to settle controversies which may arise than is the State Engineer personally, or any of his office force, who at best have only a long range perspective regarding intimate details of water distribution throughout the State.

It has therefore been the policy to refer complaints and appeals from decisions of local water commissioners back to the commissioners themselves for further investigation and detailed report to the State Engineer. This usually results in the commissioner and the aggrieved water user coming to an amicable and just settlement. However, in certain instances it has been necessary for the State Engineer, or his agent, to make a personal investigation in the field upon which to base a decision. Thus, during the past biennium field investigations have been made in connection with appeals from water commissioner's decisions on the Humboldt River and several of the minor streams in Nevada.



CHAPTER III

Applications for Water Rights

During the biennium covered by this report 592 applications have been filed. Of this number 62 applications have not as yet been sent to publication, having been returned to the applicant for correction or being held pending the receipt of a supporting map.

During the years 1929-1930 positive action of some kind has been taken on 584 applications, representing action on 235 applications filed during the present biennium and 349 applications which were filed prior to January 1, 1929. This leaves on January 1, 1931, out of a total of 9,394 applications which have been filed since the creation of the office of the State Engineer, 1,482 applications which are now pending action by this office.

There has been perceptible increase in the number of applications filed for stock watering purposes during recent years, and at the same time a marked decrease in the number filed for irrigation purposes, indicating that with the possible exception of underground waters the point of complete utilization of irrigation water supply has practically been reached.

The major portion of the applications for stock water purposes represents filings on isolated springs and water holes. In numerous instances it is obvious that the primary object in filing these applications is either to acquire and perfect valid stock watering rights on lands of the public domain previously utilized for stock grazing purposes, or to gain a foothold on the public range used by other persons, whose stock watering rights, either vested or applied, are probably somewhat questionable. For this reason it has been the policy of the office to proceed slowly in the granting of permits, unless it had some previous knowledge to the effect that prior or existing rights would not be impaired by the approval of an application.

In the administration of the Stock Watering Act the State Engineer is required to make numerous decisions affecting the appropriation of water for stock watering purposes, and in making these decisions he has pursued the past policy of the office in giving the prior user every benefit of the doubt in the matter of legal requirements governing the appropriation of water.

During the past biennium hearings have been held on protests against the granting of permits under 25 applications. Appeals from the findings of the State Engineer in the matter of 12 of these applications are now pending in the District Courts within the counties in which the water rights involved are situated.

In order to secure more definite and accurate locations of sources applied for, the office now requires that a supporting map be submitted with each application before publication is made. It is found that such a procedure not only facilitates and simplifies the handling of records in connection with water rights but, it is believed, will ultimately result in saving appropriators considerable expense and needless trouble.

Pertinent information regarding applications filed and certificates issued will be found as follows:

1. Status of Applications Filed During the Bien-
nium 1929-1930..... Chapter XVII
2. Status of Applications Filed Prior to January 1,
1929, upon which Action Has Been Taken
During the Years 1929-1930..... Chapter XVIII
3. Certificates Issued Under Permits 1929-1930..... Chapter XIX

CHAPTER IV

Adjudication of Water Rights

The work of determination of relative rights to the water resources of the State during the past biennium has progressed as rapidly as possible, considering the fact that the office and field personnel of this department of water rights has been limited to a minimum under the present appropriation.

The scope of activities in connection with the adjudication of the various sources during the biennium may best be considered in order of their importance for irrigation.

CARSON RIVER

A brief resumé of the legal proceedings that have been under way for the past several years, in an effort to determine the priorities and duty of water for lands depending upon the waters of the Carson River and its tributaries for their irrigation supply, is herewith given for the purpose of bringing up-to-date the status of these water rights:

May, 1903, to May, 1905—An attempt was made to determine these rights by A. E. Chandler, Nevada's first State Engineer. These findings resulted in the issuance of certificates of appropriation of water during April, 1905, but did not include old water right lands included in the Newlands Project nor those lands in the State of California that depend upon this watershed for irrigation water. Subsequent litigation brought forth the fact that these Chandler findings were unconstitutional.

April 10, 1920—J. G. Scrugham, State Engineer at that time, initiated adjudication proceedings on the "Waters of the Carson River and Its Forks in the Counties of Ormsby, Douglas and Lyon." No mention was made of the water rights in Churchill County nor those in California.

May 11, 1925—A suit in equity was filed in the District Court of the United States for the District of Nevada entitled "The United States of America, Plaintiff, v. Alpine Land and Reservoir Company, a Corporation, et al, Defendants."

The suit was instituted by the United States in behalf of the United States Bureau of Reclamation, who were the constructors of the Newlands Project, and was brought for the purpose of determining the relative rights of all the water users of the Carson River and its tributaries, regardless of State boundary lines.

This action is before the Federal Court at the present time and will not be finally acted upon for at least another year, as there seems to be a wide difference of opinion among the water users as to the acreages that were under irrigation on the dates of priorities claimed by the water users.

March 28, 1927—Robert A. Allen, then State Engineer, officially filed the completed Order of Determination in his office. This completed order did not mention the various existing rights in Churchill County nor those rights diverting water from this stream in California.

November 21, 1928—The present State Engineer filed the Order of Determination, together with the original evidence, etc., with the Clerk of the First Judicial District Court at Carson City.

February 4, 1929—Hearings started before Honorable G. A. Ballard on Exceptions to the Order of Determination.

April 6, 1929—Application for writ of prohibition issued by the Supreme Court of the State of Nevada in the suit of Mexican Dam and Ditch Company, a Corporation, et al, Petitioners, v. The District Court of the First Judicial District of the State of Nevada, in and for the County of Ormsby, and Honorable G. A. Ballard, Judge thereof, Defendants.

This writ of prohibition requested the State Supreme Court to issue an order which would hold in abeyance any further proceedings on the part of the District Court until after the conclusion of a suit that had been instituted by the United States of America in the District Court of the United States for the District of Nevada on May 11, 1925. These findings of the Supreme Court were based upon the presentation of proof that all of the water users on the Carson River and its tributaries had not been made parties to the Order of Determination.

April 6, 1929—Order of alternative writ of prohibition issued by the Supreme Court of the State of Nevada directing "that all proceedings in said cause" in the Matter of the Determination of the Relative Rights of Claimants and Appropriators of the Waters of the Carson River and Its Forks, now pending in the District Court of the First Judicial District in and for the County of Ormsby, be and the same are hereby stayed until the return of the alternative writ of prohibition herein.

July 1, 1930—The Supreme Court of the State of Nevada issued a writ of prohibition in the above-mentioned suit, thus permanently holding in abeyance any effort on the part of the State of Nevada to determine the relative rights of the various water users diverting water from the Carson River and its tributaries until such time as the District Court of the United States for the District of Nevada renders its decree or findings. It is the general opinion of many of the parties concerned that a duplication of proceedings can be prevented and a great deal of time and money saved by withdrawal on the part of the State of Nevada in all proceedings relating to the determination of the relative rights of the various water users of the Carson River.

A total of 36,955 acres of irrigated lands are included in the State Engineer's Order of Determination.

LITTLE HUMBOLDT RIVER

The Little Humboldt River system derives the major portion of its water supply from the main stream of the Little Humboldt River, and in addition receives water from the following tributary creeks: Martin, Cottonwood, Indian, Colony, Morey, Dooley, Haviland, Hansen and Stonehouse. Approximately 50,000 acres of land are irrigated from these sources. A greater part of this area is wild hay and natural meadow pasture land.

Proofs of appropriation were first filed with the State Engineer

during the years of 1909 and 1910. The proofs submitted included the total acreage irrigated by each claimant without regard to the acreage in each 40-acre subdivision, which is required before the abstract of claims can be prepared, and were therefore of little value. From this time on attempts made by former State Engineers to further the proceedings came to naught, as sufficient funds could not be obtained to assure the completion of this work.

During the régime of the present State Engineer an urgent request was made by many of the water users involved that the proceedings necessary for the completion of the adjudication of this stream be aggressively pursued until the Final Order of Determination could be filed with the Clerk of the District Court. A voluntary contribution of \$5,000 from the water users on the stream system has made it possible for this office to employ special engineers, who have devoted their entire time to this adjudication:

January 18, 1929—Formal notice was served upon the water users of the Little Humboldt River and its tributaries that the State Engineer's office would proceed with the adjudication of this stream system pursuant to section 14, chapter 253, of the Statutes of 1915. This notice granted the water users a period of 60 days in which to file "additional or supplementary maps, plats, surveys, or evidence, or objections to the admissibility of any evidence hitherto presented and on file in my office." This period was extended from time to time, and on August 1, 1929, was closed. From the data that was on file in this office and with the additional data that was submitted during the period extending from January 18 to August 1, 1929, the abstract of claims was prepared.

October 1, 1929—Abstract of Claims to Waters of the Little Humboldt River and Its Tributaries prepared by the State Engineer and filed in his office at Carson City.

November 1, 1929—The present State Engineer filed in his office the Preliminary Order of Determination, Little Humboldt River and Its Tributaries in Humboldt and Elko Counties.

January 6, 1930—Preliminary Order of Determination opened for inspection, continuing for a twenty-day period.

January 6 to February 15, 1930—Period allowed for filing Objections to Preliminary Order of Determination.

February 15, 1930—Water users notified as to the date for opening hearing on Objections to the Preliminary Order of Determination.

February 21, 1930—Objections to Preliminary Order of Determination printed and officially filed by the State Engineer in his office.

March 19, 1930—Opening date for hearing Objections to the Preliminary Order of Determination. This hearing was postponed from time to time upon request of the attorneys representing the various water users.

October 1, 1930—Final hearing began at Winnemucca before a representative of the State Engineer's office and has made progress intermittently since that time. This hearing was completed on December 12, 1930, and the Final Order of Determination will probably be filed with the Clerk of the District Court about March 1, 1931.

THOUSAND SPRINGS CREEK

Thousand Springs Creek and its principal tributaries, Rock and Silver, or Crittenden, Creeks, are situated in Elko County, in the extreme northeastern part of the State. The total area embraced in adjudication proceedings of this stream is 5,408.7 acres, all of which are owned by the Utah Construction Company.

These proceedings were held on the following dates and carried through to completion by this office:

1924 and 1925—Proofs of appropriation and supporting maps filed in the office of the State Engineer.

March 27, 1928—Petition received by State Engineer's office requesting adjudication of waters of Thousand Springs Creek and its tributaries.

April 11, 1928—Report on investigation of stream system filed in office of the State Engineer by Deputy State Engineer.

April 12, 1928—Petition granted by the State Engineer.

April 24, 1928—Waivers of notices received by the State Engineer.

August 16, 1928—Abstract of Claims, Thousand Creek adjudication filed by State Engineer in his office.

May 15, 1929—Preliminary Order of Determination filed in the office of the State Engineer.

July 18, 1929—Final Order of Determination filed with the Clerk of the District Court of the Fourth Judicial District of the State of Nevada, County of Elko.

September 9, 1929—Court hearings held on above cause.

December 6, 1929—Decree entered by Honorable E. P. Carville, District Judge.

April, 1930—Certificates of Appropriation of Water issued by the State Engineer of Nevada.

CARRICO CREEK

Adjudication proceedings were initiated on this stream in response to a petition filed in the State Engineer's office on July 29, 1927, by J. C. Wholey, a water user.

Carrico Creek and its tributaries, Hall and Iowa Creeks, are located in Lander County, about forty miles north of Austin, Nevada. Approximately 1,002 acres are involved in the adjudication:

August 15, 1927—Report of field investigation made by agent of the State Engineer filed in office of State Engineer.

August 18, 1927—Petition granted and notice filed by State Engineer that proceedings would be instituted to determine the water rights for the waters of Carrico Creek and its tributaries.

August 18 to October 1, 1927—Proof of Claims filed in the office of the State Engineer by water users.

May 10, 1928—Abstract of Claims filed in the office of the State Engineer.

May 16, 1928—Order of Determination filed by the State Engineer in his office at Carson City.

May 19, 1928—Filed Abstract of Claims and Order of Determination with the Clerk of the Court, Third Judicial District, at Austin, Nevada.

September 18, 1929—Court hearing held in the above cause.

November 26, 1929—Decree entered by Honorable W. R. Reynolds, District Judge.

July 9, 1930—Certificates of Appropriation of Water issued by the State Engineer of Nevada.

TONY CREEK

Tony Creek and its principal tributaries, Chimney and Porecupine Creeks, are situated in Humboldt County, about forty miles north of Winnemucca, in the Quinn River basin. As none of the waters of Tony Creek ever reached Quinn River, this creek was considered as a separate and distinct source:

April 12, 1925—Petition filed in the office of the State Engineer for initiating proceedings for determining the relative rights of water users of Tony Creek and its tributaries.

March 1, 1926—Report on field investigation filed by the State Engineer in his office.

April 7, 1926—Order issued by State Engineer authorizing initiation of proceedings to determine the relative rights of water users of Tony Creek and its tributaries.

May 3 to November 30, 1926—Maps, plans and proofs filed in the office of the State Engineer.

January 10, 1928—Abstract of Claims filed by the State Engineer in his office.

January 10, 1928—Preliminary Order of Determination filed by the State Engineer in his office.

February 20, 1928—Abstract of Claims and Preliminary Order of Determination opened for inspection for twenty-day period.

February 20 to March 26, 1928—Objections received and filed in the office of the State Engineer.

May 1, 1928—Hearing held at Winnemucca, Nevada, by State Engineer on Objections to the Preliminary Order of Determination.

June 28, 1928—Order of Determination filed by the State Engineer in his office at Carson City.

July 9, 1928—Order of Determination, together with all evidence, maps and transcript was filed with the Clerk of the Sixth Judicial District Court at Winnemucca.

November 1, 1928—Hearing held by the court on Exceptions to the Order of Determination.

August 31, 1929—Final decree rendered by the Honorable L. O. Hawkins, District Judge.

December 31, 1930—Issuance of Certificates of Appropriation of Water withheld by the State Engineer pending receipt of the decree issued by the above-mentioned court.

BAKER AND LEHMAN CREEKS

Baker and Lehman Creeks are situated in White Pine County, and the adjudication proceedings which were initiated on July 18, 1925, have not advanced during the past biennium. The last extension of time within which to file additional proofs of water rights was granted on March 5, 1928, and extended the time to June 1, 1928:

January 10, 1912—The State Engineer of Nevada issued Certificates of Appropriation of Water for 2,190.7 acres of land receiving water from these sources under the provisions of section 18, chapter 18, Statutes of 1907. There is an additional area of approximately 1,500 acres deriving water for irrigation purposes, which are acquiring water rights under permits from the office of the State Engineer. Due to the doubt on the part of the legal fraternity as to the constitutionality of the power granted the State Engineer under the provisions of section 18, chapter 18, Statutes of 1907, the certificates issued on January 10, 1912, are of doubtful validity. In order to clear up the legal status of these rights and make all water users deriving water from Baker and Lehman Creeks parties to the action, the usual procedure in determining the relative rights of the various water users was initiated on July 18, 1925. There is no doubt but what these proceedings will be completed during the next biennium.

SILVER CREEK

Upon petition of two of the water users on Silver Creek, Lander County, a field investigation was made by the State Engineer's office on March 7-11, 1928, which disclosed the fact that existing conditions warranted initiation of adjudication proceedings on this stream. Three claimants are involved, two of whom have submitted proof of their claims. These proceedings have been held in abeyance pending receipt of proofs from the third water user. On November 14, 1930, a representative of the State Engineer's office visited these water users and attempted to secure their cooperation in bringing to a conclusion these proceedings. A final adjudication of these water rights will probably be completed during the next biennium.

K. C. CREEK

A petition was filed in the office of the State Engineer on July 1, 1927, by a K. C. Creek water user, requesting the State Engineer to initiate proceedings that would determine the relative rights of the various claimants on K. C. Creek, sometimes known as Conway Creek, and sometimes called Renshaw Creek, Clover Valley, Elko County, Nevada:

September 15, 1927—The State Engineer filed Notice of Order and Proceedings to Determine Water Rights.

November 27, 1928—A Notice and Order for Taking Proofs was entered and served on interested claimants involved in the proceeding.

March 16, 1929—Suit filed in District Court by two water users, asking for restraining order restraining the State Engineer from proceeding with the adjudication proceedings.

March 29, 1929—Court ordered hearing held on restraining order.

November 27, 1929—Court rendered decision dissolving injunction and dismissing restraining order.

June 10, 1930—Amended complaint filed by water users again requesting restraining order, which was answered by the Attorney-General on behalf of the State Engineer.

December 17, 1930—No action reported to date on amended complaint.

PEAVINE CREEK

Peavine Creek and its tributaries are situated in Nye County, about fifty miles north of Tonopah, Nevada. There are 222 acres owned by two water users that are directly involved in this adjudication, although there is an additional area of several hundred acres that derive a partial supply of irrigation water by virtue of water rights, as evidenced by filings in the office of the State Engineer:

February 18, 1928—Petition filed with State Engineer by water users requesting the State to initiate proceedings to determine relative rights.

June 25, 1928—Field investigation completed and report filed by the State Engineer in his office.

August 8, 1928—Notice of order and proceedings to determine water rights published.

September 27, 1929—Notice and order for taking proofs published.

July 1, 1930—Abstract of Claims prepared by State Engineer and filed in State Engineer's office.

July 5, 1930—Preliminary Order of Determination filed by State Engineer.

July 7, 1930—Notice and order setting time and place of inspection of Abstract of Claims and Preliminary Order of Determination.

September 19, 1930—Notice of time and place for hearing Objections and Proof of Service on Claimants.

December 8, 1930—Hearing postponed to January 20, 1931.

DUCKWATER CREEK

The main source of water supply of Duckwater Creek is a spring known as Big Warm Springs. The lands irrigated from this stream are located in the northeastern part of Nye County, about four miles north of Duckwater, Nevada. There are approximately 3,000 acres of land irrigated from this stream. Legal controversies have been in existence since the late 70's:

December 1, 1909—The first court decree was rendered by Honorable M. R. Averill, adjudicating the rights of the various water users of Duckwater Creek.

June 20, 1910—Another decree was entered by the above-mentioned court, and these decrees have been the basis upon which all subsequent activities have centered.

October 6, 1919—A stipulation was entered into by the various water users and indorsed by the court, requesting the State Engineer's office to make a field investigation of the water resources of this stream and recommend to the court and the water users types of structures, measuring devices and canal construction required to bring about a more economical and satisfactory method of distributing the waters of this stream.

This investigation was completed and a report filed on April 13,

1921, by the office of the State Engineer. From that time on the State Engineer's office has been actively in charge of the distribution of the waters of this stream.

March 27, 1930—A stipulation was entered into by the various water users, which brought to a conclusion the remaining questions involved in the litigation of the waters of this stream.

PAHRANAGAT LAKE

The Pahrnanagat Lake stream system is located in Lincoln County, from Hiko southerly to Pahrnanagat Lake, the town of Alamo being situated near the center of the system:

December 8, 1919—Several of the water users diverting water for irrigation purposes from this source of supply petitioned the State Engineer to initiate adjudication proceedings to determine the relative rights of the various water users.

July 27, 1921—The State Engineer issued order initiating proceedings for the determination of the relative rights to the waters of Pahrnanagat and Maynard Lakes and their tributaries.

September 3, 1921, to May 27, 1922—Proofs of appropriation of water, maps, plans and surveys filed by water users with the State Engineer.

1925—Abstract of Claims completed and filed by State Engineer in his office.

October 1, 1925—Preliminary Order of Determination completed by State Engineer and filed in his office.

January 25, 1926—Abstract of Claims and Preliminary Order of Determination open for inspection for twenty-day period.

March 4, 1926—Last-day objections to the Preliminary Order of Determination would be received by State Engineer's office.

April 21, 1926—Order of Determination filed by State Engineer in his office.

March 10, 1927—Order of Determination filed by State Engineer with the Clerk of the District Court, Pioche, Nevada.

June 21, 1927—Hearing held by Honorable Wm. E. Orr, Judge of the Tenth Judicial District Court of the State of Nevada.

October 14, 1929—Decree issued by the above court.

November 1, 1929—Certificates of Proof of Appropriation of Water issued by the State Engineer to the respective water users as set forth by the decree of October 14, 1929.

QUINN RIVER

The headwaters of the Quinn River rises in the vicinity of the Oregon-Nevada line near the town of McDermitt, Nevada, in Humboldt County. These waters flow in a southerly direction for about fifty miles and thence westerly approximately forty miles, dissipating into the Black Rock Desert.

The adjudication of the relative rights of the water users of this stream and its tributaries was initiated on October 28, 1907, in the Second Judicial District Court of the State of Nevada. This action was completed by the court without any recourse on the part of the water users to the State Engineer:

April 9, 1919—A final decree was rendered by the above court, which adjudged, decreed and established the water rights of Quinn River and its tributaries. This decision of the District Court was appealed to the Supreme Court of the State of Nevada, requesting the Supreme Court to set aside the findings of the District Court and order a retrial.

April 2, 1930—The Supreme Court of the State of Nevada handed down a decision which dismissed the appeal and affirmed the order, denying appellant's motion for a new trial.

July 1, 1930—Request received by the State Engineer from the Pacific Livestock Company, requesting the State Engineer to take charge of the distribution of the waters of Quinn River and distribute the waters in accordance with findings of the decree of April 9, 1919.

July 2, 1930—The State Engineer refused to assume the responsibility of distributing the waters of Quinn River, on the grounds that the State Engineer's authority only applies to streams where the rights have been adjudicated, wherein the State Engineer compiles an Order of Determination defining the relative rights of the claimants and appropriators and files same with the court of jurisdiction.

August 12, 1930—A petition for an alternative writ of mandate was filed in the Supreme Court of the State of Nevada by the Pacific Livestock Company, a Corporation, Petitioner, v. Geo. W. Malone, State Engineer of the State of Nevada. This petition requests the Supreme Court to issue a writ of mandate commanding the State Engineer to assume and take control of the waters of Quinn River and its tributaries and to regulate, distribute and divide the waters thereof in accordance with the District Court decree of April 9, 1919.

October 6, 1930—Arguments by attorneys representing the interested parties were presented before the Supreme Court on the petition for an alternative writ of mandate.

At the close of this biennium a decision in this action has not been handed down by the Supreme Court.

WALKER RIVER

The drainage area of the Upper Walker River lies in Mono County, California, on the eastern slope of the Sierra Nevada Mountains. There are two main forks of this stream, known as the West Walker River and the East Walker River. These two streams come together in the State of Nevada a few miles south of Yerington, and form the main Walker River, which empties into the Walker Lake.

Initiation of adjudication proceedings to determine the relative rights of the water users of this stream was evidenced by a suit filed in the United States District Court for the District of Nevada entitled Pacific Livestock Company, a Corporation, Complainants, v. Thomas B. Rickey, et al. Defendants. This suit was filed on June 10, 1902, and was intermittently before the court until March 3, 1919, at which time a final decree was entered by the Honorable E. S. Farrington, Judge of the United States District Court.

For several years the office of the State Engineer acted as an agent of the Federal Court in distributing the waters of the Walker River, but due to the difficulties arising from State control over waters diverted in the State of California, the State Engineer of Nevada recommended

to the Judge of the Federal Court, as evidenced by a letter dated May 1, 1920, on file in the State Engineer's office, that a much more just and equitable distribution of the waters of this stream could be obtained by the court appointing a disinterested party as Water Commissioner, thus relieving the State Engineer's office of any further responsibilities in this matter:

On March 1, 1922, the Federal Court assumed entire charge of this stream, and has continued to do so since that time.

July 3, 1924—A suit was filed in the District Court of the United States of America, in and for the State of Nevada, by the United States of America v. The Water Users of the Walker River. This suit was filed by the United States in behalf of the Indian lands on the Walker River Indian Reservation, on the grounds that the United States was not made a defendant in the original suit brought by the Pacific Livestock Company. The Government alleges in its bill of complaint that there are 11,000 acres on the Indian Reservation susceptible of irrigation, and claim 150 second feet of water from the Walker River for the irrigation of said lands.

This suit is before the court at the close of this biennium.

TRUCKEE RIVER

The Truckee River derives its major water supply from Lake Tahoe, which is one of the scenic lakes of the Sierra Nevada mountains. Lake Tahoe is situated on the Nevada-California State line, about fifteen miles west of Carson City, Nevada. The surface of the lake represents an area of approximately 120,000 acres and has an average fluctuation of about six feet in depth each year.

During the year 1903 the United States Reclamation Service started work on the reclamation of the arid lands of the Newlands Project, which derives a portion of its water supply from the Truckee River. The entry of the United States as an appropriator of waters of this stream was the cause of the initiation of proceedings to determine the relative rights of the water users of this stream before the United States District Court instead of attempting to determine these rights in the State Courts:

March 3, 1913—Suit was instituted by the United States of America, naming all the water users of the Truckee River as defendants. This suit was before the Federal Court for several years and resulted in a temporary restraining order being handed down by the Federal Court on February 13, 1926. This temporary order was issued for the purpose of giving to the Water Commissioner a basis from which to distribute the waters of this stream until such time as additional data could be gathered upon which a final decree could be based.

The distribution of the waters of the Truckee River has been directly under the supervision of the United States District Court for the past several years.

PROOFS OF APPROPRIATION AND CERTIFICATES OF WATER RIGHTS

During the biennium the following proofs of appropriation, accompanied by cultural maps in support of the rights claimed, have been accepted and filed for future use in determination of relative rights on various sources of water supply within the boundaries of the State.

The certificates of water right listed were issued upon completion of adjudication proceedings by entry of the Court's final decree of determination in the matter of the adjudication of Pahrnagat Lake and Its Tributaries, Lincoln County; Thousand Springs Creek and Tributaries, Elko County, and Carrico Creek and Tributaries, Lander County.

PROOFS OF APPROPRIATION FILED DURING THE YEARS 1929-1930

Following is a condensed statement giving the salient data in connection with Proofs of Appropriation filed during the years 1929-1930, in the order of:

1. Proof Serial Number.
2. Date Filed.
3. Name of Claimant.
4. Source of Water Supply.
5. Use Claimed under Appropriation in Terms of Acres Irrigated, Stock Watered, Etc.
6. Purpose of Appropriation.

02204.....12-22-28.....John W. Henriod; Indian Creek; 23.70 acres; Irrigation and domestic. (Omitted from 1927-1928 Biennial Report.)

1929

02205.... 3- 2-29....Murray Sheep Company; White Rock Cabin Springs; 6.5 acres; Irrigation and domestic.
 02206.... 3-30-29....W. B. Griffith; Wood Gulch Creek; 200 cattle; Stockwater.
 02207.... 8-20-29....A. W. Hesson, Thomas Hunter and J. J. Hylton; Sweepstake Spring; Domestic and small garden; Domestic.
 02208.... 9-16-29....F. C. Vanover; Box Spring; 100 cattle; Stockwater.
 02209.... 9-16-29....F. C. Vanover; Ike Spring; 150 horses; Stockwater.
 02210....10- 7-29....J. P. Saffores; Little Antelope Spring; 700 cattle or 2,500 sheep; Stockwater.
 02211....10- 7-29....J. P. Saffores; Summit Spring; 700 cattle or 2,500 sheep; Stockwater.
 02212....10- 7-29....J. P. Saffores; Devine Spring; 700 cattle or 2,500 sheep; Stockwater.
 02213....10- 7-29....J. P. Saffores; Cottonwood Spring; 700 cattle or 2,500 sheep; Stockwater.
 02214....10- 7-29....J. P. Saffores; Reservoir Spring; 700 cattle or 2,500 sheep; Stockwater.
 02215....10- 7-29....J. P. Saffores; Cherry Spring; 300 cattle or 2,500 sheep; Stockwater.
 02216....10- 7-29....J. P. Saffores; Rock Spring; 700 cattle or 2,500 sheep; Stockwater.
 02217....10- 7-29....J. P. Saffores; Pothole Spring; 700 cattle or 2,500 sheep; Stockwater.
 02218....11-21-29....Ellison Ranching Company; Fall Creek; 300.26 acres; Irrigation and domestic.
 02219....11-21-29....Ellison Ranching Company; McConnell Creek and its tributary, Horse Creek; 432.25 acres; Irrigation and domestic.
 02220....11-21-29....Ellison Ranching Company; Buffalo Creek; 569.68 acres; Irrigation and domestic.
 02221....12-24-29....Elizabeth Symonds Whitty; Poison Creek and Thunderbolt Creek, a tributary; 30.52 acres; Irrigation and domestic.

1930

02222.... 2-14-30....Tippett Mercantile Company; Mud Spring; 1,500 sheep; Stockwater.
 02223.... 2-14-30....Tippett Mercantile Company; Long Spring; 1,500 sheep; Stockwater.
 02224.... 3- 5-30....Annie M. Horton; Elison Creek; 63.13 acres; Irrigation and domestic.
 02225.... 6-10-30....Mrs. O. Bertolino; Peavine Creek; 94.60 acres; Irrigation and domestic.
 02226.... 6-13-30....E. E. Seyler; Peavine Creek; 170 acres; Irrigation and domestic.
 02227.... 8- 5-30....Chango and Aldax; Churchill Canyon Creek; 2,000 sheep; Stockwater.
 02228....11-26-30....Joe Chabagno; Spring in Golconda Canyon; 75 cattle; Stockwater.

NOTE—In every case the term "Domestic Use" includes stock watering when it is considered under an appropriation for water for irrigation. In other cases the appropriation is made for water exclusively for "Stock Watering." Under "Use Claimed" a sufficient amount of water is claimed to meet requirements for a given number of acres irrigated or for the number of stock watered.

CERTIFICATES ISSUED UNDER PROOFS OF APPROPRIATION 1929-1930

The following information is given in the order of:

1. Certificate Number.
2. Book Number.
3. Proof Serial Number.
4. Name of Claimant.
5. Source of Water Supply.
6. Purpose of Appropriation.
7. Number of Acres Irrigated.
8. Date Certificate Issued.

1929

302	2	01354	J. L. Sharp; Ash Springs, a tributary of Pahrana-gat Lake; Irrigation and domestic; 165.90; November 1, 1929.
303	2	01362	J. W. Richard; Ash Spring Creek, a tributary of Pahrana-gat Lake; Irrigation and domestic; 82.00; November 1, 1929.
304	2	01363	John W. Wedge; Ash Spring Creek, a tributary of Pahrana-gat Lake; Irrigation and domestic; 82.00; November 1, 1929.
305	2	01393	G. W. Richard; Ash Springs, a tributary of Pahrana-gat Lake; Irrigation and domestic; 109.00; November 1, 1929.
306	2	01394	W. H. Sharp; Ash Spring Creek, a tributary of Pahrana-gat Lake; Irrigation and domestic; 459.40; November 1, 1929.
307	2	01490	Lawrence Richard; Ash Spring Creek, a tributary of Pahrana-gat Lake; Irrigation and domestic; 59.50; November 1, 1929.
308	2	01548	G. W. Thriot; Crystal and North Crystal Springs, tributaries of Pahrana-gat Lake; Irrigation and domestic; 338.70; November 1, 1929.
309	2	01630	Rachel Stewart; Ash Springs, a tributary of Pahrana-gat Lake; Irrigation and domestic; 51.30; November 1, 1929.
310	2	01765	Mary A. Castles; Hiko Spring, a tributary of Pahrana-gat Lake; Irrigation and domestic; 136.60; November 1, 1929.
311	2	01788	Mary E. Wright; Hiko Spring, a tributary of Pahrana-gat Lake; Irrigation and domestic; 17.09; November 1, 1929.
312	2	01789	J. L. Sharp; Ash Spring, a tributary of Pahrana-gat Lake; Irrigation and domestic; 100.00; November 1, 1929.
313	2	01793	Gardner Ranch Company; Ash Springs, a tributary of Pahrana-gat Lake; Irrigation and domestic; 1186.67; November 1, 1929.
314	2	01794	Gardner Ranch Company; Crystal Springs, a tributary of Pahrana-gat Lake; Irrigation and domestic; 564.00; November 1, 1929.
315	2	01794	Gardner Ranch Company; Crystal Springs, a tributary of Pahrana-gat Lake; Irrigation and domestic; 111.00; November 1, 1929.
316	2	01796	G. Edgar Nesbitt; Hiko Spring, a tributary of Pahrana-gat Lake; Irrigation and domestic; 134.66; November 1, 1929.
317	2	01797	James Castles; Hiko Spring, a tributary of Pahrana-gat Lake; Irrigation and domestic; 10.00; November 1, 1929.
318	2	01798	M. F. W. U. and W. J. Schofield; Hiko Spring, a tributary of Pahrana-gat Lake; Irrigation and domestic; 271.50; November 1, 1929.
319	2	01799	W. F. Thorne; Ash Spring Creek, a tributary of Pahrana-gat Lake; Irrigation and domestic; 11.40; November 1, 1929.
320	2	01802	Alamo Irrigation Co., Inc.; Ash Spring Creek, a tributary of Pahrana-gat Lake; Irrigation and domestic; 501.50; November 1, 1929.
321	2	01825	A. W. Geer; Crystal Springs, a tributary of Pahrana-gat Lake; Irrigation and domestic; 441.70; November 1, 1929.
322	2	01825	A. W. Geer; Crystal Springs, a tributary of Pahrana-gat Lake; Irrigation and domestic; 137.70; November 1, 1929.

1930

323	2	01862	The Utah Construction Co.; Thousand Springs Creek; Irrigation; 330.90; April 19, 1930.
324	2	01863	The Utah Construction Co.; Thousand Springs Creek; Irrigation; 2985.30; April 19, 1930.
325	2	01864	The Utah Construction Co.; Thousand Springs Creek; Irrigation and domestic; 1482.70; April 19, 1930.
326	2	01865	The Utah Construction Co.; Thousand Springs Creek; Irrigation and domestic; 40.10; April 19, 1930.
327	2	01866	The Utah Construction Co.; Crittenden Creek and Springs; Irrigation and domestic; 90.5; April 19, 1930.
328	2	01876	The Utah Construction Co.; Thousand Springs Creek; Irrigation and domestic; 179.6; April 19, 1930.
329	2	01877	The Utah Construction Co.; Crittenden Creek and Spring; Irrigation and domestic; 81.8; April 19, 1930.

330.....2.....01860.....	The Utah Construction Co.; Rock Springs, Rock Springs Creek and tributaries; Irrigation and domestic; 164.2; April 19, 1930.
331.....2.....01861.....	The Utah Construction Co.; Emigrant Springs; Irrigation and domestic; 64.7; April 19, 1930.
332.....2.....02182.....	Joe Phillipi; Iowa Creek (Tributary of Carrico Creek); Irrigation and domestic; 176.00; July 3, 1930.
333.....2.....01723.....	Michel Cadet; Hall Creek (Tributary of Carrico Creek); Irrigation and domestic; 70.20; July 3, 1930.
334.....2.....01723.....	Michel Cadet; Hall Creek (Tributary of Carrico Creek); Irrigation and domestic; 100.80; July 3, 1930.
335.....2.....01723.....	Eusebia Cadet; Hall Creek (Tributary of Carrico Creek); Irrigation and domestic; 4.1; July 3, 1930.

RECORD OF ADJUDICATION PROCEEDINGS SINCE CREATION OF OFFICE OF STATE ENGINEER

Although one of the chief reasons for the enactment of a water law was to provide a method for the determination of relative rights to the water resources of the State, the results of accomplishment along this line by the office of the State Engineer during the past 25 years has never, so far as it is known, been collected and compiled in one source for ready reference and information. In considering the matter of adjudication of the streams of the State the first questions that present themselves are: What streams have been the subject of adjudication proceedings; when were the proceedings initiated; have they been completed, and if not how far have they been advanced?

The following table has therefore been prepared to show this information. It has been difficult to obtain much of the data presented owing to the incomplete state of the early adjudication files and records. It is hoped succeeding State Engineers will keep the record up-to-date in each biennial report, making it more extensive and complete by the addition of headings to show location of stream system, cultural areas embraced and any other data which may seem valuable.

ADJUDICATIONS BY DEPARTMENT OF STATE ENGINEER

The following information is presented in the order of:

1. Name of Stream System.
2. Date Adjudication Proceedings Initiated.
3. Status Toward Completion or, if Completed, Date of Final Decree.
4. General Remarks.

Baker Creek—1925; to Preliminary Order of Determination.

Barber Creek (Douglas County)—1916; January 29, 1919.

Bishop Creek (Elko County)—1910; To Notice of Pendency of Proceedings; Tributary to Humboldt River now under adjudication as part of Humboldt River Stream System.

Carrico Creek—1927; July 9, 1930; Certificates of Appropriation of Water issued by State Engineer to water users.

Carson River—1904; November 21, 1928; Order of Determination filed with Clerk of Court. July 1, 1930, Supreme Court of State of Nevada issued writ of prohibition holding in abeyance any effort on part of the State of Nevada to complete adjudication proceedings. Suit now before United States Federal Court.

Cherry, Pine and Cottonwood Creeks—1912; 1912; Adjudicated in accordance with secs. 14 to 19, inclusive, Statutes 1907 (see 4685 to 4600, inclusive, Revised Laws, 1912) and Certificates issued.

Clear Creek (Pershing County)—1918; November 25, 1919.

Clover Valley Creek—1919; To Order Setting Time and Place of Inspection.

Crum and Wilson Creeks—1925; May 26, 1928.

Currant Creek—1919; April 23, 1921.

- Deephole Springs. Clear Creek, Squaw Valley Creek, Lost Creek, Grass Valley Creek, Cottonwood Creek, Red Mountain Creek, and Hot Springs**—1915; To Abstract of Proofs; Adjudication initiated under provision 88a, Chap. 253, Stats. 1915.
- Eden Creek**—1915; To Abstract of Proofs; Adjudication initiated under provision 88a, Chap. 253, Stats. 1915.
- Evans Creek**—1916; To Notice of Inspection served on claimants.
- Franklin River**—1927; To investigation of Facts and Conditions; Pending Order Granting Petition.
- Goose Creek**—1916; June 29, 1922.
- Humboldt River**—1913; To Final Decree by Court; Awaiting Final Judgment and Decree.
- Indian or Chiatovich Creek (Esmeralda County)**—1915; To Abstract of Proofs; Adjudication initiated under provision 88a, Chap. 253, Stats. 1915.
- Indian or McNett Creek (Esmeralda County)**—1915; To Abstract of Proofs; Adjudication initiated under provision 88a, Chap. 253, Stats. 1915.
- K. C. Creek**—1927; March 16, 1929; Suit filed in District Court requesting the Court restrain State Engineer from proceeding with adjudication; Court dissolved injunction and dismissed restraining order; July 10, 1930, Amended Complaint filed requesting restraining order; No action to date by Court on amended restraining order.
- Lehman Creek**—1925; To Proofs taken.
- Little Humboldt River**—1910; Dec. 12, 1930; Final hearing completed; Order of Determination will be filed with Clerk of Court early in year 1931.
- Long Spring (White Pine County)**—1915; To Abstract of Proofs; Adjudication initiated under provision 88a, Chap. 253, Stats. 1915.
- Muddy River**—1906; March 12, 1920; Referred by Tenth Judicial District Court to State Engineer, 1919 (see Sec. 45, Chap. 140, Stats. 1913).
- Overland Creek**—1919; October 5, 1925.
- Owyhee River**—1913; To Proofs taken.
- Pahranagat Lake**—1921; Certificates of Proof of Appropriation issued October 14, 1929.
- Peavine Creek**—1928; Hearings of Objections to Preliminary Order of Determination.
- Quinn River**—1907; Final decree entered by Court April 9, 1919.
- Reese River (Lander County)**—1910; To Notice of Pendency of Proceedings.
- Rice Creek**—1919; June 29, 1922.
- Robison Creek**—1915; To Abstract of Proofs; Adjudication initiated under provision 88a, Chap. 253, Stats. 1915.
- Salmon River**—1915; March 1, 3, 1923.
- Siegel Creek**—1918; To Proofs taken.
- Silver Creek**—1928; To Proofs taken.
- Simpson Creek (Eureka County)**—1910; To Notice of Pendency of Proceedings.
- Six Mile Creek**—1919; 1925.
- Spanish Creek (Perry Aiken Creek)**—1915; To Copy of Exceptions to Order of Determination received from Clerk of Court.
- Thousand Springs Creek**—1928; April 1930; Certificate of Appropriation of Water issued by State Engineer to water users.
- Tony Creek**—1925; August 31, 1929; Final decree rendered by Court. Issuance of certificates awaiting receipt of certified copy of decree.
- Truckee River**—1913; Temporary Order issued by United States Court, February 13, 1926.
- Trout Creek (Elko County)**—1910; To Notice of Pendency of Proceedings; Tributary to Humboldt River now under adjudication as part of Humboldt River Stream System.
- Virgin River**—1921; May 4, 1927.
- Walker River**—1902; Final Decree March 3, 1919.
- Weeks (Steel) Creek**—1915; To Notice of Inspection served on Claimants. Refer to K. C. Creek.
- White River**—1912; December 4, 1922; Certificates issued under secs. 14 to 19, inclusive, Stats. 1907. Case reopened in 1915 under Statutes 1913, adjudication completed in accordance therewith.

CHAPTER V

Water Distribution

The Nevada Water Law vests the State Engineer with legal authority to distribute water only on those streams where the relative rights to the use of water have been completely determined or adjudicated, or where the adjudication has reached a stage of completion where the State Engineer's Order of Determination has been officially filed with the District Court.

Of the streams covered in this chapter and which are under the jurisdiction of the State Engineer, the adjudication of rights has been completed on all but the Humboldt River.

On the Humboldt River, pending the District Court's Final Decree of Determination, division of water has been made during the past biennium by the State Engineer in accordance with his Order of Determination. This stream system presents many unique and difficult problems in its distribution, which have been exceptionally well-handled during the past two seasons by Supervising Water Commissioner J. A. Millar.

The present administration has inaugurated the policy of requiring all water commissioners to prepare daily distribution reports which, when compiled over a period of years, will furnish the basis for determination of duty of water, transportation losses and importance of return flow to the streams.

At the close of the irrigation season each commissioner prepares a detailed report of the season's activities, which includes a complete record of stream and ditch flow and individual deliveries.

Following is a brief resumé of distribution activities on the streams under the jurisdiction of the office:

HUMBOLDT RIVER

Season of 1929

Some time after the 1928 irrigation season, the State Engineer conceived the idea of having an Engineer Advisory Board confer with and aid the Humboldt River Distribution Commission in formulating a plan of distribution that would most advantageously conform to the Order of Determination. On November 24, 1928, the State Engineer appointed the following engineers to act on this board: Wm. Settlemeyer, of Elko; O. P. Adams, of Battle Mountain; Frank O'Leary, of Winnemucca; L. H. Taylor, of Reno; Thomas R. King, of Reno.

Under authority of their appointment, the above-named men met in the city of Elko during the early part of January, 1929, and organized "The Humboldt River Advisory Board." O. P. Adams was elected chairman and Wm. Settlemeyer was elected secretary.

Formal hearings were held in Elko, Battle Mountain, Winnemucca and Lovelock, and representative water users were given an opportunity to submit their ideas regarding how the waters of the Humboldt River should be administered.

Following a five-day executive session during the month of February detailed recommendations were submitted.

The Humboldt River Commission commenced distribution on March

14, 1929, with instructions to follow the recommendations of this Advisory Board.

A low stage of flow prevailed throughout the entire length of the river during the month of March. An increase in flow began to appear at Palisade about the last of March, and it was then that the Commission decided to start irrigation in the Battle Mountain District first; however, the Commission learned the water users in that district were not ready. The Commission then decided to irrigate the Winnemucca District, and on March 28, 1929, a rotation system of irrigation was started and maintained until the entire district was irrigated.

On or about April 24, 1929, irrigation began in the Upper Battle Mountain District, and on May 1 in the Lower Battle Mountain District. During this period very little water reached the Lovelock District.

During the latter part of June the court ordered the Commission "to deliver water to all persons entitled to it under the Order of Determination in accordance with priorities therein listed, giving those who had no irrigation whatsoever up to that time the same irrigation that had been given to other persons of equal priority."

Pursuant to the order a certain percentage of the flow was used in the Battle Mountain District and the remainder of the flow was allowed to go down for the benefit of the Lovelock District. On July 5 the entire flow was turned to Lovelock and continued to flow until the end of the irrigation season.

General irrigation started in the Elko District about May 15. The first program in this district allowed water to lands with a priority of 1905. After May 21, 1929, the priorities were cut to 1890, and on June 5 they were cut to 1880.

On July 31, 1929, the small flow of water in the river prompted the Commission to declare the irrigation season closed. The services of the commissioners and hydrographers were dispensed with, and no distribution activities took place until the latter part of August, when a commissioner was appointed to distribute stock water in Lamoille Valley.

Delivery of 3,962.62 acre feet was made to the Lovelock District; 17,258.21 acre feet to the Winnemucca District, and 47,312 acre feet to the Battle Mountain District.

Practically all the lands in Elko County were served with water after June 1, 1929.

Season of 1930

The distribution of the waters of the Humboldt River and its tributaries for the 1930 irrigation season began on March 15. However, it was not until the stream flow forecast was submitted by Dr. J. E. Church on March 25 that a plan of distribution was adopted. The priority to be served was determined to be up to and including 1876. Under this priority 179,737.05 acre feet were to be delivered to the water users on the stream system, of which 97,388.60 acre feet were to be delivered to the Elko District and 82,388.45 acre feet to all other water users on the stream system below the Palisade gaging station.

In addition to the foregoing orders, the State Engineer issued further orders that all so-called tight dams diverting water with a priority later than 1876 be removed. On March 27 and 28, 1930, several of the dams were removed, and on March 29, 1930, a halt was called on the dam-removal campaign because of a restraining order issued by Honorable Geo. A. Bartlett.

On March 31, 1930, all dams in the Winnemucca and Battle Mountain Districts were opened and the water turned to the Lovelock District. On April 20 the water was diverted by the Winnemucca and Battle Mountain Districts, and on June 8 a second flow reached Lovelock.

During the month of April the discharge of the river became so low that the State Engineer issued an order, on April 25, 1930, setting the priority at 1874.

On May 2 it commenced to rain throughout the entire Humboldt River basin and continued to rain and snow a good part of the month. This unusual amount of precipitation created a flood stage in the river and its tributaries, and on or about May 10 the priority was again set at 1876.

On or about the 1st of July the flow of the river began to show a marked decrease, and on July 15 the flow of water became so low that it was deemed advisable to dispense with the services of most of the commissioners and hydrographers. However, Mr. Whitacre was retained in the Winnemucca District until July 28 and then transferred to Elko, where he served until November 1, 1930. J. A. Millar and Albert Quill discontinued their services on July 31, 1930.

There were 7,032.27 acre feet, or 40 per cent, delivered to the Lovelock District; 21,187.39 acre feet, or 84 per cent, to the Winnemucca District, and 35,832.87 acre feet, or 79 per cent, to the Battle Mountain District.

Practically all the lands in the Elko District were irrigated after June 1, 1930.

—J. A. MILLAR, *Supervising Water Commissioner.*

The following details of distribution activities of other streams supervised by the State Engineer's office is taken from reports submitted by the supervising water commissioners of the districts or streams mentioned:

TONY CREEK

The distribution of water on this stream during the year 1929 started on March 31 and ended May 14. A water commissioner was employed during a part of the month of May, 1930, and no further need arose during the balance of the season for regulatory service. The expense incurred in the distribution of the waters of this stream is far in excess of the benefit derived and some mechanical method of dividing these waters should be devised in order to do away with the employment of a water commissioner.

MUDDY RIVER (Clark County)

The irrigation season on this stream usually begins about April 1 and ends on September 1 of each year.

Distribution during the past biennium has been successful, no complaints of any kind having been received from the water users. One part-time commissioner at \$80 per month attends to the entire stream, with the result that unit distribution costs are exceedingly low for the 2,748 acres irrigated.

PAHRANAGAT LAKE AND TRIBUTARIES (Lincoln County)

Distribution of water on this source has been as successful as can be expected during years of water shortage.

Water commissioners were employed continuously during the irrigation seasons to deliver irrigation water to 4,805 acres of cultivated lands. The water commissioner during the season of 1930 was active in carrying on construction work to relieve drainage problems arising in this district.

CURRENT AND DUCKWATER CREEKS (Nye County)

The distribution on these creeks during the irrigation season of 1929 and 1930 has been satisfactory. The water supply on Current Creek held up fairly well, while Duckwater Creek maintained its usual consistent spring-fed flow.

One water commissioner handled distribution on both these sources to the general satisfaction of the water users. No major complaints were received during the past biennium.

SIX MILE CREEK (Elko County)

Water was distributed from this source during the 1929 irrigation season. However, early in the season of 1929, at the urgent request of Mr. John Taylor, one of the two water users on the stream, the State Engineer appointed a commissioner to distribute water between the two users involved. Mr. R. A. Kinne was duly appointed for this purpose and served during May and June, the water commissioner making special trips whenever necessity arose. On petition of Mr. John Taylor, Chas. Brown was appointed water commissioner for 1930 and acted in such capacity from April 14 to May 7, at which time the work was discontinued due to water shortage.

An adequate system of simple rotation in the ratio fixed by the court decree defining the relative rights could easily be worked out and adhered to with the cooperation of the users, thus doing away with the necessity of employing a water commissioner.

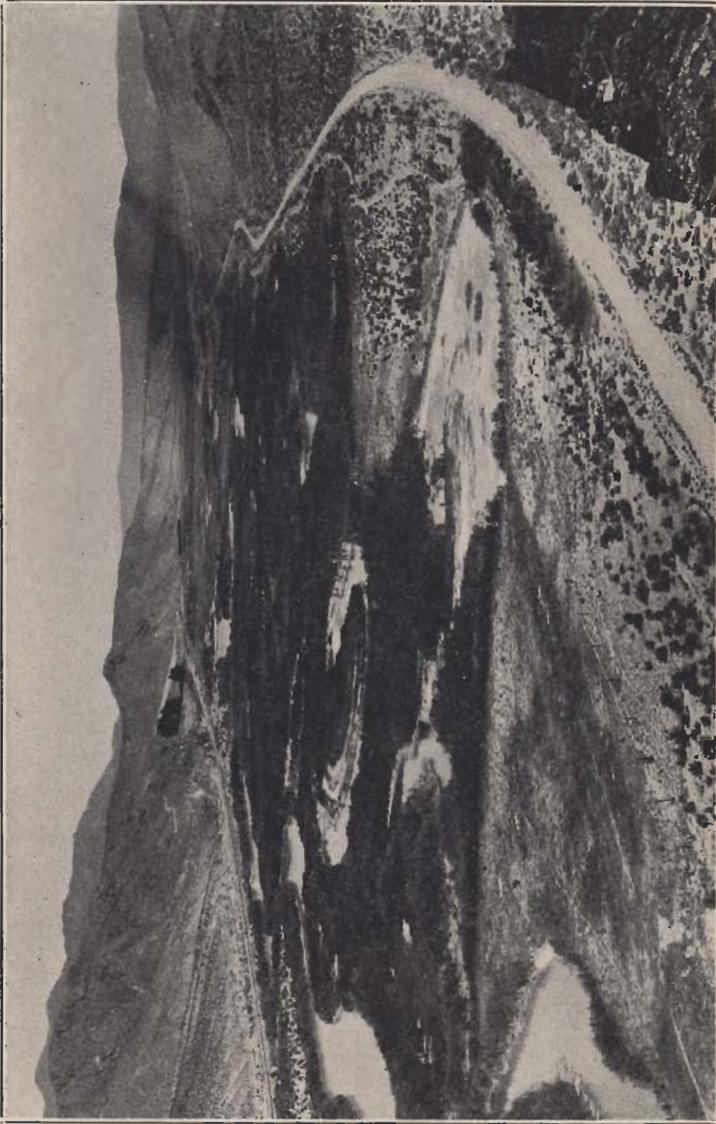
TRUCKEE AND WALKER RIVERS

Although distribution of water on these major stream systems is not under the supervision of the State Engineer, they are of such importance as to merit brief discussion in this report. Both streams are under the jurisdiction of the Federal Court for this district, and water on each is distributed by officials appointed by the court.

Waters of the Truckee River have been successfully distributed under the provisions of a recommended temporary restraining order in the case of the United States of America v. Orr Water Ditch Company et al. This restraining order is in effect a temporary decree

determining the relative rights involved, the operation of which is being tried out for a period of years preliminary to the eventual entry of a final order and decree.

On the Walker River, water was successfully distributed under the supervision of the Directors of the Walker River Irrigation District acting as officers of the Federal Court. Water is distributed to irrigated lands through the medium of Topaz and Bridgeport storage reservoirs.



Humboldt River Three Miles East of Golconda, Nevada.
(Courtesy Nevada State Highway Department)

CHAPTER VI

Resume of Distribution Activities on the Humboldt River 1927 to 1930, Inclusive

The following excerpts from a special report that is being prepared by the State Engineer's office are included in this Biennial Report in order to give the Legislature an idea of the scope of work on this subject. Not only is the State Engineer's office intrusted with the duty of carrying on all of the preliminary ground work that is required prior to the initiation of court proceedings in determining the legal status of all the water rights on our various streams, but it is also charged with the responsibility of administering the resources of these various streams as an officer of the court after the Final Order of Determination is filed with the court by the State Engineer:

HISTORY

The early history of the settlement of the lands lying along and adjacent to the Humboldt River is comparable to all early development of irrigated lands in the arid West. Some time during the interval of a ten-year period between the years 1850 and 1860 the first settler started diverting water from this stream, and from that time on to the year 1910 there was a gradual influx of ranchers into this basin. All early development was closely associated with the stock-raising industry; in fact, the cattle-growing industry was paramount to all other agricultural pursuits, and the irrigation of arid lands was a secondary consideration in the growth of this particular section of Nevada. As the years advanced, more and more settlers came into this section, the outlying ranges becoming overstocked, thus forcing the newer settlers to turn to the production of crops that would find a market in other States.

As this change in agricultural production came on more attention was given to irrigation of productive lands, and the realization that irrigation waters had a real potential value was firmly impressed upon the water users having water rights that were considered of value because of long continued use. A custom, or unwritten law or precedent, that has always been recognized in the western arid States, and which establishes the real value of any water right, is the year of priority of that right. This firmly-established method of computing the value of a water right originated with the early placer miners, who accepted the theory and fact that *the first in time was the first in right*.

The great influx of new settlers to the arid western States, starting about the year 1905, and their settlement of undeveloped land susceptible of irrigation rapidly brought on a condition that taxed beyond the limit the natural flow water resources of practically all rivers and streams flowing through these States. This rapid settlement of new lands during this period was responsible for the initiation of court action on the part of early water users on many streams in order to set forth and determine in a legal manner the rights of the various water users in order that the prior users, or "the first in time," regardless of location of their diversion works would receive the water to which they were justly entitled. The above statement is

borne out by the fact that in all of the early hearings held by the western courts more attention was given to the establishment of priorities of the respective water users than was given to the quantities of water that were necessary for the proper irrigation of different classes of soils. On practically all streams in the arid west that have adjoining irrigable lands the two questions involved in all litigation were, first, priorities, and second, duty of water. The importance of establishing priorities of the various users on any stream having two or more water users has become so well-established, due to the impossibility of administering the distribution of waters of a stream without first establishing priorities, that there are few streams in the arid west on which priorities have not been established, whereas the duty of water or crop requirement for water for irrigation purposes has been and always will be a much mooted question and will probably be before the courts for final determination for many years to come.

Referring particularly to the Humboldt River, we find that many of the early priorities divert water from that section known as the "Lower River," or the section lying between Palisade and the Humboldt Sinks. Because of the great length of this river and the difficulties encountered in transporting water from the upper reaches to the lower districts it frequently happens that the older priorities in these lower districts are deprived of some of the water to which they are entitled. Always bearing in mind the fact that "the first in time is the first in right," regardless of location of diversion works, our sole objective has been, during the past four years, to so administer the distribution of the waters of the Humboldt River that the water users having water rights with priorities that were entitled to divert water were assured of the supply to which their rights entitled them. During these four years the distribution has not been perfect, due largely to the absence of proper information, but each year has seen a betterment of operating conditions, and as more data becomes available from each year's effort we are enabled to make a more careful and intelligent study of the many problems that affect and control the distribution of the waters of this stream.

PRESENT MANAGEMENT

Beginning with the year 1927 the State Engineer's office, through its water commissioners, has attempted to gather sufficient data on the Humboldt River each irrigation season so that a comparative study might be made of the various distribution problems in order that recommendations might be made that would be based on fact instead of theory. There being no records available of the disposal made of the water resources of this stream prior to 1927, it was necessary to base all of our operations upon theories and experience derived from a study of operations on other streams having similar problems. The gathering and compilation of all the data that limited funds would permit has now given us a working basis upon which to proceed.

RECORDS AVAILABLE

All data used in the compilation of this report were secured from the United States Geological Survey, the United States Weather Bureau, Professor J. E. Church of the University of Nevada, and

our own office. Too much credit cannot be given to the above departments for the wonderful spirit of cooperation that has been manifested during the past four years, and any financial assistance that is needed to continue this cooperative work should be furnished by the parties benefited.

SNOW SURVEYS

The past four years' work on the Humboldt River has proven conclusively that an estimate must be made, prior to the irrigation season, of the probable run-off of the watershed contributing water to the Humboldt basin. The necessity for this is apparent when the two main factors that govern the distribution of the waters of this river are taken into consideration—first, the brief length of time that elapses during which the maximum stream flow occurs and, secondly, the thousand miles of stream bed that the waters have to flow through in order to serve priorities of equal date.

The only reliable method that can be used in making an estimate of the run-off of any watershed is based upon the principles advanced by Professor J. E. Church, and as this work is carried on from year to year the data secured become more valuable and more accurate and enables this office to set the dates of priorities that can be served with irrigation water for the following season.

ORDER OF DETERMINATION

A study of the past four years' data gathered by the water commissioners of the Humboldt River discloses the obvious fact that the right of the water users to divert a continuous flow of 0.81 of a second foot of water for each 100 acres of irrigable land does not agree with the actual crop requirements, the available supply or the method of irrigation that has been practiced during the past fifty years. Our records show that the present method of allowing a maximum diversion of three acre feet per acre per season for those rights entitled to water, delivers to those water users sufficient water to mature their crops. Due to the anxiety on the part of some water users that the water supply in the river would become exhausted before their quota of three acre feet per acre had been diverted, they have demanded large heads of water for short periods, such total demands calling for a much larger volume of water than that available in the river. This practice has been the cause of exhausting the river of its entire supply before all priorities on the Lower River had been supplied with their quota. This practice has also resulted in a very uneven flow of water at many points on the river, and a constantly fluctuating head of irrigation water usually results in an economic loss of the use of water. In order to eliminate these fluctuations and still give to the water users a maximum head of water that will permit of a total diversion of three acre feet per acre during the period that water is available, it is essential that the State Engineer have full authority to fix the flow of water to individual users in such amount as will enable him to deliver the full amount to which the user may be entitled, during the estimated period of river flow, and that a rotation system among water users in each section be devised in order to give each user a large flow for stated intervals. These recommendations are based upon the results obtained from a study of transportation losses which occur

during the months of April, May and the first half of June in the section of the river from Palisade to Lovelock. It should also be kept in mind that the length of the irrigation season is dependent upon the precipitation and weather conditions, and there must be enough flexibility allowed this office to meet the changing conditions to insure the delivery of the three acre feet per acre.

RIVER REGULATION

During the past four years we have encountered many problems in river regulation that have been difficult of solving because of lack of funds with which to secure data that would have helped materially in reaching an understanding of the effect these problems have had on the distribution of water. The main difficulty encountered has been the lack of regulatory dams and headgates throughout the entire length of the river. Although the State laws provide that the State Engineer has the authority to compel a water user to install suitable diversion dams and headgates at each point of diversion, we have been prone to overlook this provision because of the financial condition that has existed among all classes of water users. The regulation of dams diverting water for the use of the older priorities that will always be entitled to water is not an important factor, as these dams are necessary for the diversion of water each year and the losses accruing from ground water storage above these dams is at least going to land that is entitled to receive water, whereas the installation of a diversion dam by a water user whose priority may not receive water during the irrigation season constitutes an unlawful diversion as much as though he had diverted the water through an open channel, for his dam will cause a sub-irrigation of adjoining lands to take place and help to create a greater loss in the transportation of river water in addition to checking the flow. Too much emphasis cannot be given to the fact that the newer rights, which will not receive water during the short water years, should be prevented from installing any kind of an obstruction in the Humboldt River that will cause the water level to be raised above the level of the natural channel when they are not entitled to receive water.

Another factor that has contributed to the difficulty of proper river regulation is the unlawful diversion of water by users who were not entitled to water, or by those who became impatient of the delay in delivering water to them. These unlawful diversions were partly responsible for the failure of the water commissioner to deliver to the water users diverting water from the Lower River their full quota of water to which they were entitled during the season of 1930.

During the past season an attempt was made by the water commissioner to deliver the entire flow of the river, excepting a sufficient flow to maintain the level of the water table in the lower sections, to one district at a time, this sectional delivery applying only to those districts lying below Palisade. Approximately twenty second feet were required for the purpose of holding up the water table in the lower districts, but in many instances this quantity was reduced to a zero flow, due to unlawful diversions that occurred frequently. This method of regulating diversions was successful in the first district below Palisade because of the fact that the water table in this district

was maintained at a uniform level. The Winnemucca and Lovelock districts were seriously handicapped under this system of rotation as the water table of lands lying adjacent to the river was lowered during the time that all of the water in the river was being diverted to the Battle Mountain District. This water table had to be filled again out of the water that the next section below should have had, not only decreasing the net flow available for delivery but also cutting short the number of days that water could actually be delivered in these two lower districts.

The foregoing facts strengthen our belief that a constant flow of water should be maintained throughout the entire length of the river and that a rotation system between water users in each district should be devised.

LEGAL COOPERATION

Satisfactory regulation of the waters of the Humboldt River will never be attained until the water users, the water commissioners, the State Engineer's office, the legal fraternity and the court all work together in harmony and all show an earnest and sincere desire to bring about a just and equitable distribution, so that all rights will be served according to their priorities. Practically all the information that has been available in the past for guidance in settling disputes has been based upon theories advanced by men who were honest in their beliefs, but who lacked sufficient data upon which to state facts. Much of the testimony introduced in the many hearings, court and otherwise, that have been held during the past several years was based upon the memory of the individual and not upon correlated records. Evidence of this kind, although well-meant, does not solve the problem of distributing water through a natural channel that traverses over a thousand miles of stream bed and where losses or gains in the natural flow occur to a greater or lesser extent in every section of the river; these losses or gains must be determined by actual measurements.

It is our belief that the final decree on the Humboldt River should be rendered by the court on acreages and priorities as soon as it is possible for the court to do so, leaving the duty of water and other conditions to be determined by actual records of results from year to year.

A decree entered at this time going beyond the fixing of areas and priorities would be dangerous, due to the absence of proper information on the use of water over a period of years. If at the end of the three-year period allowed by statute to reopen the court decree, sufficient data has not been gathered to confirm the duty of water as established by the court, legislative action could be obtained which would lengthen the three-year period now in effect.

Our procedure here in Nevada has one advantage that very few western States have adopted and that is the fact that the District Court which renders the decree retains jurisdiction over the legal affairs of the stream for the following three-year period, and the decree as entered is not final as to the duty of the water, but is subject to modification in this connection without the necessity of appealing to the State Supreme Court. The foregoing discussion is made for the purpose of emphasizing the need for obtaining complete record of all the water resources of the Humboldt River and its tributaries, and a

record of the disposal of these resources for a sufficient number of years so that definite conclusions may be drawn and recommendations made as to proper duty of water.

WATER USERS BOARD OF CONTROL

The experience gained during the past four years of distributing the waters of the Humboldt River has demonstrated clearly that as long as a "foreign" or disinterested party or office has entire charge of this stream the water users will assume no responsibility toward assisting in proper regulation. In order to remedy this situation and make the water user feel that these distribution problems are his problems, we recommend that the Water Users Association of each district elect one representative to represent it, these representatives to form a Board of Control that will have power to act in an advisory capacity to the State Engineer in all matters concerning the distribution of waters of this stream. The State Engineer or his authorized agents could meet with the Board of Control whenever the necessity arose and advise them as to the procedure to be followed in all phases of river management and investigational work required for the securing of data upon which to base future operation. A properly chosen Board of Control, consisting of men of broad vision, of unselfish personal desires, and men who were desirous of representing the best interests of the entire river system, would materially help iron out the many controversial problems that may arise in the conservation and distribution of the waters of the river.

It is apparent that within the near future steps will have to be taken to provide holdover storage for the water users on this stream and if the preliminary work has been done in perfecting some kind of a water users organization, results will be obtained in a much more orderly and efficient manner.

EMPLOYMENT OF WATER COMMISSIONER

The work that has to be done each year on this river is of sufficient magnitude to justify the employment of a water commissioner by the year. Offices for the commissioner should be maintained throughout the year in one of the cities lying within the territory served. Complete records should be obtained each year on all phases of water distribution and these records should be tabulated and reports prepared in order that each water user may have a complete knowledge of all activities and results secured. The employment of a commissioner should be made upon recommendations of the Board of Control. The expenditure of funds for salaries and all necessary expenses incurred should be approved by the Board of Control before contracted.

Ways and means should be provided to pay all costs of this work each month, as the present method of paying costs lends toward laxity and extravagance. Many of the records now obtained by paid employees might be obtained by the water users without cost. A part of the overhead expenses now necessary for supervision of headgate diversions could be eliminated by proper cooperation on the part of the water users.

Public meetings should be held at convenient locations throughout the river system during the winter months by the water commissioner,

in order to explain to the water users all matters that affect their water rights and to discuss methods of procedure.

DUTY OF WATER

There is insufficient data available at the present time to make a study of the water requirements of different classes of soils and crops. The duty of water as established by the Order of Determination, which is based on a continuous flow for the entire irrigation season, will deliver to each water user a sufficient quantity of water to mature his crops, but as the river flow after July 1 of the short-water years is practically exhausted, larger quantities of water must be delivered to the users entitled to water than is provided for in the Order of Determination.

Many of the water users are under the impression that during years of large run-off there is no necessity for river regulation. We agree that the necessity for regulation is not as necessary during these years as it is during low-water years, but the records obtained on all phases of the disposal made of the water resources are far more accurate and of much more value. Data obtained during these years simplifies to a large extent the many problems that arise during years of water shortage.

The duty of water, or water requirement for various crops and soils, should be based upon data secured by the diversions of water by the water users during the years of ample water supply.

STOCK WATER

Throughout the arid West the diversion of irrigation water for stock water purposes has been a serious problem for many years. Many of the western States now do not recognize the right of the water user to divert irrigation water for this purpose, as the use of water for crop production and storage is considered of paramount importance to all other uses to which water may be applied. During years of shortage in the available water supply the practice of diverting water for stock watering purposes should be discontinued on streams that have adjoining lands requiring water for crop production.

CLASSIFICATION OF RIVER SECTIONS

A perusal of the data available from which to make a study of the different features affecting the distribution of water on the Humboldt River brought forth clearly the fact that only sufficient data were available to make a study of the Humboldt River extending from Deeth to Lovelock, and no attempt was made to enter into a study of the conditions existing on the tributary streams. The following discussion of the conditions existing on the Humboldt River will only embrace that part of the river known as the main river channel:

In making this study of the different features affecting the distribution of water it was thought advisable to study each section of the river as defined by gaging stations maintained by the United States Geological Survey and then assemble the data computed from these separate districts into a study of the river in two sections, hereinafter referred to as the Upper Section and the Lower Section, and then to again consider the river as one unit.

The section herein referred to as the '71 Ranch District is that section of the river lying between Deeth and Halleck; the Upper Elko District is that section of the river lying between Halleck and Elko; the Lower Elko District is that section of the river lying between Elko and Moleen Canyon; the Carlin District is that section lying between Moleen Canyon and Palisade; the Battle Mountain District is that section of the Humboldt River lying between Palisade and Comus; the Winnemucca District is that section of the river lying between Comus and the gaging station at Oreana, and the Lovelock District embraces all of that part of the river lying between Oreana and the Humboldt Sink.

DAILY CANAL RECORDS

During the past four years the water commissioner's office has secured daily records during the irrigation season on practically all of the inflow and outflow of that section of the river lying between Palisade and Lovelock. We feel that the data secured in this section is of sufficient scope so that conclusions may be made that will have a bearing on the future operations in that section.

The operating conditions existing on the Upper Humboldt River were of such an unsatisfactory nature, due to the lack of proper control works at the head of the diversion canals, that insufficient data was secured during the past four years on the quantities of water that were diverted by the water users in that section to allow definite conclusions to be made.

The estimate used in computing the losses and gains in this upper section of the river are based on 100 per cent diversions of the rights that were entitled to water during the two years that a study was made of this section.

SUMMARY OF COMPILED DATA

A presentation of all the factors that govern the following brief discussion of data pertinent to each section of the Humboldt River is impossible in these excerpts because of the limited space available. The reader should keep in mind that the results presented may change considerably after a study is made of this river covering a longer period of time, and that the data herein contained were influenced by inflow and outflow that was not taken into consideration because of the lack of available assistance to carry on a complete seasonal investigation.

'71 Ranch District—Humboldt River from Deeth to Halleck

For the period extending from May 15 to July 15, 1930, there was a gain or return flow of 1,077 acre feet. As there are no rights in this section that were entitled to water having 1876 or older priorities, this return flow indicates that there were unlawful diversions or tributary inflow that was not measured.

Upper Elko District—Humboldt River from Halleck to Elko

For the period extending from May 15 to July 15, 1930, there was an estimated diversion of 6,169 acre feet and a gain or return flow of 8,025 acre feet in this section. From May 15 to June 20 heavy losses

were found in this section, which tends to show that the ground water table was depleted prior to the opening of the irrigation season.

Diversions in excess of quantities allowable for the rights up to 1876 occurred and had a direct influence on the return flow.

Lower Elko District—Humboldt River from Elko to Moleen Canyon

This section of the river is the only "Upper River" section that shows a net loss, there being a loss of 3,072 acre feet in this section during the period May 15 to July 15, 1930. The heavy losses occurring up to June 20 more than offset the gains that occurred after that date. Had accurate records been kept of all diversions in this section a gain might have been noted, as there is no apparent reason why there should be any greater loss in this section than in the sections further up the river.

Carlin District—Humboldt River Between Moleen Canyon and Palisade

For the period extending from May 15 to July 15, 1930, there was an average estimated daily diversion of 39 second feet per day, which is based upon their rights of 3 acre feet per acre for Class 1 lands; $1\frac{1}{2}$ acre feet for Class 2 lands, and 0.75 acre feet for Class 3 lands, for the periods outlined in the Order of Determination. The net gain in this section for the period mentioned above was 3,267 acre feet, or 68 per cent of the amount diverted. The only losses shown in this section occurred from May 15 to 25.

Battle Mountain District—Humboldt River from Palisade to Comus

This section includes the famous Argenta Swamp which has been under discussion for several years. During the months of April and May and up to the 20th of June, 1930, there was a steady loss of water in this section of the river, which no doubt was due to the fact that the ground water table was being brought up to the level of the river channel. After the 20th of June there was a consistent daily gain which tends to show that once the water table was built up the surplus waters diverted flowed back into the river channel. This section of the river includes some 300 miles of river channel and the net loss for the four months period was only 9,651 acre feet, or 12 per cent of the total flow available for this section. The unusual rains that occurred during the months of May and June, 1930, may have had a direct influence on the data obtained. Additional records must be obtained of the losses occurring in this section of the Humboldt River before recommendations can be made as to the necessary work that should be done to relieve this section of these transportation losses.

In an irrigation canal of equal length and having a capacity of 500 second feet the estimated losses would be at least one per cent per mile, and no attempt would be made to decrease a 12 per cent transportation loss.

Winnemucca Section—Humboldt River, Comus to Oreana

Our study of the conditions existing in this section during the year 1930 included the period from April 1 to July 31. Our data shows that there was a loss in this section of 1,968 acre feet, which is a very nominal loss for a section of this length.

Lovelock District—Humboldt River from Oreana to Lovelock

There was a net operating loss in this section of 1,644 acre feet for the period April 1 to July 15, 1930, or a loss of 19 per cent of the gross flow available. In order to rectify this condition and reduce the loss to a minimum during the irrigation season, it will be necessary to maintain a constant flow of water through this section of the river, thus maintaining a water table in the adjacent lands sufficiently high to prevent these losses.

Upper River—Humboldt River from Deeth to Palisade

Treating this section as one unit, the data for 1930 shows that during the months of May, June and July there was a net gain in this section and a total net gain for the sixty-two day period, extending from May 15 to July 15, of 9,277 acre feet, which amounts to 63 per cent return flow of the estimated diversions of 14,747 acre feet. This return flow from the diverted water represented a gain of 15 per cent of the total flow available in this section from the visible flow in the main channel plus measured tributary flow. In making these computations the outflow from this section was treated as a diversion. The reader should also bear in mind that there were unlawful diversions of water occurring in this section of which no record was obtained, as well as tributary flow resulting from unusual rains that caused floods of short duration.

Lower River—Humboldt River from Palisade to Lovelock

A net operating loss for the season of 1930 of 13,226 acre feet is shown for this section of the river, all of which occurred during the months of April, May and up to June 20. It is evident that by the 20th of June the ground water table had been filled and from that time on there was a return flow back to the river which was available for irrigation purposes. Again we repeat that no diversion of water should be permitted throughout the length of the river until the natural flow of the stream has reached the lowest water user entitled to water. The resultant tributary flow from unusual rains occurring during the irrigation season of 1930 was not recorded as completely as it should have been because of the lack of gage readers, and emphasizes the fact that several years' continuous records must be obtained before definite conclusions can be made.

Entire River—Humboldt River from Deeth to Lovelock

For the period extending from May 15 to July 15, 1930, there was a net operating loss of 3,404 acre feet, all of which occurred during the 15th of May to the 20th of June. If the losses in the Battle Mountain District could be eliminated there would be considerable gain in this river system. A more strict regulation of the rights that are not entitled to water would materially assist in decreasing the losses that occur during the first of the season.

In making a study of the losses and gains noted in the above discussion it is advisable at this time to clearly set forth the fact that there is a definite loss sustained by irrigation waters in the production of plant growth, even under the most favorable conditions. The ratio of the losses to the quantities diverted by the irrigator varies according

to climatic conditions, classes of soils, kinds of crops and many other factors.

Upper River—Humboldt River from Deeth to Palisade for Years 1929 and 1930

It is surprising to note that the total gain, which is a portion of the water diverted, for 1929, 11,640 acre feet, and for 1930, 9,297 acre feet, from this section of the river is very nearly the same. Comparisons of this gain in relation to the estimated quantities of water diverted show that during the season of 1929, 61 per cent of the water diverted was returned. The reader should bear in mind that these computations may vary from year to year, as more complete and accurate records are obtained of inflow and outflow to these sections of the river.

Lower River—Humboldt River from Palisade to Lovelock for the Years 1927, 1928, 1929 and 1930

The following quantities were delivered to the canals diverting water from this section during the years set forth: 1927, 183,014 acre feet; 1928, 95,045 acre feet; 1929, 60,145 acre feet, and 1930, 64,901 acre feet. The losses and gains for these years were as follows: 1927, 26,241 acre feet, loss; 1928, 568 acre feet, gain; 1929, 164 acre feet, loss; 1930, 13,263 acre feet, loss. There is no question but what there is a distinct ratio between the losses and the flow available, but sufficient data has not been secured upon which to base an accurate estimate of the losses that will occur for any known flow at Palisade. There are so many factors that must be taken into consideration before definite statements can be made as to just what the losses or gains will be for each seasonal run-off that it is unwise to arrive at definite conclusions until additional data have been secured.

Entire River—Humboldt River from Deeth to Lovelock for the Years 1929 and 1930

The average daily loss of the entire river during the year 1929 was 12 per cent of the flow available, and 5 per cent for the year 1930. A study of the transportation losses occurring during these two years shows clearly that the losses are very nominal when compared with the total flow available.

HUMBOLDT RIVER STORAGE

A brief interesting study has been made by this office of the storage possibilities and requirements on this stream. As this discussion is of considerable length, the following paragraph is all that space will permit in these excerpts:

If storage were the only consideration it would not be advisable to recommend an expenditure for storage purposes, excepting to provide equalizing reservoirs on the lower reaches of the river. * * * From the past history of this stream floods occur rather infrequently, which do as much damage to the adjoining lands as occurs from the extreme shortage of waters during the dry years. * * * It is only a question of time until serious floods will again take place on this stream, and with this thought in mind we do not hesitate to recommend that steps be taken to provide storage on the main stream of the Humboldt River.

STATEMENT

A study of the data given in these excerpts should be made in conjunction with reference to the charts that show graphically the daily conditions that exist on the Humboldt River during each irrigation season. A complete report of our activities on this stream during the past four years is nearing completion and will be published and distributed as soon as it is possible to do so.

It is believed that with this report as a basis the work can be made increasingly effective as time goes on.

NOTE—On December 21, 1930, the Honorable Geo. A. Bartlett, Judge of the District Court of the Sixth Judicial District of the State of Nevada, handed down a decision and opinion in the Matter of the Determination of the Relative Rights of Claimants and Appropriators of the Waters of the Humboldt River Stream System and Its Tributaries. As this decision contains some 26 pages of written material it is too voluminous to include in this report.

A verbal opinion by the Attorney-General's office holds that the State Engineer shall continue the distribution of the waters of this stream as outlined in the Order of Determination until such time as the findings are prepared in accordance with this decision and a final decree is signed by the court.

CHAPTER VII

Measurement of Water

Throughout the entire West the term miner's inch has been used up to the present time by the majority of water users in preference to the second foot and the acre foot, which are the legal units in most, if not all, of the western States. The reason for this comes, perhaps, from the fact that the miner's inch was the standard of measurement during the pioneer days of mining and farming in the west, and the people having become used to gaging water in accordance with this term are loath to depart from it.

The term miner's inch, however, is very uncertain unless when used the pressure under which the discharge is delivered is given. The different States have different values for a miner's inch, as the head or pressure is not the same. The legislatures have recognized this uncertainty and have accordingly made the standard of measurement the cubic foot per second, or second foot, and the standard of volume the acre foot.

USEFUL EQUIVALENTS

The following equivalents of the terms second foot, acre foot and miner's inch will serve as a guide where necessary to transpose them; One acre foot of water is the quantity that will cover an area of one acre one foot deep.

One second foot of water is the quantity that will fill a space of one cubic foot in one second of time.

1 second foot equals 40 miners' inches.

1 second foot equals 7.4805 gallons per second, or 448.83 gallons per minute.

1 acre foot equals 43,560 cubic feet or the volume of water that will cover one acre one foot deep.

1 miner's inch equals 0.186+ gallons per second.

1 miner's inch equals 11.21 gallons per minute.

1 miner's inch equals 672.60 gallons per hour.

1 miner's inch equals 16,142.40 gallons per day of 24 hours.

1 miner's inch flowing 20.16 days will cover an acre of land 1 foot deep or it will be the equivalent of 1 acre foot.

1 miner's inch flowing 150 days (5 months of 30 days each) will cover an acre of land 7.4 feet deep.

1 second foot of water flowing 150 days equals 297.06 acre feet or enough water to cover 100 acres of land 2.9706 feet deep.

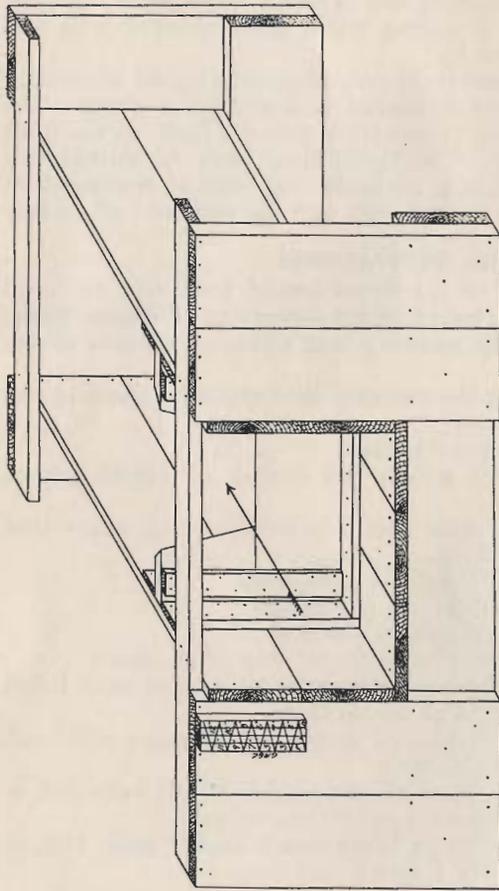
1 second foot of water flowing 24 hours equals 86,400 cubic feet, or 1.98 acre feet, or approximately 1 acre 2 feet deep.

1 acre foot equals 325,850 gallons.

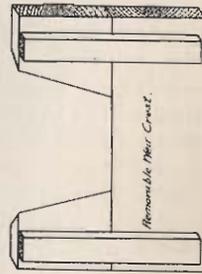
METHODS OF MEASUREMENT

Irrigation water is usually measured by one of three methods: Over a weir, through an orifice, or in an open channel. Of these methods the one most commonly used by water users is the weir.

A weir is a notch in a vertical wall through which water flows. The weir is the best instrument ever devised for common use in the measurement of irrigation water. It is cheap and simple of construction.



Scale 1/2"=1'



Removable Weir Crest.

Bill of Material for Box for 1 Foot Weir.

- 1-1/2" x 18'
- 1-2" x 12'
- 1-2" x 12'
- 1-2" x 12'
- 1-2" x 12'
- TOTAL 74 1/2 BOARD FEET.

CIPPOLETTI WEIR AND BOX.

The results are accurate and easily understood. The measurements are easy to make and the computations are rapid.

There are many types of weirs, but the one most commonly used in the measurement of irrigation water is the Cippoletti weir, so called because it was designed by an Italian engineer named Cesare Cippoletti. The weir has a thin horizontal crest and thin sides, and the weir notch is wider across the top than at the bottom, the sides having a slope of one inch out to four inches rise or what is usually termed a 1:4 slope.

CONSTRUCTION OF WEIRS

The construction of a two-foot weir box and crest is shown in the accompanying drawing.

The requirements for the proper setting and operating of this type of weir are:

1. It should be set at the lower end of a long pool sufficiently wide and deep to give an even smooth current with a velocity of approach of not over 0.5 of a foot per second, which means practically still water.

2. The line of the weir box should be parallel with the direction of flow, that is, the crest is to be at right angles to the direction of the flow.

3. The face of the weir should be perpendicular, that is, leaning neither up nor down stream.

4. The crest of the weir should be level so the water passing over it will be the same depth at all points along the crest.

5. The distance of the crest above the bottom of the pool should be about three times the depth of water flowing over the weir crest, and the sides of the pool should be at a distance from the sides of crest not less than twice the depth of the water passing over the crest.

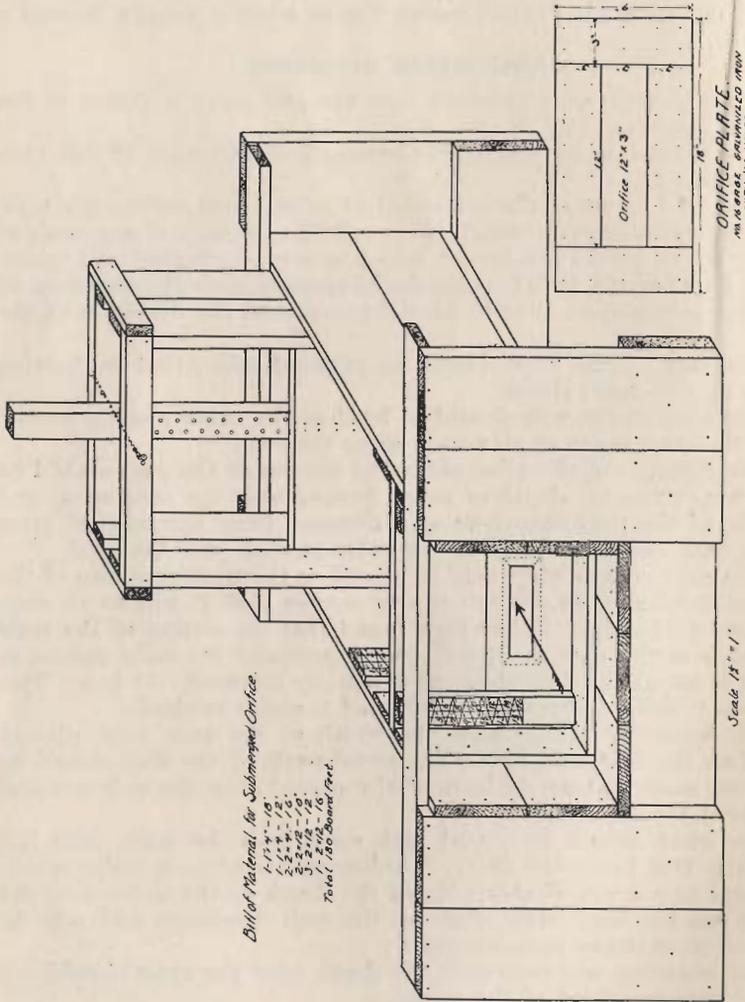
6. The gage or weir scale may be placed on the upstream face of the weir structure and far enough to one side so that it will be in comparatively still water. It has been found that the setting of the scale at one side of the weir as shown gives practically the same results as when it is set in the pool above as is usually directed. It is set with much less trouble, is more permanent and is easier to check.

7. The structure should have the width of the weir crest plainly marked on the upstream face. The metal parts of the weir should be accurately made and should be carefully placed after the weir box and weir board are installed.

8. The crest should be placed high enough so the water will fall practically free below the weir. A submergence or back water condition equal to a depth of about $\frac{1}{16}$ of the depth of the water over the weir or less has very little effect on the weir discharge and may be neglected in ordinary measurements.

9. For accurate measurements the depth over the crest should not be more than one-third of the crest.

10. The depth of water over the crest should not be less than about 2 inches as it is difficult to get sufficiently accurate gage readings below this point to give close results. However, a broad crested weir with low gage heights used where there is little fall will give more reliable results as a rule than can ordinarily be obtained by the use of an orifice using the same amount of head.



SUBMERGED ORIFICE AND BOX .

THE SUBMERGED ORIFICE

The structure for the submerged orifice is built the same as for a weir, but instead of placing a weir crest in the front heading an opening known as an orifice is placed therein as shown in the accompanying cut.

This opening may be of any required dimensions and of any shape, though for convenience of computation certain standard dimensions are usually selected. The orifice is not used as generally as the weir. This is due to certain inherent disadvantages. First, the orifice structure is such that it gathers trash which tends to check the flow and hence to destroy the accuracy of the measurement. Second, there is a chance for inaccuracy on low heads, that is, where there is but little difference between the upper and lower gage readings the relative discharge for this small difference is so great that a slight error in reading the gage makes a very great difference in the result of the computed discharge. Third, unless some special provision is made the submerged orifice is not adapted to passing large quantities of water; it will pond the water above the orifice so that damage from overflow is liable to be done to the canal or the heading. In the case of the weir the proportional discharge is increased as the head increases and the excess flow is automatically taken care of by passing over the weir.

The coefficient of discharge in the orifice is much more uncertain than in the case of the weir, and is affected by a greater variety of factors that are not so easily regulated. Notwithstanding the above-mentioned disadvantages there are times when it is desirable to use the orifice as a measuring device. This may occur where it is imperative to save head, or hold the water level as high as possible in the canal. In this case it may be necessary to sacrifice accuracy for the sake of saving head. There are times when it is desirable to combine a canal heading with a measuring device, in which case an orifice can well be used because the heading shuts out the trash and regulates the flow.

RULES GOVERNING THE USE OF THE ORIFICE

The orifice opening should be regular in shape, and should have sharp edges. The pressure head should be not less than 0.10 of a foot.

The depth of submergence of the orifice should not be less than the height of the orifice, and a submergence of twice the height of the orifice is preferable.

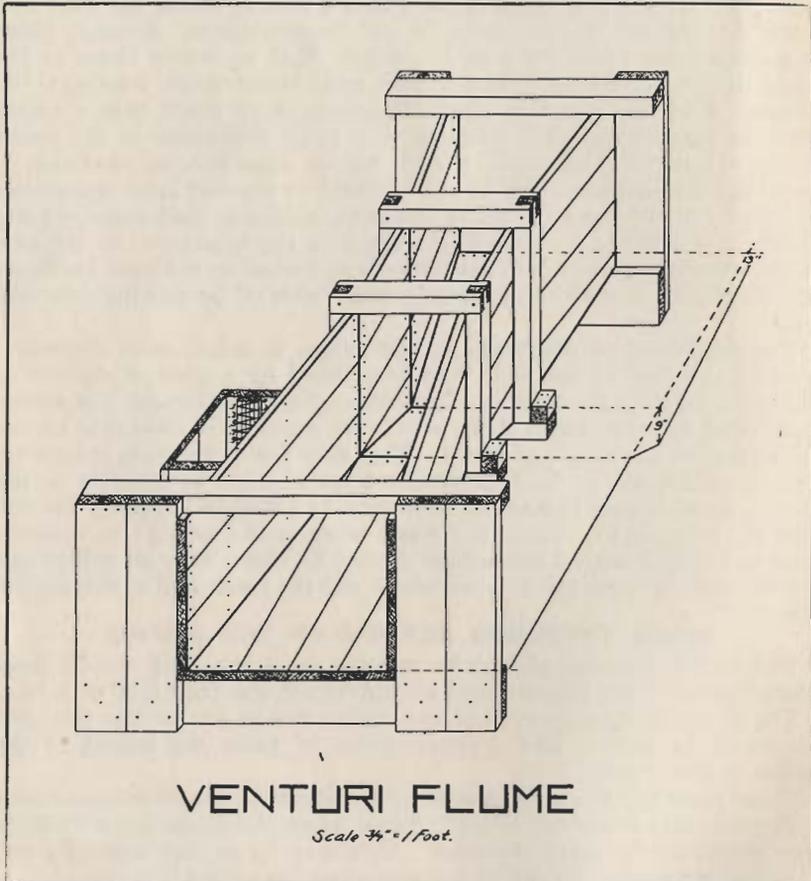
There must be two gages, one of which should be set on the head-wall to one side and below the orifice. These gages should be set with their zero marks at the same elevation. This may be at any desired point so it will always be covered with water when the orifice is in use.

Where a canal gate or heading is used for an orifice to measure water the coefficient of discharge must be determined for each different condition, either by measuring the water over a weir or by a current meter measurement, if any degree of accuracy is required. This is because the discharge coefficient changes with the form and kind of orifice and in many cases with the depth of water and the water pressure. For this reason, if good measurements are desired, the standard orifice structure should be used, and the discharges may then be taken from the table as given.

ORIFICE TABLE

In using the table find the difference between the reading of the upper and the lower gages. This will be the "effective head" as used in the table. In the accompanying tables will be found the discharges for orifices having openings of different sizes with effective heads as shown by the gages. Discharge for orifices of larger sizes may be found by multiplying the discharge for one foot orifice by the size of the orifice desired.

The coefficient used in this table is 0.62. If any other coefficient is



desired, divide the given discharge by 0.62 and multiply the result by the desired coefficient and the required discharge is obtained.

THE IMPROVED VENTURI FLUME

This device for the measurement of water flowing in open channels is adaptable to both large and small flows.

Probably the most accurate known device for the measurement of water is the weir. Due to changeable conditions in the ditch section from growth of vegetation, deposit of silt above the weir, carelessness

in placing the same in the ditch, and generally to the lack of sufficient fall in the ditch which is most needful, its practical use is rather limited.

The most common type of measuring device is the rectangular flume in which there is installed a gage rod to determine the depth of water flowing at any particular stage. For determining the carrying capacity of such a flume at different depths of flow, it is necessary to keep the flume rated. This is usually done by means of a current meter. Due to change in conditions resulting from sand deposits, growth of vegetation or use of check boards in the canal below, it is necessary to keep such type of flume carefully rated if serious errors are to be avoided.

To overcome practically all of the aforementioned objections, there was perfected by R. L. Parshall, Engineer of the Division of Agricultural Engineering, Bureau of Public Roads, United States Department of Agriculture, in cooperation with the Colorado Agricultural Experiment Station, what is known as the Improved Venturi Flume.

This device, consisting of three main parts, has, first, an upstream converging section with a level floor; second, a throat or contracted section two feet in length, with a floor sloping downstream; third, a diverging section with the floor sloping upward. The side walls are all vertical, and in the throat section they are parallel. In all structures, the downstream or outlet end of the floor of the diverging section is three inches lower in elevation than the level floor of the upper end of the flume, while the lowest point in the floor is always placed nine inches lower than the floor at the upper end of the flume. The crest is the downstream end of the floor of the converging section, or is the place of entry to the throat.

The principal advantages of this flume over that of any other measuring device are:

First—It is self rating, *i. e.*, it does not require rating with a current meter.

Second—It is self-cleaning of sand and silt deposits.

Third—The discharge at any given height is not affected by back-water conditions due to vegetable growth, or sand bars or other obstructions in the canal below the flume under usual conditions of operation.

Fourth—The rating table for this flume based upon a constant formula does not vary unless the water below the flume backs up so as to destroy more than 70 per cent of the difference in head between tail water below the flume and head water above the same.

Fifth—It requires a much less fall in the ditch than does the standard weir.

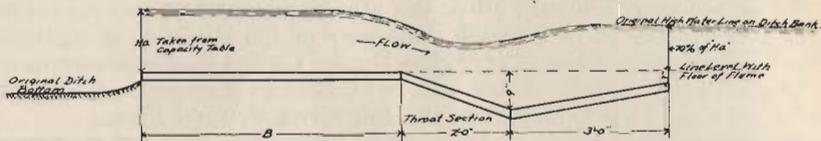
The accompanying tables, together with a cut of this structure, are published for the information of those who are interested in such matters.

A bill of material for the construction of Venturi flumes may be obtained by writing to the State Engineer's office at Carson City.

STANDARD DIMENSIONS AND CAPACITIES, IMPROVED VENTURI FLUME

W*	DIMENSIONS IN FEET						MAXIMUM†		MINIMUM†	
	A	§A	B	§B	C	D	Ha	Sec. Ft.	Ha	Sec. Ft.
1	4'-6"	3'-0"	4'-4 $\frac{1}{4}$ "	2'-11 $\frac{1}{4}$ "	2	2'-9 $\frac{1}{4}$ "	2.50	16.1	0.20	0.35
2	5'-0"	3'-4"	4'-10 $\frac{3}{4}$ "	3'-3 $\frac{1}{2}$ "	3	3'-11 $\frac{1}{2}$ "	2.50	33.2	0.20	0.66
3	5'-6"	3'-8"	5'-4 $\frac{1}{8}$ "	3'-7 $\frac{1}{8}$ "	4	5'-1 $\frac{1}{4}$ "	2.50	50.4	0.20	0.97
4	6'-0"	4'-0"	5'-10 $\frac{1}{8}$ "	3'-11 $\frac{1}{8}$ "	5	6'-4 $\frac{1}{2}$ "	2.50	67.9	0.20	1.26
5	6'-6"	4'-4"	6'-4 $\frac{1}{2}$ "	4'-3"	6	7'-6 $\frac{1}{8}$ "	2.50	85.6	0.25	2.22
6	7'-0"	4'-8"	6'-10 $\frac{1}{2}$ "	4'-7"	7	8'-9"	2.50	103.5	0.25	2.63
8	8'-0"	5'-4"	7'-10 $\frac{1}{8}$ "	5'-2 $\frac{3}{4}$ "	9	11'-1 $\frac{3}{4}$ "	2.50	139.5	0.30	4.62

Directions for Placing Venturi Flume



DIRECTIONS FOR PLACING FLUME.

First—Select from table of flume capacities the proper depth of water or head "Ha" that corresponds with the maximum capacity of the ditch, so that "Ha" will ordinarily not exceed one-half the width of throat "W" which may be adopted.

Second—Locate the high water line on the ditch bank where the flume is to be installed, as shown by previous flows.

Third—Place the surface of the floor "B" at a depth of 70 per cent of "Ha" below the high water line.

Fourth—Place the floor "B" level both length and crosswise and construct all flume bottoms with the drop and rise and at the lengths as shown by above sketch.

Fifth—Place gage on side of flume at a distance upstream from the throat, equal to two-thirds the distance "A."

Sixth—Provide cut-off wall and wings at each end of flume at 45 degree angles, to prevent water cutting under or around same.

NOTE—Refer to isometric drawing.

*Crest width in feet. †Discharge capacity in cubic feet per second, free flow conditions.

DISCHARGE OVER CIPPOLETTI'S TRAPEZOIDAL WEIR

For Various Lengths and Depths.

Formula: $Q=3.3\frac{3}{8} LH^{\frac{3}{2}}$

Head "H" on Crest Measured in Still Water		Discharge in Cubic Feet per Second												
		Length of Weir Crest in Feet												
In feet	In inches	1	1½	2	2½	3	3½	4	5	7½	10	12½	15	
.01	¾	.003	.01	.01	.01	.01	.01	.01	.02	.02	.03	.04	.05	
.02	¾	.010	.01	.02	.02	.03	.03	.04	.05	.07	.10	.12	.14	
.03	¾	.018	.03	.04	.04	.05	.06	.07	.09	.13	.18	.22	.26	
.04	¾	.027	.04	.06	.07	.08	.09	.11	.13	.20	.27	.34	.40	
.05	¾	.038	.06	.08	.09	.11	.13	.15	.19	.28	.38	.47	.56	
.06	¾	.050	.07	.10	.12	.15	.17	.20	.25	.37	.49	.62	.74	
.07	¾	.062	.09	.12	.16	.19	.22	.25	.31	.47	.62	.78	.94	
.08	1	.076	.11	.15	.19	.23	.27	.30	.38	.57	.76	.95	1.14	
.09	¾	.091	.14	.18	.23	.27	.32	.36	.45	.68	.91	1.14	1.36	
.10	¾	.107	.16	.21	.27	.32	.37	.43	.53	.80	1.06	1.33	1.60	
.11	1¾	.123	.18	.25	.31	.37	.43	.49	.61	.92	1.23	1.54	1.84	
.12	½	.140	.21	.28	.35	.42	.49	.56	.70	1.05	1.40	1.75	2.10	
.14	¾	.176	.26	.35	.44	.53	.62	.71	.88	1.32	1.76	2.20	2.65	
.15	¾	.196	.29	.39	.49	.59	.68	.78	.98	1.47	1.96	2.44	2.93	
.16	1¾	.216	.32	.43	.54	.65	.75	.86	1.08	1.62	2.15	2.69	3.23	
.17	2	.236	.35	.47	.59	.71	.83	.94	1.18	1.77	2.36	2.95	3.54	
.18	¾	.257	.39	.51	.64	.77	.90	1.03	1.29	1.93	2.57	3.21	3.86	
.19	¾	.279	.42	.56	.70	.84	.98	1.12	1.39	2.09	2.79	3.49	4.18	
.20	¾	.301	.45	.60	.75	.90	1.05	1.20	1.51	2.26	3.01	3.76	4.52	
.21	2½	.324	.49	.65	.81	.97	1.13	1.30	1.62	2.43	3.24	4.05	4.86	
.22	¾	.347	.52	.69	.87	1.04	1.22	1.39	1.74	2.61	3.47	4.34	5.21	
.23	¾	.371	.56	.74	.93	1.11	1.30	1.49	1.86	2.79	3.71	4.64	5.57	
.24	¾	.396	.59	.79	.99	1.19	1.39	1.58	1.98	2.97	3.96	4.95	5.94	
.25	3	.421	.63	.84	1.05	1.26	1.47	1.68	2.10	3.16	4.21	5.26	6.31	
.26	3½	.446	.67	.89	1.12	1.34	1.56	1.79	2.23	3.35	4.46	5.58	6.70	
.27	¾	.472	.71	.94	1.18	1.42	1.65	1.89	2.36	3.54	4.72	5.90	7.09	
.28	¾	.499	.75	1.00	1.25	1.50	1.75	2.00	2.49	3.74	4.99	6.24	7.48	
.29	½	.526	.79	1.05	1.31	1.58	1.84	2.10	2.63	3.94	5.26	6.57	7.89	
.30	¾	.553	.83	1.11	1.38	1.66	1.94	2.21	2.77	4.15	5.53	6.92	8.30	
.31	3¾	.....	.87	1.16	1.45	1.74	2.03	2.32	2.91	4.36	5.81	7.26	8.72
.32	¾	.....	.91	1.22	1.52	1.83	2.13	2.44	3.05	4.57	6.09	7.62	9.14
.33	4	.....	.96	1.28	1.60	1.91	2.23	2.55	3.19	4.79	6.38	7.98	9.57
.34	¾	.....	1.00	1.33	1.67	2.00	2.34	2.67	3.34	5.01	6.67	8.34	10.01
.35	¾	.....	1.05	1.39	1.74	2.09	2.44	2.79	3.49	5.23	6.97	8.71	10.46
.36	4¾	.....	1.09	1.45	1.82	2.18	2.56	2.91	3.64	5.45	7.27	9.09	10.91
.37	½	.....	1.14	1.52	1.89	2.27	2.65	3.03	3.79	5.68	7.58	9.47	11.37
.39	¾	.....	1.23	1.64	2.05	2.46	2.87	3.28	4.10	6.15	8.20	10.25	12.30
.40	¾	.....	1.28	1.70	2.13	2.56	2.98	3.41	4.26	6.39	8.52	10.65	12.78
.41	4¾	.....	1.33	1.77	2.21	2.65	3.09	3.54	4.42	6.63	8.84	11.05	13.26
.42	5	.....	1.37	1.83	2.29	2.75	3.21	3.67	4.58	6.87	9.16	11.46	13.75
.43	½	.....	1.42	1.90	2.37	2.85	3.32	3.80	4.75	7.12	9.49	11.87	14.24
.44	¾	.....	1.47	1.97	2.46	2.95	3.44	3.93	4.91	7.37	9.83	12.28	14.74
.45	¾	.....	1.52	2.03	2.55	3.05	3.56	4.07	5.08	7.62	10.16	12.70	15.24
.46	5½	.....	1.58	2.10	2.63	3.15	3.68	4.20	5.25	7.88	10.50	13.13	15.76
.47	¾	.....	1.63	2.17	2.71	3.25	3.80	4.34	5.42	8.14	10.85	13.56	16.27
.48	¾	.....	1.68	2.24	2.80	3.36	3.92	4.48	5.60	8.40	11.20	14.00	16.79
.49	¾	.....	1.73	2.31	2.89	3.46	4.04	4.62	5.77	8.66	11.55	14.43	17.32
.50	6	.....	1.79	2.38	2.98	3.57	4.17	4.76	5.95	8.93	11.90	14.88	17.85

DISCHARGE OVER CIPPOLETTI'S TRAPEZOIDAL WEIR—Continued
For Various Lengths and Depths.

$$\text{Formula: } Q=3.3\frac{2}{3} LH^{\frac{3}{2}}$$

Head "H" on Crest Measured in Still Water		Discharge in Cubic Feet per Second												
		Length of Weir Crest in Feet												
In feet	In inches	1½	2	2½	3	3½	4	5	7½	10	12½	15	18	
.51	6¼	1.84	2.45	3.07	3.68	4.29	4.90	6.13	9.20	12.26	15.33	18.39	22.07	
.52	¾	1.89	2.52	3.16	3.79	4.42	5.05	6.31	9.47	12.62	15.78	18.94	22.72	
.53	⅝	1.95	2.60	3.25	3.90	4.55	5.20	6.50	9.74	12.99	16.24	19.49	23.38	
.54	½	2.00	2.67	3.34	4.01	4.68	5.34	6.68	10.02	13.36	16.70	20.04	24.05	
.55	⅜	2.06	2.75	3.43	4.12	4.81	5.49	6.87	10.30	13.73	17.17	20.60	24.72	
.56	6¾	2.12	2.82	3.53	4.23	4.94	5.64	7.05	10.58	14.11	17.64	21.16	25.40	
.57	⅞	2.17	2.90	3.62	4.35	5.07	5.80	7.24	10.87	14.49	18.11	21.73	26.08	
.58	7	2.23	2.97	3.72	4.46	5.20	5.95	7.44	11.15	14.87	18.59	22.31	26.77	
.59	⅞	2.29	3.05	3.81	4.58	5.34	6.10	7.63	11.44	15.26	19.07	22.89	27.46	
.60	¾	2.35	3.13	3.91	4.69	5.48	6.26	7.82	11.74	15.65	19.56	23.27	28.16	
.61	7¾	.....	3.21	4.01	4.81	5.61	6.42	8.02	12.03	16.04	20.05	24.06	28.87
.62	½	.....	3.29	4.11	4.93	5.75	6.57	8.22	12.33	16.44	20.54	24.65	29.58
.64	⅝	.....	3.45	4.31	5.17	6.03	6.89	8.62	12.93	17.24	21.55	25.86	31.03
.65	¾	.....	3.53	4.41	5.29	6.18	7.06	8.82	13.23	17.64	22.05	26.46	31.76
.66	7⅞	.....	3.61	4.51	5.42	6.32	7.22	9.03	13.54	18.05	22.56	27.08	32.49
.67	8	.....	3.69	4.62	5.54	6.46	7.39	9.23	13.85	18.46	23.08	27.70	33.23
.68	⅞	.....	3.78	4.72	5.66	6.61	7.55	9.44	14.16	18.88	23.60	28.32	33.98
.69	¾	.....	3.86	4.82	5.79	6.75	7.72	9.65	14.47	19.30	24.12	28.94	34.73
.70	⅝	.....	3.94	4.93	5.92	6.90	7.89	9.86	14.79	19.72	24.65	29.58	35.49
.71	8½	.....	4.03	5.04	6.04	7.05	8.06	10.07	15.11	20.14	25.18	30.21	36.25
.72	¾	.....	4.11	5.14	6.17	7.20	8.23	10.28	15.43	20.57	25.71	30.85	37.03
.73	¾	.....	4.20	5.25	6.30	7.35	8.40	10.50	15.75	21.00	26.25	31.50	37.80
.74	⅞	.....	4.29	5.36	6.43	7.50	8.57	10.72	16.07	21.43	26.79	32.15	38.58
.75	9	.....	4.37	5.47	6.56	7.65	8.75	10.93	16.40	21.87	27.33	32.80	39.36
.76	9¼	.....	4.46	5.58	6.69	7.81	8.92	11.15	16.73	22.31	27.88	33.46	40.15
.77	¾	.....	4.55	5.69	6.82	7.96	9.10	11.37	17.06	22.75	28.43	34.12	40.95
.78	¾	.....	4.64	5.80	6.96	8.12	9.28	11.60	17.39	23.19	28.99	34.79	41.75
.79	½	.....	4.73	5.91	7.09	8.27	9.46	11.82	17.73	23.64	29.55	35.46	42.55
.80	⅝	.....	4.82	6.02	7.23	8.43	9.64	12.05	18.07	24.09	30.11	36.13	43.36
.81	9¾	.....	4.91	6.14	7.36	8.59	9.82	12.27	18.41	24.54	30.68	36.81	44.18
.82	⅞	.....	5.00	6.25	7.50	8.75	10.00	12.50	18.75	25.00	31.25	37.50	45.00
.83	10	.....	5.09	6.36	7.64	8.91	10.18	12.73	19.09	25.46	31.82	38.19	45.82
.84	¾	.....	5.18	6.48	7.78	9.07	10.37	12.96	19.44	25.92	32.40	38.88	46.65
.85	¾	.....	5.28	6.60	7.92	9.23	10.55	13.19	19.79	26.38	32.98	39.57	47.49
.86	10¾	.....	5.37	6.71	8.06	9.40	10.74	13.43	20.14	26.85	33.56	40.28	48.33
.87	½	.....	5.46	6.83	8.20	9.56	10.93	13.66	20.49	27.32	34.15	40.97	49.18
.89	⅝	.....	5.65	7.07	8.48	9.89	11.31	14.13	21.20	28.27	35.33	42.40	50.88
.90	¾	.....	5.75	7.19	8.62	10.06	11.50	14.37	21.56	28.75	35.93	43.12	51.74
.91	10¾	.....	.....	7.31	8.77	10.23	11.69	14.61	21.92	29.23	36.53	43.84	52.61
.92	11	.....	.....	7.43	8.91	10.40	11.88	14.85	22.28	29.71	37.14	44.56	53.48
.93	¾	.....	.....	7.55	9.06	10.57	12.08	15.10	22.65	30.19	37.74	45.29	54.35
.94	¾	.....	.....	7.67	9.20	10.74	12.27	15.34	23.01	30.68	38.35	46.02	55.23
.95	⅝	.....	.....	7.79	9.35	10.91	12.47	15.59	23.38	31.17	38.97	46.76	56.11
.96	11½	.....	.....	7.92	9.50	11.08	12.67	15.83	23.75	31.67	39.58	47.50	57.00
.97	⅝	.....	.....	8.04	9.65	11.26	12.87	16.08	24.12	32.16	40.20	48.24	57.89
.98	¾	.....	.....	8.17	9.80	11.43	13.06	16.33	24.49	32.66	40.83	48.99	58.79
.99	⅞	.....	.....	8.29	9.95	11.61	13.27	16.58	24.87	33.16	41.45	49.74	59.69
1.00	12	.....	.....	8.42	10.10	11.78	13.47	16.83	25.25	33.67	42.08	50.50	60.60

DISCHARGE OVER CIPPOLETTI'S TRAPEZOIDAL WEIR—Continued
 For Various Lengths and Depths. Formula: $Q=3.3\frac{1}{2} LH^{\frac{3}{2}}$

Head "H" on Crest Measured in Still Water		Discharge in Cubic Feet per Second										
		Length of Weir Crest in Feet										
In feet	In inches	2½	3	3½	4	5	7½	10	12½	15	18	20
1.01	12½	8.54	10.25	11.96	13.67	17.09	25.63	34.17	42.72	51.26	61.61	68.35
1.02	¾	8.67	10.40	12.14	13.87	17.34	26.01	34.68	43.35	52.02	62.43	69.36
1.03	¾	8.80	10.56	12.32	14.08	17.60	26.39	35.19	43.99	52.79	63.35	70.39
1.04	½	8.93	10.71	12.50	14.28	17.85	26.78	35.71	44.63	53.56	64.27	71.41
1.05	⅝	9.06	10.87	12.68	14.49	18.11	27.17	36.22	45.28	54.33	65.20	72.45
1.06	12¾	9.19	11.02	12.86	14.70	18.37	27.56	36.74	45.93	55.11	66.14	73.48
1.07	⅞	9.32	11.18	13.04	14.91	18.63	27.95	37.26	46.58	55.89	67.07	74.53
1.08	13	9.45	11.34	13.23	15.11	18.89	28.34	37.79	47.23	56.68	68.02	75.57
1.09	¾	9.58	11.49	13.41	15.33	19.16	28.73	38.31	47.89	57.47	68.96	76.62
1.10	¾	9.71	11.65	13.59	15.54	19.42	29.13	38.84	48.55	58.26	69.91	77.68
1.11	13¾	9.84	11.81	13.78	15.75	19.69	29.53	39.37	49.21	59.06	70.87	78.74
1.12	½	9.98	11.97	13.97	15.96	19.95	29.93	39.90	49.88	59.86	71.83	79.81
1.14	⅝	10.24	12.29	14.34	16.39	20.49	30.73	40.98	51.22	61.47	73.76	81.96
1.15	¾	10.38	12.46	14.53	16.61	20.76	31.14	41.52	51.90	62.28	74.73	83.04
1.16	13¾	10.52	12.62	14.72	16.82	21.03	31.55	42.06	52.58	63.09	75.71	84.12
1.17	14	10.65	12.78	14.91	17.04	21.30	31.96	42.61	53.26	63.91	76.69	85.21
1.18	½	10.79	12.95	15.10	17.26	21.58	32.37	43.15	53.94	64.73	77.68	86.31
1.19	¾	10.93	13.11	15.30	17.48	21.85	32.78	43.70	54.63	65.56	78.67	87.41
1.20	⅝	11.06	13.28	15.49	17.70	22.13	33.19	44.26	55.32	66.38	79.66	88.51
1.21	14½	.....	13.44	15.68	17.92	22.41	33.61	44.81	56.01	67.22	80.66	89.62
1.22	¾	.....	13.61	15.88	18.15	22.68	34.03	45.37	56.71	68.05	81.66	90.73
1.23	¾	.....	13.78	16.07	18.37	22.96	34.44	45.93	57.41	68.89	82.67	91.85
1.24	⅞	.....	13.95	16.27	18.59	23.24	34.87	46.49	58.11	69.73	83.68	92.97
1.25	15	.....	14.12	16.47	18.82	23.53	35.29	47.05	58.81	70.58	84.69	94.10
1.26	15½	.....	14.28	16.67	19.05	23.81	35.71	47.62	59.52	71.42	85.71	95.23
1.27	¾	.....	14.46	16.86	19.27	24.09	36.14	48.18	60.23	72.28	86.74	96.37
1.28	¾	.....	14.63	17.06	19.50	24.38	36.57	48.75	60.94	73.13	87.76	97.51
1.29	½	.....	14.80	17.26	19.73	24.66	37.00	49.33	61.66	73.99	88.79	98.65
1.30	⅝	.....	14.97	17.47	19.96	24.95	37.43	49.90	62.38	74.85	89.82	99.80
1.31	15¾	.....	15.14	17.67	20.19	25.24	37.86	50.48	63.10	75.72	90.86	100.96
1.32	¾	.....	15.32	17.87	20.42	25.53	38.29	51.06	63.82	76.59	91.90	102.12
1.33	16	.....	15.49	18.07	20.66	25.82	38.73	51.64	64.55	77.46	92.95	103.28
1.34	¾	.....	15.67	18.28	20.89	26.11	39.17	52.22	65.28	78.33	94.00	104.45
1.35	¾	.....	15.84	18.48	21.12	26.40	39.61	52.81	66.01	79.21	95.05	105.62
1.36	16¾	.....	16.02	18.69	21.36	26.70	40.05	53.40	66.74	80.09	96.11	106.79
1.37	½	.....	16.20	18.90	21.59	26.99	40.49	53.99	67.48	80.98	97.18	107.97
1.39	⅝	.....	16.55	19.31	22.07	27.59	41.38	55.17	68.97	82.76	99.31	110.35
1.40	¾	.....	16.73	19.52	22.31	27.88	41.83	55.77	69.71	83.65	100.38	111.54
1.41	16¾	.....	16.91	19.73	22.55	28.18	42.28	56.37	70.46	84.55	101.46	112.74
1.42	17	.....	17.09	19.94	22.79	28.48	42.73	56.97	71.21	85.45	102.54	113.94
1.43	¾	.....	17.27	20.15	23.03	28.79	43.18	57.57	71.96	86.36	103.63	115.14
1.44	¾	.....	17.45	20.36	23.27	29.09	43.63	58.18	72.72	87.26	104.72	116.35
1.45	¾	.....	17.63	20.57	23.51	29.39	44.09	58.78	73.48	88.17	105.81	117.57
1.46	17½	.....	17.82	20.79	23.76	29.70	44.54	59.39	74.24	89.09	106.91	118.78
1.47	⅝	.....	18.00	21.00	24.00	30.00	45.00	60.00	75.00	90.01	108.01	120.01
1.48	¾	.....	18.19	21.22	24.25	30.31	45.46	60.62	75.77	90.93	109.11	121.23
1.49	⅞	.....	18.37	21.43	24.49	30.62	45.92	61.23	76.54	91.85	110.22	122.46
1.50	18	.....	18.55	21.65	24.74	30.92	46.39	61.85	77.31	92.77	111.33	123.70

DISCHARGE OVER CIPPOLETTI'S TRAPEZOIDAL WEIR—Continued
 For Various Lengths and Depths. Formula: $Q=3.3\frac{3}{8} LH^{\frac{3}{2}}$

Head "H" on Crest Measured in Still Water		Discharge in Cubic Feet per Second									
		Length of Weir Crest in Feet									
In feet	In inches	3½	4	5	7½	10	12½	15	18	20	
1.51	18½	21.86	24.99	31.23	46.85	62.47	78.09	93.70	112.44	124.94	
1.52	¼	22.08	25.24	31.55	47.32	63.09	78.86	94.64	113.56	126.18	
1.53	⅜	22.30	25.49	31.86	47.79	63.71	79.64	95.57	114.69	127.43	
1.54	½	22.52	25.74	32.17	48.26	64.34	80.43	96.51	115.81	128.68	
1.55	⅝	22.74	25.99	32.48	48.73	64.97	81.21	97.45	116.94	129.94	
1.56	18¾	22.96	26.24	32.80	49.20	65.60	82.00	98.40	118.08	131.19	
1.57	⅞	23.18	26.49	33.11	49.67	66.23	82.79	99.34	119.21	132.46	
1.58	19	23.40	26.75	33.43	50.15	66.86	83.58	100.29	120.35	133.73	
1.59	1⅞	23.62	27.00	33.75	50.62	67.50	84.37	101.25	121.50	135.00	
1.60	¼	23.85	27.25	34.07	51.10	68.14	85.17	102.20	122.65	136.27	
1.61	19%	24.07	27.51	34.39	51.58	68.78	85.97	103.16	123.80	137.55	
1.62	½	24.30	27.77	34.71	52.06	69.42	86.77	104.13	124.95	138.84	
1.64	⅝	24.75	28.28	35.35	53.03	70.71	88.38	106.06	127.27	141.42	
1.65	¾	24.97	28.54	35.68	53.52	71.36	89.19	107.03	128.44	142.71	
1.66	19⅞	25.20	28.80	36.00	54.00	72.00	90.01	108.01	129.61	144.01	
1.67	20	25.43	29.06	36.33	54.49	72.66	90.82	108.98	130.78	145.31	
1.68	1⅞	25.66	29.32	36.66	54.98	73.31	91.64	109.97	131.96	146.62	
1.69	¼	25.89	29.59	36.98	55.47	73.97	92.46	110.95	133.14	147.93	
1.70	⅜	26.12	29.85	37.31	55.97	74.62	93.28	111.93	134.32	149.25	
1.71	20½	26.35	30.11	37.64	56.46	75.28	94.10	112.92	135.51	150.57	
1.72	⅝	26.58	30.38	37.97	56.96	75.94	94.93	113.92	136.70	151.89	
1.73	¾	26.81	30.64	38.30	57.46	76.61	95.76	114.91	137.89	153.21	
1.74	⅞	27.05	30.91	38.64	57.95	77.27	96.59	115.91	139.09	154.54	
1.75	21	27.28	31.18	38.97	58.45	77.94	97.42	116.91	140.29	155.88	
1.76	21⅞	27.51	31.44	39.30	58.96	78.61	98.26	117.91	141.50	157.22	
1.77	¼	27.75	31.71	39.64	59.46	79.28	99.10	118.92	142.70	158.56	
1.78	⅜	27.98	31.98	39.98	59.96	79.95	99.94	119.93	143.91	159.90	
1.79	½	28.22	32.25	40.31	60.47	80.63	100.78	120.94	145.13	161.25	
1.80	⅝	28.46	32.52	40.65	60.98	81.30	101.63	121.96	146.35	162.61	
1.81	21¾	.....	32.79	40.99	61.49	81.98	102.48	122.97	147.57	163.96
1.82	⅞	.....	33.06	41.33	62.00	82.66	103.33	123.99	148.79	165.32
1.83	22	.....	33.34	41.67	62.51	83.34	104.18	125.02	150.02	166.69
1.84	1⅞	.....	33.61	42.01	63.02	84.03	105.04	126.04	151.25	168.06
1.85	¼	.....	33.89	42.36	63.54	84.71	105.89	127.07	152.49	169.43
1.86	22⅞	.....	34.16	42.70	64.05	85.40	106.75	128.10	153.72	170.80
1.87	½	.....	34.44	43.05	64.57	86.09	107.61	129.14	154.97	172.18
1.89	⅝	.....	34.99	43.74	65.61	87.48	109.35	131.22	157.46	174.95
1.90	¾	.....	35.27	44.09	66.13	88.17	110.22	132.26	158.71	176.34
1.91	22⅞	.....	35.55	44.43	66.65	88.87	111.09	133.30	159.96	177.74
1.92	23	.....	35.83	44.78	67.18	89.57	111.96	134.35	161.22	179.14
1.93	1⅞	.....	36.11	45.13	67.70	90.27	112.84	135.40	162.48	180.54
1.94	¼	.....	36.39	45.49	68.23	90.97	113.71	136.46	163.75	181.94
1.95	⅜	.....	36.67	45.84	68.76	91.68	114.59	137.51	165.02	183.35
1.96	23½	.....	36.95	46.19	69.29	92.38	115.48	138.57	166.29	184.76
1.97	⅝	.....	37.24	46.54	69.82	93.09	116.36	139.63	167.56	186.18
1.98	¾	.....	37.52	46.90	70.35	93.80	117.25	140.70	168.84	187.60
1.99	⅞	.....	37.80	47.26	70.88	94.51	118.14	141.77	170.12	189.02
2.00	24	.....	38.09	47.61	71.42	95.22	119.03	142.84	171.40	190.45

DISCHARGE OVER CIPPOLETTI'S TRAPEZOIDAL WEIR—Continued
 For Various Lengths and Depths. Formula: $Q=3.3\frac{2}{3} LH^{\frac{3}{2}}$

Head "H" on Crest Measured in Still Water		Discharge in Cubic Feet per Second							
		Length of Weir Crest in Feet							
In feet	In inches	4	5	7½	10	12½	15	18	20
2.01	24 1/8	38.38	47.97	71.95	95.94	119.92	143.91	172.69	191.88
2.02	1/4	38.66	48.33	72.49	96.66	120.82	144.98	173.98	193.31
2.03	3/8	38.95	48.69	73.03	97.37	121.72	146.06	175.27	195.75
2.04	1/2	39.24	49.05	73.57	98.09	122.62	147.14	176.57	196.19
2.05	5/8	39.53	49.41	74.11	98.82	123.52	148.23	177.87	197.63
2.06	24 3/4	39.82	49.77	74.66	99.54	124.43	149.31	179.17	199.08
2.07	7/8	40.11	50.13	75.20	100.27	125.33	150.40	180.48	200.53
2.08	25	40.40	50.50	75.75	100.99	126.24	151.49	181.79	201.99
2.09	1 1/8	40.69	50.86	76.29	101.72	127.15	152.58	183.10	203.45
2.10	1/4	40.98	51.23	76.84	102.45	128.07	153.68	184.42	204.91
2.11	25 3/8	.....	51.59	77.39	103.19	128.98	154.78	185.74	206.37
2.12	1/2	.....	51.96	77.94	103.92	129.90	155.88	187.06	207.84
2.14	5/8	.....	52.70	79.05	105.40	131.74	158.09	189.71	210.79
2.15	3/4	.....	53.07	79.60	106.13	132.67	159.20	191.04	212.27
2.16	25 7/8	.....	53.44	80.16	106.88	133.60	160.31	192.38	213.75
2.17	26	.....	53.81	80.71	107.62	134.52	161.43	193.71	215.24
2.18	1/8	.....	54.18	81.27	108.36	135.45	162.55	195.06	216.73
2.19	1/4	.....	54.56	81.83	109.11	136.39	163.67	196.40	218.22
2.20	3/8	.....	54.93	82.39	109.86	137.32	164.79	197.75	219.72
2.21	26 1/2	.....	55.30	82.96	110.61	138.26	165.91	199.10	221.22
2.22	5/8	.....	55.68	83.52	111.36	139.20	167.04	200.45	222.72
2.23	3/4	.....	56.06	84.09	112.11	140.14	168.17	201.80	224.23
2.24	7/8	.....	56.43	84.65	112.87	141.09	169.30	203.16	225.74
2.25	27	.....	56.81	85.22	113.63	142.03	170.44	204.53	227.25
2.26	27 1/8	.....	57.19	85.79	114.38	142.98	171.58	205.89	228.77
2.27	1/4	.....	57.57	86.36	115.14	143.93	172.72	207.26	230.29
2.28	3/8	.....	57.96	86.93	115.91	144.88	173.86	208.63	231.81
2.29	1/2	.....	58.33	87.50	116.67	145.84	175.00	210.00	233.34
2.30	5/8	.....	58.72	88.08	117.43	146.79	176.15	211.38	234.87
2.31	27 3/4	.....	59.10	88.65	118.20	147.75	177.30	212.76	236.40
2.32	7/8	.....	59.48	89.23	118.97	148.71	178.45	214.14	237.94
2.33	28	.....	59.87	89.80	119.74	149.67	179.61	215.53	239.48
2.34	1/8	.....	60.26	90.38	120.51	150.64	180.77	216.92	241.02
2.35	1/4	.....	60.64	90.96	121.28	151.60	181.93	218.31	242.57
2.36	28 3/8	.....	61.03	91.54	122.06	152.57	183.09	219.71	244.12
2.37	1/2	.....	61.42	92.13	122.84	153.54	184.25	221.10	245.67
2.39	5/8	.....	62.20	93.30	124.39	155.49	186.59	223.91	248.79
2.40	3/4	.....	62.59	93.88	125.17	156.47	187.76	225.31	250.35
2.41	28 7/8	.....	.....	94.47	125.96	157.45	188.94	226.72	251.92
2.42	29	.....	.....	95.06	126.74	158.43	190.11	228.14	253.49
2.43	1/8	.....	.....	95.65	127.53	159.41	191.29	229.55	255.06
2.44	1/4	.....	.....	96.24	128.32	160.40	192.48	230.97	256.63
2.45	3/8	.....	.....	96.83	129.11	161.38	193.66	232.39	258.21
2.46	29 1/2	.....	.....	97.42	129.90	162.37	194.85	233.82	259.80
2.47	5/8	.....	.....	98.02	130.69	163.36	196.04	235.24	261.38
2.48	3/4	.....	.....	98.61	131.49	164.36	197.23	236.67	262.97
2.49	7/8	.....	.....	99.21	132.28	165.35	198.42	238.11	264.56
2.50	30	.....	.....	99.81	133.08	166.35	199.62	239.54	266.16

DISCHARGE OVER CIPPOLETTI'S TRAPEZOIDAL WEIR—Continued
 For Various Lengths and Depths. Formula: $Q=3.3\frac{3}{4} LH^{\frac{3}{2}}$

Head "H" on Crest Measured in Still Water		Discharge in Cubic Feet per Second					
		Length of Weir Crest in Feet					
In feet	In inches	7½	10	12½	15	18	20
2.51	30¼	100.41	133.88	167.35	200.82	240.98	267.76
2.52	¾	101.01	134.68	168.35	202.02	242.42	269.36
2.53	¾	101.61	135.48	169.35	203.22	243.87	270.96
2.54	½	102.21	136.29	170.36	204.43	245.31	272.57
2.55	¾	102.82	137.09	171.36	205.64	246.76	274.18
2.56	30¾	103.42	137.90	172.37	206.85	248.22	275.80
2.57	¾	104.03	138.71	173.38	208.06	249.67	277.41
2.58	31	104.64	139.52	174.40	209.28	251.13	279.04
2.59	¾	105.25	140.33	175.41	210.49	252.59	280.66
2.60	¾	105.86	141.14	176.43	211.71	254.06	282.29
2.61	31¾	106.47	141.96	177.45	212.94	255.53	283.92
2.62	½	107.08	142.77	178.47	214.16	256.99	285.55
2.64	¾	108.31	144.41	180.52	216.62	259.94	288.83
2.65	¾	108.93	145.23	181.54	217.85	261.42	290.47
2.66	31¾	109.54	146.06	182.57	219.09	262.90	292.11
2.67	32	110.16	146.88	183.60	220.32	264.39	293.76
2.68	¾	110.78	147.71	184.63	221.56	265.97	295.41
2.69	¾	111.40	148.53	185.67	222.80	267.36	297.07
2.70	¾	112.02	149.36	186.70	224.05	268.86	298.73
2.71	32½	112.65	150.19	187.74	225.29	270.35	300.39
2.72	¾	113.27	151.03	188.78	226.54	271.85	303.05
2.73	¾	113.90	151.86	189.83	227.79	273.35	303.72
2.74	¾	114.52	152.70	190.87	229.04	274.85	305.39
2.75	33	115.15	153.53	191.92	230.30	276.36	307.06
2.76	33¾	115.78	154.37	192.96	231.56	277.87	308.74
2.77	¾	116.41	155.21	194.01	232.82	279.38	310.42
2.78	¾	117.04	156.05	195.06	234.08	280.89	312.10
2.79	½	117.67	156.89	196.12	235.34	282.41	313.79
2.80	¾	118.30	157.74	197.17	236.61	283.93	315.48
2.81	33¾	118.94	158.58	198.23	237.88	285.45	317.17
2.82	¾	119.57	159.43	199.29	239.15	286.98	318.86
2.83	34	120.21	160.28	200.35	240.42	288.50	320.56
2.84	¾	120.85	161.13	201.41	241.70	290.03	322.26
2.85	¾	121.49	161.98	202.48	242.97	291.57	323.96
2.86	34¾	122.13	162.84	203.54	244.25	293.10	325.67
2.87	½	122.77	163.69	204.61	245.54	294.64	327.38
2.89	¾	124.05	165.40	206.76	248.11	297.73	330.81
2.90	¾	124.70	166.26	207.83	249.40	299.27	332.53
2.91	34¾	125.34	167.12	208.91	250.69	300.82	334.25
2.92	35	125.99	167.99	209.98	251.98	302.38	335.97
2.93	¾	126.64	168.85	211.06	253.28	303.93	337.70
2.94	¾	127.29	169.72	212.14	254.57	305.49	339.43
2.95	¾	127.94	170.58	213.23	255.87	307.05	341.16
2.96	35½	128.59	171.45	214.31	257.18	308.61	342.90
2.97	¾	129.24	172.32	215.40	258.48	310.18	344.64
2.98	¾	129.89	173.19	216.49	259.79	311.74	346.38
2.99	¾	130.55	174.06	217.58	261.09	313.31	348.13
3.00	36	131.20	174.94	218.67	262.41	314.89	349.87

DISCHARGE TABLE IN SECOND FEET FOR STANDARD SUBMERGED ORIFICE

$Q = 0.62 \sqrt{2gh} \times A$

EFFECTIVE HEAD		AREA OF ORIFICE IN SQUARE FEET								
In feet	In inches	1/4	1/2	3/4	1	1 1/2	2	3	4	5
0.01	1/8	0.12	0.25	0.37	0.50	0.75	1.00	1.49	1.99	2.49
.02	1/8	.18	.35	.53	.70	1.06	1.41	2.11	2.82	3.52
.03	3/8	.22	.43	.64	.86	1.29	1.72	2.58	3.44	4.30
.04	1/2	.25	.50	.75	.97	1.49	1.99	2.98	3.98	4.97
.05	5/8	.28	.56	.83	1.11	1.67	2.22	3.34	4.45	5.56
.06	3/4	.30	.61	.91	1.22	1.83	2.44	3.65	4.87	6.09
.07	7/8	.33	.66	.99	1.32	1.97	2.63	3.95	5.26	6.58
.08	1	.35	.70	1.05	1.41	2.11	2.81	4.22	5.62	7.03
.09	1 1/8	.37	.75	1.12	1.49	2.24	2.98	4.48	5.97	7.46
.10	1 1/4	.39	.79	1.18	1.57	2.36	3.14	4.72	6.29	7.86
.11	3/8	.41	.82	1.24	1.63	2.48	3.30	4.95	6.60	8.25
.12	1/2	.43	.86	1.29	1.72	2.58	3.44	5.17	6.89	8.61
.14	5/8	.46	.93	1.40	1.86	2.79	3.72	5.58	7.44	9.30
.15	3/4	.48	.96	1.44	1.93	2.89	3.85	5.78	7.70	9.63
.16	7/8	.50	.99	1.49	1.99	2.98	3.98	5.96	7.95	9.94
.17	2	.51	1.02	1.54	2.05	3.08	4.10	6.15	8.20	10.25
.18	1 1/8	.53	1.06	1.58	2.11	3.16	4.22	6.33	8.44	10.55
.19	1 1/4	.54	1.08	1.63	2.17	3.25	4.34	6.50	8.67	10.84
.20	3/8	.56	1.11	1.67	2.22	3.34	4.45	6.67	8.90	11.12
.21	1/2	.57	1.14	1.71	2.28	3.42	4.56	6.83	9.11	11.39
.22	5/8	.58	1.17	1.75	2.33	3.50	4.66	7.00	9.33	11.66
.23	3/4	.60	1.19	1.79	2.38	3.58	4.77	7.15	9.54	11.92
.24	7/8	.61	1.22	1.83	2.44	3.65	4.87	7.31	9.74	12.18
.25	3	.62	1.24	1.86	2.49	3.73	4.97	7.46	9.94	12.43
.26	1 1/8	.63	1.27	1.90	2.54	3.80	5.07	7.61	10.14	12.68
.27	1 1/4	.65	1.29	1.94	2.58	3.88	5.17	7.75	10.34	12.92
.28	3/8	.66	1.32	1.97	2.63	3.95	5.26	7.90	10.53	13.16
.29	1/2	.67	1.34	2.01	2.68	4.02	5.36	8.03	10.71	13.39
.30	5/8	.68	1.36	2.04	2.72	4.09	5.45	8.17	10.90	13.62
.31	3/4	.69	1.38	2.08	2.77	4.15	5.54	8.30	11.07	13.84
.32	7/8	.70	1.41	2.11	2.81	4.22	5.62	8.44	11.25	14.06
.33	4	.72	1.44	2.15	2.87	4.29	5.74	8.57	11.48	14.35
.34	1 1/8	.73	1.45	2.18	2.90	4.35	5.80	8.70	11.60	14.50
.35	1 1/4	.74	1.47	2.21	2.94	4.41	5.88	8.83	11.77	14.71
.36	3/8	.75	1.49	2.24	2.98	4.48	5.97	8.95	11.94	14.92
.37	1/2	.76	1.51	2.27	3.02	4.54	6.05	9.07	12.10	15.12
.39	5/8	.78	1.55	2.33	3.10	4.66	6.21	9.31	12.42	15.52
.40	3/4	.79	1.57	2.36	3.14	4.72	6.29	9.43	12.58	15.72
.41	7/8	.80	1.59	2.39	3.18	4.78	6.37	9.55	12.74	15.92
.42	5	.81	1.61	2.42	3.22	4.83	6.44	9.67	12.89	16.11
.43	1 1/8	.82	1.63	2.44	3.26	4.89	6.52	9.78	13.04	16.30
.44	1 1/4	.82	1.65	2.47	3.30	4.95	6.60	9.89	13.19	16.49
.45	3/8	.83	1.67	2.50	3.34	5.00	6.67	10.01	13.34	16.68
.46	1/2	.84	1.69	2.53	3.37	5.06	6.74	10.12	13.49	16.86
.47	5/8	.85	1.70	2.56	3.41	5.11	6.82	10.22	13.63	17.04
.48	3/4	.86	1.72	2.58	3.44	5.17	6.89	10.33	13.78	17.22
.49	7/8	.87	1.74	2.61	3.48	5.22	6.96	10.44	13.92	17.40

DISCHARGE TABLE IN SECOND FEET FOR STANDARD SUBMERGED ORIFICE—Continued

EFFECTIVE HEAD		AREA OF ORIFICE IN SQUARE FEET								
In feet	In inches	1/4	1/2	3/4	1	1 1/2	2	3	4	5
.50	6	.88	1.76	2.64	3.52	5.27	7.03	10.55	14.06	17.58
.51	5/8	.89	1.78	2.66	3.55	5.32	7.10	10.65	14.20	17.75
.52	1/2	.90	1.79	2.69	3.59	5.38	7.17	10.76	14.35	17.93
.53	3/4	.90	1.81	2.72	3.62	5.43	7.24	10.86	14.48	18.10
.54	1/2	.91	1.83	2.74	3.65	5.48	7.31	10.96	14.62	18.27
.55	5/8	.92	1.84	2.77	3.69	5.53	7.38	11.06	14.75	18.44
.56	3/4	.93	1.86	2.79	3.72	5.58	7.44	11.16	14.88	18.60
.57	5/8	.94	1.88	2.82	3.75	5.63	7.51	11.26	15.02	18.77
.58	7	.95	1.89	2.84	3.79	5.68	7.57	11.36	15.14	18.93
.59	1/2	.96	1.91	2.86	3.82	5.73	7.64	11.46	15.28	19.10
.60	3/4	.96	1.93	2.89	3.85	5.78	7.70	11.56	15.41	19.36
.61	5/8	.97	1.94	2.91	3.88	5.83	7.77	11.65	15.54	19.42
.62	1/2	.98	1.96	2.94	3.92	5.87	7.83	11.75	15.66	19.58
.64	5/8	.99	1.99	2.98	3.98	5.97	7.96	11.93	15.91	19.89
.65	3/4	1.00	2.01	3.01	4.01	6.01	8.02	12.02	16.03	20.04
.66	5/8	1.01	2.02	3.03	4.05	6.07	8.09	12.14	16.18	20.24
.67	8	1.02	2.04	3.05	4.07	6.10	8.14	12.21	16.28	20.36
.69	1/4	1.03	2.06	3.10	4.13	6.20	8.26	12.39	16.52	20.64
.71	1/2	1.05	2.10	3.14	4.19	6.28	8.38	12.57	16.76	20.96
.73	3/4	1.06	2.12	3.19	4.25	6.37	8.50	12.74	16.99	21.24
.75	9	1.08	2.15	3.23	4.31	6.46	8.61	12.92	17.22	21.52
.80	5/8	1.11	2.22	3.34	4.45	6.67	8.90	13.34	17.79	21.24
.85	10 3/4	1.15	2.29	3.44	4.58	6.88	9.17	13.75	18.34	22.92
.90	3/4	1.18	2.36	3.54	4.72	7.07	9.43	14.15	18.86	23.58
.95	11 3/8	1.21	2.42	3.63	4.85	7.27	9.69	14.54	19.38	24.24
1.00	12	1.24	2.49	3.73	4.97	7.46	9.94	14.92	19.89	24.86
1.05	5/8	1.27	2.55	3.82	5.10	7.64	10.19	15.29	20.38	25.48
1.10	13 1/4	1.30	2.61	3.91	5.22	7.82	10.43	15.65	20.86	26.08
1.15	3/4	1.33	2.67	4.00	5.33	8.00	10.66	16.00	21.32	26.66
1.20	14 3/8	1.36	2.72	4.08	5.45	8.17	10.89	16.34	21.78	27.24
1.25	15	1.39	2.78	4.17	5.56	8.34	11.12	16.68	22.24	27.80
1.30	5/8	1.42	2.84	4.25	5.67	8.50	11.34	17.01	22.68	28.36
1.35	16 1/4	1.44	2.89	4.33	5.78	8.66	11.55	17.33	23.10	28.88
1.40	3/4	1.47	2.94	4.41	5.88	8.83	11.77	17.65	23.54	29.42
1.45	17 3/8	1.50	2.99	4.49	5.99	8.98	11.98	17.96	23.96	29.94
1.50	18	1.52	3.04	4.57	6.09	9.14	12.18	18.27	24.36	30.44
1.60	19 1/4	1.57	3.14	4.72	6.29	9.44	12.58	18.87	25.16	31.44
1.70	20 3/8	1.62	3.24	4.86	6.48	9.73	12.97	19.45	25.94	32.42
1.80	21 3/8	1.67	3.34	5.00	6.67	10.01	13.34	20.02	26.68	33.36
1.90	22 3/4	1.71	3.43	5.14	6.85	10.28	13.71	20.56	27.42	34.28
2.00	24	1.76	3.52	5.27	7.03	10.55	14.06	21.10	28.12	35.16
3.00	36	.....	4.31	6.46	8.62	12.93	17.24	25.86	34.48	43.10
4.00	48	.....	4.96	7.44	9.92	14.88	19.84	29.76	39.68	49.60
5.00	60	.....	5.55	8.32	11.10	16.65	22.20	33.30	44.40	55.60
6.00	72	.....	.....	9.12	12.16	18.24	24.32	36.48	48.64	60.80
7.00	84	.....	.....	9.86	13.14	19.72	26.28	39.42	52.56	65.70
8.00	96	.....	.....	10.56	14.08	21.12	28.16	42.24	56.32	70.40
9.00	108	.....	.....	11.20	14.94	22.40	29.88	44.82	59.76	74.70
10.00	120	.....	.....	11.80	15.74	23.60	31.48	47.22	62.96	78.70

TABLE OF FREE-FLOW DISCHARGE FOR IMPROVED VENTURI FLUMES

Gage reading (Ha) inches	Gage reading (Ha) feet	Discharge in Cubic Feet per Second								
		WIDTH OF CREST								
		6 inches	1 foot	2 feet	3 feet	4 feet	5 feet	6 feet	7 feet	8 feet
1 1/4	0.10	0.05	.....	.....	.....	.....	.....	.....	.....	.....
3/8	.11	.06	.....	.....	.....	.....	.....	.....	.....	.....
1/2	.12	.07	.....	.....	.....	.....	.....	.....	.....	.....
5/8	.14	.09	.....	.....	.....	.....	.....	.....	.....	.....
3/4	.15	.10	.....	.....	.....	.....	.....	.....	.....	.....
7/8	.16	.11	.....	.....	.....	.....	.....	.....	.....	.....
2	.17	.12	.....	.....	.....	.....	.....	.....	.....	.....
1 1/8	.18	.14	.....	.....	.....	.....	.....	.....	.....	.....
1 1/4	.19	.15	.....	.....	.....	.....	.....	.....	.....	.....
3/8	.20	.16	.35	.66	.97	1.26	.....	.....	.....	.....
1/2	.21	.18	.37	.71	1.04	1.36	.....	.....	.....	.....
5/8	.22	.19	.40	.77	1.12	1.47	.....	.....	.....	.....
3/4	.23	.20	.43	.82	1.20	1.58	.....	.....	.....	.....
7/8	.24	.22	.46	.88	1.28	1.69	.....	.....	.....	.....
3	.25	.23	.49	.93	1.37	1.80	2.22	2.63	.....	.....
1 1/8	.26	.25	.51	.99	1.46	1.91	2.36	2.80	.....	.....
1 1/4	.27	.26	.54	1.05	1.55	2.03	2.50	2.97	.....	.....
3/8	.28	.28	.58	1.11	1.64	2.15	2.65	3.15	.....	.....
1/2	.29	.29	.61	1.18	1.73	2.27	2.70	3.33	.....	.....
5/8	.30	.31	.64	1.24	1.82	2.39	2.96	3.52	4.08	4.62
3/4	.31	.32	.68	1.30	1.92	2.52	3.12	3.71	4.30	4.88
7/8	.32	.34	.71	1.37	2.02	2.65	3.28	3.90	4.52	5.13
4	.33	.36	.74	1.44	2.12	2.78	3.44	4.10	4.75	5.39
1 1/8	.34	.38	.77	1.50	2.22	2.92	3.61	4.30	4.98	5.66
1 1/4	.35	.39	.80	1.57	2.32	3.06	3.88	4.50	5.22	5.93
3/8	.36	.41	.84	1.64	2.42	3.19	3.95	4.71	5.46	6.20
1/2	.37	.43	.88	1.72	2.53	3.34	4.13	4.92	5.70	6.48
5/8	.39	.47	.95	1.86	2.75	3.62	4.49	5.35	6.20	7.05
3/4	.40	.48	.99	1.93	2.86	3.77	4.68	5.57	6.46	7.34
7/8	.41	.50	1.03	2.01	2.97	3.92	4.86	5.80	6.72	7.64
5	.42	.52	1.07	2.09	3.08	4.07	5.05	6.02	6.98	7.94
1 1/8	.43	.54	1.11	2.16	3.20	4.22	5.24	6.25	7.25	8.24
1 1/4	.44	.56	1.15	2.24	3.32	4.38	5.43	6.48	7.52	8.55
3/8	.45	.58	1.19	2.32	3.44	4.54	5.63	6.72	7.80	8.87
1/2	.46	.61	1.23	2.40	3.56	4.70	5.83	6.96	8.08	9.19
5/8	.47	.63	1.27	2.48	3.68	4.86	6.03	7.20	8.36	9.51
3/4	.48	.65	1.31	2.57	3.80	5.03	6.24	7.44	8.65	9.84
7/8	.49	.67	1.35	2.65	3.92	5.20	6.45	7.69	8.94	10.17

TABLE OF FREE-FLOW DISCHARGE FOR IMPROVED VENTURI FLUMES

Gage read- ing (Ha) inches	Gage read- ing (Ha) feet	Discharge in Cubic Feet per Second								
		WIDTH OF CREST								
		6 inches	1 foot	2 feet	3 feet	4 feet	5 feet	6 feet	7 feet	8 feet
6	0.50									
	$\frac{1}{8}$	.51	.71	1.44	2.82	4.18	5.53	6.87	8.20	9.53
	$\frac{1}{4}$	.52	.73	1.48	2.90	4.31	5.70	7.09	8.46	9.83
	$\frac{3}{8}$	.53	.76	1.52	2.99	4.44	5.88	7.30	8.72	10.14
	$\frac{1}{2}$	.54	.78	1.57	3.08	4.57	6.05	7.52	8.98	10.45
	$\frac{5}{8}$	.55	.80	1.62	3.17	4.70	6.23	7.74	9.25	10.76
	$\frac{3}{4}$	.56	.82	1.66	3.26	4.84	6.41	7.97	9.52	11.07
	$\frac{7}{8}$	.57	.85	1.70	3.35	4.98	6.59	8.20	9.79	11.39
7	.58	.87	1.75	3.44	5.11	6.77	8.43	10.07	11.71	13.33
	$\frac{1}{8}$	.59	.89	1.80	3.53	5.25	6.96	8.66	10.35	12.03
	$\frac{1}{4}$	.60	.92	1.84	3.62	5.39	7.15	8.89	10.63	12.36
	$\frac{3}{8}$	.61	.94	1.88	3.72	5.53	7.34	9.13	10.92	12.69
	$\frac{1}{2}$	.62	.97	1.93	3.81	5.68	7.53	9.37	11.20	13.02
	$\frac{5}{8}$	.64	1.02	2.03	4.01	5.97	7.91	9.85	11.78	13.70
	$\frac{3}{4}$	.65	1.04	2.08	4.11	6.12	8.11	10.10	12.08	14.05
	$\frac{7}{8}$	.66	1.07	2.13	4.20	6.26	8.31	10.34	12.38	14.40
8	.67	1.10	2.18	4.30	6.41	8.51	10.59	12.68	14.75	16.81
	$\frac{1}{8}$	.68	1.12	2.23	4.40	6.56	8.71	10.85	12.98	15.10
	$\frac{1}{4}$	.69	1.15	2.28	4.50	6.71	8.91	11.10	13.28	15.46
	$\frac{3}{8}$	.70	1.17	2.33	4.60	6.86	9.11	11.36	13.59	15.82
	$\frac{1}{2}$	.71	1.20	2.38	4.70	7.02	9.32	11.62	13.90	16.18
	$\frac{5}{8}$	.72	1.23	2.43	4.81	7.17	9.53	11.88	14.22	16.55
	$\frac{3}{4}$	.73	1.26	2.48	4.91	7.33	9.74	12.14	14.53	16.92
	$\frac{7}{8}$	.74	1.28	2.53	5.02	7.49	9.95	12.40	14.85	17.29
9	.75	1.31	2.58	5.12	7.65	10.16	12.67	15.17	17.66	20.14
	$\frac{1}{8}$	.76	1.34	2.63	5.23	7.81	10.38	12.94	15.49	18.04
	$\frac{1}{4}$	.77	1.36	2.68	5.34	7.97	10.60	13.21	15.82	18.42
	$\frac{3}{8}$	.78	1.39	2.74	5.44	8.13	10.81	13.48	16.15	18.81
	$\frac{1}{2}$	.79	1.42	2.80	5.55	8.30	11.03	13.76	16.48	19.20
	$\frac{5}{8}$	.80	1.45	2.85	5.66	8.46	11.25	14.04	16.81	19.59
	$\frac{3}{4}$	.81	1.48	2.90	5.77	8.63	11.48	14.32	17.15	19.99
	$\frac{7}{8}$	.82	1.50	2.96	5.88	8.79	11.70	14.60	17.49	20.39
10	.83	1.53	3.02	6.00	8.96	11.92	14.88	17.83	20.79	23.72
	$\frac{1}{8}$	.84	1.56	3.07	6.11	9.13	12.15	15.17	18.17	21.18
	$\frac{1}{4}$	.85	1.59	3.12	6.22	9.30	12.38	15.46	18.52	21.58
	$\frac{3}{8}$	.86	1.62	3.18	6.33	9.48	12.61	15.75	18.87	21.99
	$\frac{1}{2}$	.87	1.65	3.24	6.44	9.65	12.84	16.04	19.22	22.40
	$\frac{5}{8}$	.89	1.71	3.35	6.68	10.00	13.31	16.62	19.93	23.24

TABLE OF FREE-FLOW DISCHARGE FOR IMPROVED VENTURI FLUMES

Gage reading (Ha) inches	Gage reading (Ha) feet	Discharge in Cubic Feet per Second								
		WIDTH OF CREST								
		6 inches	1 foot	2 feet	3 feet	4 feet	5 feet	6 feet	7 feet	8 feet
10 3/4	0.90	1.74	3.41	6.80	10.17	13.55	16.92	20.29	23.66	27.02
7/8	.91	1.77	3.46	6.92	10.35	13.79	17.22	20.65	24.08	27.50
11	.92	1.81	3.52	7.03	10.52	14.03	17.52	21.01	24.50	27.99
1/8	.93	1.84	3.58	7.15	10.71	14.27	17.82	21.38	24.93	28.48
1/4	.94	1.87	3.64	7.27	10.89	14.51	18.13	21.75	25.36	28.97
3/8	.95	1.90	3.70	7.39	11.07	14.76	18.44	22.12	25.79	29.47
1/2	.96	1.93	3.76	7.51	11.26	15.00	18.75	22.49	26.22	29.97
5/8	.97	1.97	3.82	7.63	11.44	15.25	19.06	22.86	26.66	30.48
3/4	.98	2.00	3.88	7.75	11.63	15.50	19.37	23.24	27.10	30.98
7/8	.99	2.03	3.94	7.88	11.82	15.75	19.68	23.62	27.55	31.49
12	1.00	.....	4.00	8.00	12.00	16.00	20.00	24.00	28.00	32.00
1/8	1.01	.....	4.06	8.12	12.19	16.25	20.32	24.38	28.45	32.52
1/4	1.02	.....	4.12	8.25	12.38	16.51	20.64	24.77	28.90	33.04
3/8	1.03	.....	4.18	8.38	12.57	16.76	20.96	25.16	29.36	33.56
1/2	1.04	.....	4.25	8.50	12.76	17.02	21.28	25.55	29.82	34.08
5/8	1.05	.....	4.31	8.63	12.96	17.28	21.61	25.94	30.28	34.61
3/4	1.06	.....	4.37	8.76	13.15	17.54	21.94	26.34	30.74	35.14
7/8	1.07	.....	4.43	8.88	13.34	17.80	22.27	26.74	31.20	35.68
13	1.08	.....	4.50	9.01	13.54	18.07	22.60	27.13	31.67	36.22
1/8	1.09	.....	4.56	9.14	13.74	18.34	22.93	27.53	32.14	36.76
1/4	1.10	.....	4.62	9.27	13.93	18.60	23.26	27.94	32.62	37.30
3/8	1.11	.....	4.68	9.40	14.13	18.86	23.60	28.35	33.10	37.84
1/2	1.12	.....	4.75	9.54	14.33	19.13	23.94	28.76	33.58	38.39
5/8	1.14	.....	4.88	9.80	14.73	19.67	24.62	29.58	34.54	39.50
3/4	1.15	.....	4.94	9.94	14.94	19.94	24.96	30.00	35.02	40.06
7/8	1.16	.....	5.01	10.07	15.14	20.22	25.31	30.41	35.51	40.62
14	1.17	.....	5.08	10.20	15.34	20.50	25.66	30.83	36.00	41.18
1/8	1.18	.....	5.15	10.34	15.55	20.78	26.01	31.25	36.50	41.75
1/4	1.19	.....	5.21	10.48	15.76	21.05	26.36	31.68	37.00	42.32
3/8	1.20	.....	5.28	10.61	15.96	21.33	26.71	32.10	37.50	42.89
1/2	1.21	.....	5.34	10.75	16.17	21.61	27.06	32.53	38.00	43.47
5/8	1.22	.....	5.41	10.89	16.38	21.90	27.42	32.96	38.50	44.05
3/4	1.23	.....	5.48	11.03	16.60	22.18	27.78	33.39	39.00	44.64
7/8	1.24	.....	5.55	11.17	16.81	22.47	28.14	33.82	39.51	45.22
15	1.25	.....	5.62	11.31	17.02	22.75	28.50	34.26	40.02	45.80
1/8	1.26	.....	5.69	11.45	17.23	23.04	28.86	34.70	40.54	46.38
1/4	1.27	.....	5.76	11.59	17.44	23.33	29.22	35.14	41.05	46.97
3/8	1.28	.....	5.82	11.73	17.66	23.62	29.59	35.58	41.57	47.57
1/2	1.29	.....	5.89	11.87	17.88	23.92	29.96	36.02	42.09	48.17

TABLE OF FREE-FLOW DISCHARGE FOR IMPROVED VENTURI FLUMES

Gage read- ing (Ha) inches	Gage read- ing (Ha) feet	Discharge in Cubic Feet per Second								
		WIDTH OF CREST								
		1 foot	2 feet	3 feet	4 feet	5 feet	6 feet	7 feet	8 feet	
15	$\frac{5}{8}$	1.30	5.96	12.01	18.10	24.21	30.33	36.47	42.62	48.78
	$\frac{3}{4}$	1.31	6.03	12.16	18.32	24.50	30.70	36.92	43.14	49.38
	$\frac{7}{8}$	1.32	6.10	12.30	18.54	24.80	31.07	37.37	43.67	49.99
16	1.33	6.18	12.44	18.76	25.10	31.44	37.82	44.20	50.60	
	$\frac{1}{8}$	1.34	6.25	12.59	18.98	25.39	31.82	38.28	44.73	51.22
	$\frac{1}{4}$	1.35	6.32	12.74	19.20	25.69	32.20	38.74	45.26	51.84
	$\frac{3}{8}$	1.36	6.39	12.89	19.42	25.99	32.58	39.20	45.80	52.46
	$\frac{1}{2}$	1.37	6.46	13.03	19.64	26.30	32.96	39.66	46.35	53.08
	$\frac{5}{8}$	1.39	6.60	13.33	20.10	26.90	33.72	40.58	47.44	54.33
	$\frac{3}{4}$	1.40	6.68	13.48	20.32	27.21	34.11	41.05	47.99	54.95
	$\frac{7}{8}$	1.41	6.75	13.63	20.55	27.52	34.50	41.52	48.54	55.58
17	1.42	6.82	13.78	20.78	27.82	34.89	41.99	49.09	56.22	
	$\frac{1}{8}$	1.43	6.89	13.93	21.01	28.18	35.28	42.46	49.64	56.86
	$\frac{1}{4}$	1.44	6.97	14.08	21.24	28.45	35.67	42.94	50.20	57.50
	$\frac{3}{8}$	1.45	7.04	14.23	21.47	28.76	36.06	43.42	50.76	58.14
	$\frac{1}{2}$	1.46	7.12	14.38	21.70	29.07	36.46	43.89	51.32	58.78
	$\frac{5}{8}$	1.47	7.19	14.54	21.94	29.38	36.86	44.37	51.88	59.43
	$\frac{3}{4}$	1.48	7.26	14.69	22.17	29.70	37.26	44.85	52.45	60.08
	$\frac{7}{8}$	1.49	7.34	14.85	22.41	30.02	37.66	45.34	53.02	60.74
18	1.50	7.41	15.00	22.64	30.34	38.06	45.82	53.59	61.40	
	$\frac{1}{8}$	1.51	7.49	15.16	22.88	30.66	38.46	46.31	54.16	62.06
	$\frac{1}{4}$	1.52	7.57	15.31	23.12	30.98	38.87	46.80	54.74	62.72
	$\frac{3}{8}$	1.53	7.64	15.47	23.36	31.30	39.28	47.30	55.32	63.38
	$\frac{1}{2}$	1.54	7.72	15.62	23.60	31.63	39.68	47.79	55.90	64.04
	$\frac{5}{8}$	1.55	7.80	15.78	23.84	31.95	40.09	48.28	56.48	64.71
	$\frac{3}{4}$	1.56	7.87	15.94	24.08	32.27	40.51	48.78	57.06	65.38
	$\frac{7}{8}$	1.57	7.95	16.10	24.32	32.60	40.92	49.28	57.65	66.06
19	1.58	8.02	16.26	24.56	32.93	41.33	49.78	58.24	66.74	
	$\frac{1}{8}$	1.59	8.10	16.42	24.80	33.26	41.75	50.28	58.83	67.42
	$\frac{1}{4}$	1.60	8.18	16.58	25.05	33.59	42.17	50.79	59.42	68.10
	$\frac{3}{8}$	1.61	8.26	16.74	25.30	33.92	42.59	51.30	60.02	68.79
	$\frac{1}{2}$	1.62	8.34	16.90	25.54	34.26	43.01	51.81	60.62	69.48
	$\frac{5}{8}$	1.64	8.49	17.22	26.04	34.93	43.86	52.83	61.82	70.86
	$\frac{3}{4}$	1.65	8.57	17.35	26.29	35.26	44.28	53.34	62.42	71.56
	$\frac{7}{8}$	1.66	8.65	17.55	26.54	35.60	44.70	53.86	63.03	72.26
20	1.67	8.73	17.72	26.79	35.94	45.13	54.38	63.64	72.96	
	$\frac{1}{8}$	1.68	8.81	17.88	27.04	36.28	45.56	54.90	64.25	73.66
	$\frac{1}{4}$	1.69	8.89	18.04	27.30	36.62	46.00	55.42	64.86	74.37

CHAPTER VIII

Office Engineering and Miscellaneous General Office Work

A considerable volume of office engineering work has been accomplished in connection with the various branches of activities under supervision of the State Engineer.

In addition to many maps and drawings prepared in connection with adjudication proceedings, a complete set of standard maps was prepared during the biennium 1927-1928 for the purpose of showing the salient data and general form required by the water law and the regulations of the State Engineer in the preparation of maps for submission in connection with appropriation of water. This set of six maps was designed primarily for the use and instruction of licensed State water right surveyors, to whom it was distributed in the form of bound blue print folders. The continued use of these maps has resulted in a standardization of maps submitted, not only as to general form and get-up but also as to presentation of data.

In conjunction with the standard maps a pamphlet was prepared and printed, covering in detail the regulations of the State Engineer and requirements of the water law concerning the preparation of maps to be submitted in connection with water right filings.

In addition, four other pamphlets were prepared and printed embracing respectively the Water Laws of Nevada, revised and brought up-to-date; the Nevada Irrigation District Act; the Nevada Drainage District Act, and the Nevada Improvement District Act. All of these pamphlets were distributed throughout the State to attorneys, engineers, county agents, water users and other persons directly or indirectly interested in legislation affecting water and water rights.

A State range map which was started in 1927 has been brought up-to-date and at the present time approximately 225 individual stock range areas have been included in this map.

Much work has been accomplished in connection with preparation and assembling data incident to compiling Abstracts of Claims and Orders of Determination in adjudication proceedings. In the matter of the Little Humboldt River adjudication alone the entire time of one man for several months was spent in holding hearings and in preparing data and exhibits for filing with the court. A special report of distribution activities on the Humboldt River is in process of completion by an irrigation engineer who was employed for this purpose. Excerpts from this report are published in this Biennial Report.

The office engineering force is frequently called upon to aid in the computation and solution of technical water problems by water users throughout the State. It has been the policy to assist and instruct water users generally in the solution of hydraulic and irrigation problems, construction of structures and measuring devices.

Much of the work of the engineering force consists of careful examination and checking of the maps in support of water right filings submitted to the office. Five hundred and forty-two maps in support of applications; approximately 120 maps in support of proofs of beneficial use under permits, and 33 maps in support of proofs of appropriation were examined and checked during the biennium.

Compilation of crop census reports, working up hydrographic data

and preparation of seasonal reports on distribution of water on the Humboldt River and other streams have occupied the office time of the supervising water commissioners in the interim between irrigation seasons.

In addition to the foregoing, office engineering and general miscellaneous office work has embraced the study of transcripts of testimony taken during the hearings on water rights and preparation of resultant findings; preparation of reports resulting from field investigations; extensive study of stock watering and range problems; partial preparation of a State Engineer's Handbook for the use of irrigators, water commissioners and others; inauguration of a personnel record of employees; continued reorganization of the office filing system; supplying information and data on water filings for the general public; preparation and filing of permits and certificates; filing of proofs and applications for water rights; preparation of certified copies of documental records, and investigation of complaints over distribution of water.

Giving prompt and detailed attention to daily routine office correspondence has occupied a great deal of time. The magnitude of this work can best be judged by the volume of mail leaving the office. During the past two years 1,179 registered articles have been sent out from this office, in addition to approximately 19,450 articles of regular mail.

Many other activities and accomplishments could be listed; however, it is believed the foregoing will serve to give some conception of the volume of office engineering and miscellaneous general office work accomplished during the biennium.

CHAPTER IX Cooperative Work

U. S. GEOLOGICAL SURVEY, WATER RESOURCES BRANCH

During the biennium stream measurement work has been continued by the United States Geological Survey under a cooperative agreement with the State Engineer. Elsewhere in this report will be found a detail account of this work by Mr. A. B. Purton, District Engineer, United States Geological Survey.

It is the Federal policy to cooperate with State and other non-Federal governmental agencies on a dollar-for-dollar basis in water resources investigations, consequently the value and magnitude of accruing benefits to the State are directly proportional to the amount of money appropriated by the State.

The rapidly increasing use of water in Nevada has created an urgent need for more complete and extensive hydrographic data, without which it is difficult to properly adjudicate water rights or to distribute water successfully after rights have been adjudicated.

A study of storage possibilities on the various streams cannot be undertaken until a comprehensive survey is made of the run-off over a period of several years.

Nevada is one of the few States in the arid and semiarid west whose water resources have not been fully determined and the flow of whose streams has not been extensively investigated and recorded.

The value of this work in cooperation with the Government cannot be overestimated.

Tables of run-off of Nevada streams are to be found in the back of this Biennial Report. Please note that for the years up to and including 1910, the calendar year is used in these computations. Beginning with the year 1911 the irrigation year is used in most instances or from October 1 to September 30 of each year.

COOPERATIVE SNOW SURVEYS

Snow survey work has been carried on under State direction and support in cooperation with the State of California and various water interests. The Nevada system, conceived and evolved by Dr. J. E. Church, Director, has been so successful in forecasting, far in advance, water supply for irrigation and power purposes that it has been widely adopted, not only in this but in foreign countries.

The value of water and its application in Nevada is such as to justify the permanent adoption and continuance of snow surveys under liberal financial support from the State.

STREAM MEASUREMENT WORK IN COOPERATION WITH UNITED STATES GEOLOGICAL SURVEY

By A. B. PURTON, *District Engineer*

Stream-measurement work has been continued during the biennium by the United States Geological Survey under the usual cooperative agreement with the State Engineer.

The data obtained as a result of these cooperative investigations are published in the annual water supply papers of the Geological Survey. The United States has been divided into twelve primary drainage

basins and, for convenience, the annual progress reports on stream measurements are published in fourteen water supply papers. Each of these papers contains the data for one primary drainage basin, with the exception of the Columbia River basin, for which the data are published in three water supply papers. Nevada is included in the Great Basin, Colorado River, and Columbia River primary drainage basins. The stream-flow data for this State appear in the water supply papers for these basins.

Although the problems incident to the development and use of water supplies of the State are continually increasing, the stream-gaging work, instead of being able to keep ahead of developments, has been unable even to keep pace with the need for stream-flow data. Much of the work carried on has been possible only through cooperation extended by irrigation districts. This work, while important, is largely confined to areas where development has progressed to a considerable degree and the real pioneering work for providing data upon which to base further or new developments has suffered for lack of funds to establish new stations or even maintain a number of stations that should not be neglected.

In the appropriations for the fiscal year ending June 30, 1930, the Congress definitely recognized the cooperative feature of the stream-gaging work of the Geological Survey, and provided funds to meet State cooperation. The appropriation bill for 1931 includes funds to meet all anticipated State cooperation and the general stream-measurement work can be carried on cooperatively on a 50-50 basis.

When the Nevada Assembly four years ago reduced the State appropriation for cooperative stream gaging, the modest program then in operation for obtaining an inventory of the water resources of the State was seriously handicapped. The stream-gaging program since then has been confined to an effort to continue as many stations as possible because interrupted records lose a great deal of their value. As a consequence, some stations have necessarily been discontinued and at others the equipment is antiquated and in sore need of replacement or repairs.

The water resources of the State of Nevada are certainly of sufficient importance to warrant a rather careful determination of at least the major sources of supply. Present and prospective users of water can proceed with confidence only when comprehensive data are available as to the flow of water. Reasonably safe determinations of dependable flow can be based only upon continuous and extended past records. Each year of record adds to the reliability with which these determinations can be made.

The appended list of stations shows the points at which records are now available. Many of these records are of comparatively short duration and it would seem that an effort should be made to take advantage of the recognition accorded this work by Congress and a more comprehensive and better equipped stream-gaging program attempted.

Acknowledgments are due particularly to the United States Indian Irrigation Service for financial assistance in work in the Owyhee River Basin and to the Walker River Irrigation District and the Humboldt River water users for valuable cooperation at stations in those basins.

Records for the station on Carson River, at Fort Churchill, have been furnished by the Newlands Project.

Expenditures during the biennium, January 1, 1929, to December 31, 1930, are shown in the following table:

U. S. Geological Survey.....	\$2,416.50
U. S. Indian Service.....	553.04
State of Nevada.....	2,489.81
Total	\$5,459.35

*Prior to July 1, 1930; does not include cost at Washington of general supervision and review, editing, and printing of records.

On December 31, 1930, there were being maintained on Nevada streams the following stations:

Humboldt River at Palisade.
 Humboldt River near Oreana.
 South Fork of Humboldt River near Elko.
 Martin Creek near Paradise Valley.
 Cottonwood Creek near Paradise Valley.
 H. L. I. L. & P. Co's. feeder canal near Mill City.
 H. L. I. L. & P. Co's. outlet canal near Humboldt.
 Carson River near Fort Churchill.*
 East Carson near Gardnerville.
 Owyhee River at Mountain City.†
 Walker River near Wabuska.*†
 Walker River at Schurz.
 West Walker near Coleville, Calif.‡
 West Walker near Wellington.‡
 East Walker near Bridgeport, Calif.‡

*Complete records for publication furnished by United States Bureau of Reclamation.

†Financial assistance rendered by United States Indian Service.

‡Maintained in cooperation with Walker River Irrigation District.

NOTE—Tables of run-off of Nevada streams are to be found in the back of this Biennial Report.

SNOW SURVEYS

By H. P. BOARDMAN, *Chairman Forecast Committee, Nevada Cooperative Snow Surveys*

Snow surveys were conducted much as usual in 1929 and 1930 on the Truckee, Tahoe, Carson and Walker River watersheds. Both years were far below normal in quantity of snowfall and stream run-off. A table is herewith given showing a comparison of the predicted April-July run-off of streams and rise of Lake Tahoe with the actual results which followed, a discussion of which will be found following the table:

FORECAST OF AVAILABLE WATER SUPPLY BASED ON SNOW SURVEY DATA

Streams—April-July Run-Off

Streams	Acres	Predicted Results		Actual Run-off as determined by observations		Remarks
		Based on April Forecast	Per cent of normal	Per cent of normal	Per cent of normal	
<i>Season of 1929---</i>						
Truckee River at Iceland.....	165,000	50.7	39.2	137,852	39.2	Flow in the Truckee exclusive of Lake Tahoe
Carson River at Clifton.....	65,000	28.2	23.0	53,064	23.0	Flow at Clifton, 5 miles below Dayton
West Walker River at Coleville.....	115,000	60.2	47.4	90,640	47.4	Flow above practically all diversions
East Walker River at Bridgeport Dam..	40,000	56.9	27.1	*19,056	27.1	Flow from reservoir, corrected for increase or decrease in storage; greatly affected by losses in Bridgeport Valley
<i>Season of 1930---</i>						
Truckee River at Iceland.....	175,000	53.7	59.7	194,296	59.7	Same remarks as above
Carson River at Clifton.....	110,000	47.8	44.1	101,386	44.1	
West Walker River at Coleville.....	110,000	57.6	57.9	110,600	57.9	
East Walker River at Bridgeport Dam..	31,000	44.1	21.6	15,210	21.6	

*About 3,000 acre feet held back in Twin Lakes making total yield of watershed about 22,000 or 31.3%.

Lake Tahoe Rise, April 1 to High Water

Season	Predicted Results		Actual Results		Date
	Elevation April 1	Rise to high water	Elevation	Rise to high water	
Season of 1929.....	6,224.01	.99	6,225.00	.71	June 20
Season of 1930.....	6,223.69	1.01	6,224.70	1.01	June 20
			24.10	24.10	May 1
			24.50	24.50	June 1
			24.62	24.62	July 1
			24.39	24.39	Aug. 1
			23.98	23.98	Sept. 1
			23.59	23.59	Oct. 1

The Results for 1929

The actual yield in 1929 was considerably less than was forecast from snow surveys.

The Truckee and West Walker discharges fell below predictions by 10.5% and 12.8% of normal. I have been unable to discover any unusual conditions which will account for the discrepancies but they are not excessive.

The Carson River came closer to the prediction, falling only 5.2% of normal below the forecast.

The East Walker fell 29.8% of normal below the forecast. Too little allowance was evidently made for the seepage and evaporation losses of Bridgeport Valley.

The rise of Lake Tahoe after April 1 was .71 ft. which is .28 ft. or 16.7% of normal below the predicted rise.

The water content in the snow at Tahoe City February 6 was more than 8 inches while the same for April 3 was about 3 inches, indicating a considerable loss by melting in the interim. Too little weight was attached to this loss when making the forecast. A new course has been established, at altitude 6,400 feet, across the river and about one mile south of the town of Truckee, which should give a good check on the Tahoe City courses and help greatly in future estimates of early spring melting losses.

The Results for 1930

The run-off checked much better with the predictions in 1930 than in 1929 with the exception of the East Walker.

The Truckee River exclusive of Tahoe yielded 194,296 acre feet or 5.9% of normal above the prediction.

The Carson at Clifton discharged 101,586 acre feet or 3.7% of normal below the prediction.

The West Walker yielded 110,600 acre feet, or .3% of normal above the forecast of 110,000 acre feet, but the East Walker at Bridgeport dam again fell far below the forecast, yielding only 15,210 acre feet or 22.5% of normal below the prediction of 31,000 acre feet. I do not know how much storage was held back in Twin Lakes in the summer of 1930.

If pipes could be set in the ground at several well-selected points in Bridgeport Valley and the ground water level fluctuations recorded, these data might, in a few years' time, aid greatly in predicting the discharge at the dam.

The rise of Lake Tahoe to high water checked the forecast exactly in amount and within five days in time. The actual elevations of the lake surface at the first of each month following April 1 checked the predicted elevations within .02 ft. or 1/4-inch until September 1. Pumping began August 20 and ceased November 17, 1930. The total discharged from the lake by the pumps during this time was 25,190 acre feet, equivalent to .204 ft. elevation off the surface of the lake, but had the pumps not been installed the natural discharge during that same period would have been about 4,360 acre feet, equivalent to .035 ft. depth, so the total decrease in elevation of the lake caused by the 1930 pumping was the difference, or .169 ft., which equals 2 inches depth.

The elevation predicted for October 1 was 6,223.59; actual 6,223.53,

but if the pumps had not been installed it would have been 6,223.67, or 1 inch higher than predicted.

CALIFORNIA SNOW SURVEYS

The word "cooperative" in Nevada Cooperative Snow Surveys has a new significance now since the State of California has undertaken snow surveying in earnest and on a large scale, covering the Sierra range for the full length of the State.

It is a compliment to Dr. Church and the Nevada snow survey organization that California has adopted our system and methods and is cooperating in a very practical and generous way.

California is paying the cost of the regular April 1 surveys of the following snow courses which had been part of the annual Nevada snow survey program: Courses at Webber Lake and Webber Peak; Ward Creek, west of Tahoe Tavern; Rubicon Peak west of Tahoe. These are considered as crest stations and are of prime importance to both States, but continue to be surveyed under our direction though they lie within the State of California. In addition, to cover the cost of further crest stations to the south, they pay one-half of the cost of the April 1 surveys of the following: The whole group of snow courses near the south end of Tahoe, from Daggett's Pass (Kingsbury Grade) to Lake Lucile, southwest of Fallen Leaf Lake; the group of courses in the vicinity of Blue Lakes and Burnside Lake in and near the Carson basin; the whole series of courses in both the East and West Walker basins.

They, meaning the California snow survey organization, have selected certain key snow courses where they have made monthly surveys, beginning with January 1. One of these groups is just west of Donner Summit in the South Yuba basin and these surveys, usually made by employees of the Pacific Gas and Electric Company, are now reported direct to the Sacramento office and copies promptly forwarded to us. Other key courses where they make monthly surveys are those at Blue Lakes which lie just over the divide west of the Carson basin.

As was mentioned in the last biennial report, much of the field equipment used by the Nevada Cooperative Snow Surveys organization belongs to California. They have generously permitted us to continue using what we absolutely needed but we have turned over to California what we could spare.

SCOPE OF THE FIELD WORK

The number of snow courses measured by the Nevada Cooperative Snow Surveyors is as follows:

Truckee Basin, exclusive of Tahoe.....	5
Tahoe Basin.....	18
Carson Basin.....	7
Walker Basin.....	8

The number of measurements for each of these courses is usually between fifteen and one hundred, most of the courses involving between twenty and forty measurements each.

The samples are taken at regular intervals, usually 50 feet apart, measured by tape. Record is made for each sample of the snow depth, depth of core and water content determined by weight.

HUMBOLDT BASIN

The main expense of snow surveying and forecasting for the Humboldt basin has been carried by other funds than those handled by the Nevada Cooperative Snow Surveys this biennium, and as Dr. J. E. Church had charge of that work he will render a report of it in a separate communication. (This report has not been received to date and therefore cannot be included in this report.)

Dr. Church is in favor of treating that as a distinct project for the present because of difference in character of some of the problems involved and the relatively large expense necessary to properly organize and equip it.

Our expense for the Humboldt this biennium was \$40 for wages for Forest Ranger Snow Surveyors and \$50 for printing the 1929 forecast.

Needs of the Work

We are in need of considerable new equipment.

Many of the courses should be remarked and the ground cleared of brush and debris where samples are taken.

A shelter cabin is badly needed near the head of Hunter Creek for use of snow surveyors en route to the Big Meadows course about ten miles southwest of Reno. The round trip for this survey is too long for one day in a heavy winter or even in a light winter if the going is bad, due to storms encountered or soft snow underfoot.

More repairs are needed to the Mt. Rose cabins, especially the one at the summit.

Monthly winter progress surveys should be made at a number of the Nevada courses for which money has been lacking for several years past.

In a severe winter some of the surveys are more expensive than has been the case for the biennium of 1929-1930.

FINANCES

A tabular statement of receipts and expenditures is herewith given.

Some detail is lacking in the Walker basin statement. The custom has been for the chief snow surveyor at Bridgeport to furnish his own transportation and food supplies and also make one or more special trips, on his own time, to stock cabins in the fall, ready for the next spring's snow surveys, all this being covered by a higher rate of pay for actual snow survey time. This has not made the cost any higher than it should have been, considering that the trips are necessarily long and one of them quite hazardous.

The year 1930, the Walker River Irrigation District being especially desirous of having a March 1 survey to enable an early preliminary forecast, preferring not to make a cash contribution to the Snow Survey Fund, furnished one of their employees to take part in the survey and one of our Forecast Committee, Leigh Sanford, contributed cash to help make the March 1 survey possible.

The total paid by the Walker River Irrigation District for salary and expenses of their employee taking part in the snow surveys, which does not appear in the accompanying financial statement because not passing through the hands of the Nevada Cooperative Snow Surveys, amounted to \$199.61.

The Sierra Pacific Power Company, in addition to contributing

\$150 in cash, paid the following in salaries and expenses of their employees taking part in snow surveys:

1929.....	\$51.47
1930.....	131.74
	<hr/>
	\$183.21

This makes their total contribution for the biennium amount to \$331.21, besides considerable time of one member of the Forecast Committee, George G. Devore, and several other employees taking part in conferences.

The grand total expended, including these amounts handled by the Walker River Irrigation District and the Sierra Pacific Power Company, amounted to \$3,017.02.

STATEMENT OF FINANCES

RECEIPTS

Balance in First National Bank in Reno, January 1, 1929.....	\$91.10
State biennial appropriation.....	1,500.00
Truckee-Carson Irrigation District.....	200.00
Washoe County Water Conservation District.....	200.00
Sierra Pacific Power Company.....	150.00
Leigh Sanford.....	50.00
State of California, Snow Survey Cooperation.....	447.02
	<hr/>
Total	\$2,638.12

EXPENDITURES

<i>Actual Snow Surveys—</i>	
Truckee Basin—	
Transportation and miscellaneous expense.....	\$236.98
Tahoe Basin—	
Transportation and miscellaneous expense.....	417.61
Carson Basin—	
Transportation and miscellaneous expense.....	254.68
Walker Basin—	
Transportation and miscellaneous expense.....	396.38
Humboldt Basin—	
Wages	40.00
	<hr/>
Total of actual snow surveys.....	\$1,345.65
<i>Special Items—</i>	
Introducing California Snow Survey Personnel to Tahoe and Carson Snow Courses—	
Transportation and miscellaneous expense.....	\$111.55
Clearing and Remarking Tahoe Basin Snow Courses—	
Transportation and miscellaneous expense.....	95.70
Mt. Rose Cabin Repairs—	
Transportation and miscellaneous expense.....	70.30
Installing Weather Observation Shelter at Marlette Lake—	
Miscellaneous expense	77.00
Freel Peak Shelter Cabin—	
Materials, labor, miscellaneous.....	346.25
	<hr/>
Total	700.80
<i>Miscellaneous and Overhead—</i>	
Miscellaneous and overhead.....	\$587.75
	<hr/>
Grand total of expenditures.....	\$2,634.20
Unused balance of State appropriation.....	1.27
Balance on hand in First National Bank in Reno.....	2.65
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Total	\$2,638.12

FINANCIAL SUMMARY

	Actual costs 1929-1930	Budget estimate 1931-1932
<i>Actual Snow Surveys—</i>		
Transportation	\$253.49	
Meals and lodging	268.98	
Wages	1,206.00	
<i>Special Items—</i>		
Inspection trips with California personnel.....	111.55	\$150.00
Clearing and remarking snow courses.....	95.70	200.00
Repairs of cabins.....	70.30	100.00
Construction of new cabin.....	346.25	300.00
Repairs and installation of weather observation equip- ment	77.00	
<i>Miscellaneous and Overhead—</i>		
New equipment.....	51.40	175.00
Printing and forecasts.....	185.00	200.00
Stenography and clerical work.....	158.00	175.00
Miscellaneous supplies and incidentals.....	193.35	200.00
General supervision and working up forecasts.....		500.00
Totals	\$3,017.02	\$4,300.00

ESTIMATED RECEIPTS

From Nevada State appropriation.....	\$2,500.00
From irrigation districts and power companies.....	1,000.00
From California cooperation.....	800.00
	\$4,300.00

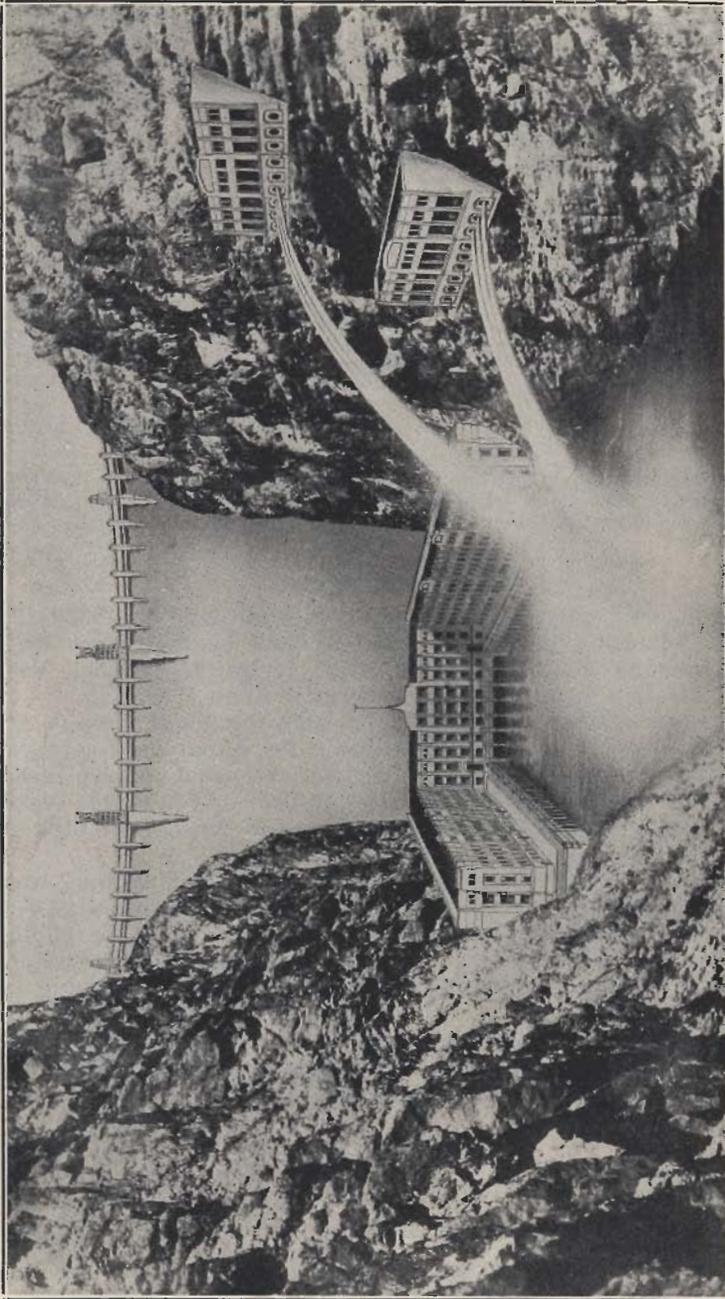
RECOMMENDATIONS

The financial summary gives total expenditures for 1929-1930, including payments and salaries and expenses by the Sierra Pacific Power Company and the Walker River Irrigation District, which were not handled by the Nevada Cooperative Snow Surveys.

The budget estimate for 1931-1932 calls for some increase in a number of items. The increased estimate for actual snow surveys is to care for anticipated increase in costs of the usual surveys because of hoped for heavier snowfall and, also, to provide for winter surveys of several courses and May 1 surveys of two or three of the high altitude courses.

The item to provide for "general supervision and working up of forecasts" is included for the first time, since there appears to be no good reason why this work should continue to be done for nothing. It involves a good deal of time, care and even responsibility when the importance of the forecasts is considered and if it is worth doing why not worth paying for?

The forecast committee recommends that the Legislature be respectfully asked to appropriate \$2,500 for the biennium 1931-1932, to be handled through the State Engineer's office.



ARTIST'S CONCEPTION OF HOOVER (BOULDER) DAM AND POWER PLANTS.
United States Reclamation Service Project. Estimated Date of Completion, 1937.

CHAPTER X

Related Activities of State Engineer

THE COLORADO RIVER DEVELOPMENT COMMISSION

The State Engineer was made a member of the Colorado River Commission of Nevada in January, 1927, and since that time has attended many conferences in Washington and other cities in an effort to advance and protect the sovereign rights of the State of Nevada in the development of the resources of the Colorado River.

The Biennial Report of this office for the years 1927 and 1928 contains a brief summary of the preliminary work carried on by the State Engineer during those years.

Renewed activity on the part of those interested in the construction of a dam on the Colorado River resulted in six of the seven western States, Colorado, New Mexico, Wyoming, Utah, California and Nevada, signing a compact or agreement in conformity with the Colorado River compact. After this compact was signed and the Boulder Dam Project Act passed it was necessary that the United States enter into firm contracts with purchasers of electrical power before the Act could become effective; said contracts assuring the United States that the revenue derived from the sale of developed power would return to the United States the government investment in the dam and power plants within a fifty-year period.

Contracts for lease of power privilege between the United States and the city of Los Angeles and the Southern California Edison Company, acting jointly, were signed, and on April 30, 1930, Secretary Wilbur sent a request for appropriation to the Bureau of Budget. On July 3, 1930, President Hoover signed the second deficiency bill, making \$10,660,000 available for construction work on the Boulder Dam. On July 5, 1930, the first contract was executed for initial work on the dam, and since that time the United States Reclamation Service has been very aggressive in speeding up the preliminary work which is necessary before contracts can be entered into for the construction of the dam and power plants.

The construction of the dam and power plant on the Colorado River will ultimately yield a return to the State of Nevada of over \$700,000 annually, according to the Secretary of the Interior, Ray Lyman Wilbur. The State Engineer has devoted a great deal of his time during the past biennium to the work incident to the beginning of actual construction.

EXPENSE AND RESULTS

The Colorado River Commission records show a total of \$33,113.31 expended during the period from March 28, 1927, to April 1, 1930, which includes all appropriations made by the Legislature during that time:

Appropriation and Expense

<i>Appropriations</i>	
Legislature, regular session, 1927.....	\$4,000.00
Legislature, special session, 1927.....	15,000.00
Legislature, regular session, 1929.....	4,113.31
Legislature, regular session, 1929.....	10,000.00
Total	\$33,113.31

Expenses

F. B. Balzar, expenses.....	\$328.25
Geo. W. Malone, expenses.....	11,950.72
Chas. P. Squires, expenses and per diem.....	4,709.22
Roy W. Martin, expenses and per diem.....	1,622.84
Ed. W. Clark, expenses and per diem.....	585.29
True Vencill, expenses.....	1,257.16
Stanley Palmer, expenses and \$150 engineering fee.....	278.85
H. W. Crozier, engineering fees and expenses.....	2,934.19
Thos. R. King, expenses.....	185.00
C. Jones, expenses.....	106.40
Colin G. Fink, expert testimony and expenses.....	132.26
Francis K. Weller, engineering fees.....	892.75
Engineering fees, miscellaneous.....	430.00
Printing and supplies.....	2,846.23
Telephone and telegraph.....	3,414.23
Stenographic service.....	2,339.92
Total	\$33,113.31

A large amount of private funds has been expended in addition to the above amounts.

The Boulder Dam Project Act as finally passed, including the power contracts, provides revenue for Arizona and Nevada in lieu of taxes and power to use for the development of the States. According to the Secretary of the Interior the revenue derived will amount to over \$700,000 to each State annually after the completion of the project, and each State can withdraw, if, as, and when wanted, up to 117,000 firm horsepower of the electrical energy for use in the State, paying cost at the switchboard when so withdrawn. It is thought that the use of this power will increase the taxable wealth of the State several millions of dollars.

When the State administration took over the work of the Colorado River Commission early in 1927 the then pending Swing-Johnson Bill, proposing to construct the Boulder Dam on the Colorado River, did not provide any revenue for the States of Arizona and Nevada nor power from the project to develop those States, but provided that the All-American Canal in Imperial Valley, costing \$38,500,000, should be paid for by power from the project in addition to the dam and power plant. Provision was later made for the lands benefited to underwrite the cost of the project.

By unanimous action of the Commission, early in 1927 it was agreed to make a thorough study of the Colorado River Set-Up, employing such assistance as found advisable, to determine the exact position the State should take relative to the pending legislation for the development of that river, so that our position would be found to be fair to all concerned and supported by the facts.

Accordingly a conference was called for the three Lower Basin States, Arizona, California and Nevada, in San Francisco, November 19 to December 16, 1927, at which time the power angle of the undertaking was thoroughly reviewed and a report subsequently issued for Nevada, definitely determining the effect of such development and making certain definite recommendations for the protection of our State and to aid the legislation by gaining the support, in so far as possible, of the Upper Basin States. The State Engineer acted as chairman of that conference.

The conference, in addition to the members of the Colorado River

Commissions of the three lower States, included such outstanding power experts as H. W. Crozier, Consulting Electrical Engineer, employed by our Commission; E. S. Scattergood, Chief Engineer of the Los Angeles Bureau of Power and Light, and L. S. Ready, former Engineer for the California Railroad Commission, employed by Los Angeles; Chas. Cragin, Chief Engineer of the Salt River Project, Arizona, and B. F. Jacobsen, Consulting Engineer of Los Angeles, employed by Arizona.

From the results of this conference a report was made, January 1, 1928, by the Nevada Colorado River Commission, known as the Boulder Canyon Lower Colorado River Power and Water Set-Up, and from the conclusions drawn from this report nine definite recommendations were made, all calculated to distribute the benefits from the project among the interested States in an equitable manner.

On January 20, 1928, the State Engineer of Nevada appeared before the United States Senate Committee on Reclamation and Irrigation and presented a statement made up from this report, including the nine recommendations, viz:

1. That Nevada and Arizona should benefit from the proposed development, at least to the extent that she would benefit if developed by private capital, second only to Government payments and any reasonable reserve.
2. That the power be not sold as low as the repayments to the Government will permit, but should be sold at a competitive figure comparable with the cost of power available elsewhere for these markets.
3. That arrangements be made for the sale of the power, so that fair offers may be had, and that legitimate bidders be not handicapped.
4. That suitable readjustment periods be arranged for the power charges per KWH and also for the proper charges for other service rendered.
5. That proper charges be made for other service rendered flood control, silt control, irrigation water storage and domestic water storage.
6. That the States shall have the right to withdraw, upon proper notice, certain blocks of power to be used within their own States.
7. That a board be arranged for, from the three lower States, to assist the Secretary of the Interior, or any agency supervising the sale of the power and other service rendered, in an advisory capacity to fix the proper charges per KWH for power and proper charges for other service rendered.
8. That an attempt be made to equalize in some manner among the three States the benefits from reclamation financing.
9. That after the Government advancement is entirely repaid the benefits from this development accrue to the States.

The State Engineer was then cross-examined at length by members of the Senate Committee, which testimony appears in full in the Hearings before the Committee on Irrigation and Reclamation, United States Senate, Seventieth Congress, first session, on S. 728 and S. 1274.

Senate Document No. 186, Colorado River Development, containing

200 pages and 67 maps and illustrations was prepared by the Nevada State Engineer to make available to our Senators and Congressman complete information for use in the Congressional fight. This report was subsequently printed by the Government as a Senate Document and was widely distributed as the official document on the Colorado River development.

When the Swing-Johnson Bill was finally reported out of the Senate Committee, and including the amendments on the floor of the Senate, eight of the nine recommendations were included in the legislation as finally passed and called the Boulder Dam Project Act, and together with the power contracts made by the Secretary of the Interior in conformance with the Act, as amended, provide:

1. That 37½ per cent of all the money the project makes above the payments due the Government each year after construction is finished is to be paid to Arizona and Nevada. The Secretary of the Interior has announced that those payments will amount to over \$700,000 per year to each of the States.
2. That the power be sold at a competitive price.
3. That the Federal Water Power Act be made a part of the Act in so far as determining between conflicting bidders is concerned, so that any agency may bid for the power.
4. That there shall be a readjustment of the charges for power after the first fifteen years from the date of signing the contracts and every ten years thereafter, either up or down, as the competitive price may indicate.
5. That a charge be made for domestic water in Los Angeles and other southern California cities.
6. That the States shall have the right to withdraw, upon certain notice, 18 per cent or 117,000 firm horsepower each for use in the States. This power can be withdrawn and turned back when not needed and withdrawn again as often as necessary by giving such notice and paying the cost at the switchboard when used.
7. That an advisory board to assist the Secretary in the construction, management and operation of the project, consisting of one duly authorized commissioner from each of the seven States, may act in an advisory capacity with the Secretary of the Interior.
8. That the All-American Canal, costing \$38,500,000, shall be underwritten by the lands benefited and not be paid for by the power from the dam (this increases the revenue of the States) and investigations shall be made by the Government in Arizona, Nevada and the Upper Basin States to determine feasible irrigation projects for development.

Recommendation number nine, providing for turning the project over to the States when the cost to the Government has been repaid, was not included in the Act. It was said that while that policy had been adopted in the case of irrigation districts, it would be fifty years before the Government would be repaid, and during that time a general policy toward this type of project would be adopted.

In connection with the Nevada amendments, we quote in part from

a dispatch from Washington over Universal Service, which appeared in the *Los Angeles Examiner* of September 19, 1930, viz:

The outstanding features of these amendments were the provision for revenue for Arizona and Nevada from the project in lieu of taxes after its completion, and the privilege of withdrawing power at cost at the switchboard for use in those States when needed. The original Swing-Johnson Bill did not provide either revenue or power for the States of Arizona and Nevada, wherein the project is located, and this fact formed the basis for objection to the project.

At a hearing of the United States Senate Committee on Reclamation and Irrigation held in Washington, January 20, 1928, George W. Malone, Secretary of the Nevada Colorado River Commission, made nine recommendations for changes in the bill as offered, all those recommendations being calculated to distribute the benefits of the project among the interested States.

Eight of these recommendations were included in the Boulder Dam Project Act as finally passed and, as a result, Arizona and Nevada each will receive, according to the Secretary of the Interior, a revenue of over \$700,000 annually after the project is completed. In addition, through these amendments, Arizona and Nevada will be allowed to withdraw such amounts of power as they may need within their State up to 117,000 firm horsepower, paying cost at the switchboard for its use.

The Act as amended also provides for a Boulder Dam fund to be built up from revenues from the sale of power and water after amortization of the Government's investment to be expended within the seven Colorado River Basin States as Congress may later direct.

Boulder Dam power will be the cheapest available in the United States and it is believed that certain electro-chemical industries using the metallic and nonmetallic minerals found in Nevada and Arizona for the manufacture of their products will be encouraged to locate near the dam.

It is thought by close observers that the Boulder Dam Project Act as finally passed is as fair a piece of legislation as it is possible to secure where so many interests are involved.

While the \$33,113.31 of State money expended, in addition to a considerable amount of private funds, seems quite large, it is, after all, insignificant by comparison with the sum of over \$700,000 that the Secretary of the Interior has announced we will receive annually, beginning when the project is completed. And when it is realized that there is a possible chance to increase our taxable wealth by several millions of dollars by the use of our allocation of 117,000 firm horsepower at cost at the switchboard, and that this was secured without the State putting up any money, we are well-satisfied with the final results.

The testimony before the Senate Committee was given January 20, 1928; the bill came up, but failed of passage during that session; it was brought up in the next session of Congress and passed the Senate

in December, 1928, but the appropriation to start the work was not made until the following June. The celebration at Las Vegas on September 17, 1930, officially started the rail-line connection between the main line and the dam, and is counted as the first unit of the project.

The legislation had been presented to Congress during two previous sessions, but had failed to get through the Committees.

The appropriation of \$4,000 made by the 1927 Legislature proved entirely inadequate to finance the investigations necessary during 1927 and 1928, and a special appropriation of \$15,000 was passed later in the year of 1927; that too failed to meet the entire expense, so the Legislature of 1929 paid bills amounting to \$4,113.31 that had been incurred, making a total of \$23,113.31 appropriated and expended on the work during the years of 1927 and 1928.

The 1929 Legislature also appropriated \$10,000 for the years 1929-1930. This amount proved inadequate and was entirely expended during the year 1929, although some of the accounts were not paid until the forepart of 1930.

The Nevada Colorado River Commission and our Congressional representatives have always worked as a unit for this legislation.

Disposal of any of the power or revenues accruing from the construction of Hoover Dam will require direct action by the State Legislature.

The newly created State Bureau of Mines, under John A. Fulton of the Mackay School of Mines, University of Nevada, rendered a real service to our Commission in securing power from the project for use in the State, as did the Mine Operators, under Henry Rives, and the Extension Service under Cecil Creel.

The suit filed in the Supreme Court of Arizona against the Secretary of the Interior and the six States of Wyoming, Colorado, New Mexico, Utah, Nevada and California, alleging the "Boulder Dam" Project Act to be unconstitutional and unfair, may be a source of expense to our State in the event the case is tried, and while we do not fear the final outcome, the importance of this development to Nevada behooves us to be ready for any emergency.

The following brief statements on the major features of this project give an idea of the magnitude of the undertaking:

HOOVER (BOULDER) DAM

1. *Location*—

30 miles southeast of Las Vegas, Nevada, on Arizona-Nevada State Line on the Colorado River.

2. *Purposes of Project*—

Flood control; river regulation; silt control; power development, and domestic water supply.

3. *Project Includes*—

Construction of dam; power plant, and All-American Canal.

4. *Cost Items*—

Dam and reservoir	\$70,600,000
Power development	38,200,000
All-American Canal	38,500,000
Interest during construction	17,700,000

Total cost	\$165,000,000
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5. *Reservoir Capacity*—
30,500,000 acre feet.
6. *Area of Reservoir*—
145,000 acres, or 227 square miles. Lake Tahoe has an area of
193 square miles.
7. *Length of Reservoir*—
115 miles.
8. *Width of Reservoir*—
Few hundred feet to 8 miles.
9. *Elevation of High Water Line*—
1,229 feet above sea level.
10. *Length of Shore Line*—
550 miles.
11. *Annual Evaporation*—
600,000 acre feet, estimated.
12. *Division of Capacity*—
9,500,000 acre feet flood regulation; 500,000 to 800,000 acre
feet silt pocket; 12,000,000 to 15,000,000 acre feet active
storage.
13. *Silt Deposit*—
Annually, 80,000 to 250,000 acre feet; 3,000,000 acre feet at end
of 50-year period.
14. *Allocation of Reservoir Water*—
California, 4,400,000 acre feet.
Nevada, no agreement;
Arizona, no agreement.
15. *Colorado River Flow at Yuma, Arizona*—
Maximum, measured, 200,000 second feet.
Maximum, estimated, 300,000 second feet, 1884.
Minimum, measured, 1,200 second feet.
16. *Colorado River Flow at Dam*—
Average, 22,000 second feet.
Average annual run-off, 15,700,000 acre feet.
17. *Dam*—
Height—727 feet above bedrock; 582 feet above river bed.
Length of crest, 950 feet.
Width—Top, 45 feet; base, 650 feet.
Type—Arch gravity.
Volume of Concrete—Dam, 3,600,000 cubic yards; power plant
and miscellaneous works, 900,000 cubic yards; total,
4,500,000 cubic yards; cement required, 5,500,000 bbls.
18. Reinforcing steel required—19,000,000 pounds.
19. Period of construction—Seven years.
20. Number of employees—1,000 upwards.
21. Temporary diversion tunnels—Four, 50 feet in diameter.
22. Length of diversion tunnels—4,075 feet.
23. Later use of diversion tunnels—Two for penstocks for power
plant; two for spillway outlets.
24. Outlets in dam—Forty 72-inch needle valve in canyon walls.
25. Mud gates—6' 9" diameter, controlled by 6' x 6' slide gates.
26. Spillways—Two glory hole type 50' diameter; 200,000 second foot
capacity.

27. Location of power plant—U shaped structure, Nevada to Arizona, below dam.
28. *Power Plant*—
 Capacity, 1,000,000 or 1,200,000 horsepower.
 Continuous firm power output, 663,000 horsepower.
 Electrical energy available yearly, 4,330,000,000 KWH.
 Installation, 12, 85,000 HP. hydraulic turbines; 12, 11' x 10' balanced valves; 12, 75,000 kilo-volt Amp. generators; 36, 25,000 kilo-volt Amp. 220,000 volt transformers; 4, 250-ton cranes.
 Power head, maximum, 582 feet; minimum, 422 feet; average, 520 feet.
 Charge for power, \$0.00163 per KWH for primary power; \$0.0005 per KWH for secondary power.
 Revenue derived from power, first year, \$7,057,900; average annual, 50-year period, \$6,550,000.
 Disposal of revenue—Operation and maintenance, cost of construction of dam and power plant: excess, 62½% flood control; 18¾% Arizona; 18¾% Nevada.
 Allocation of power—18% Arizona; 18% Nevada; 6% smaller municipalities; 13% city of Los Angeles; 9% Southern California Edison Company; 36% Metropolitan Water District.
 Operators of plant—City of Los Angeles and Southern California Edison Company.
 Transmission lines—Installed by purchasers of power.
29. *Irrigable Lands Below Dam*—
 Arizona, 900,000 acres; California, 1,000,000 acres; Nevada, 75,000 acres, estimated; no surveys available for new lands.
30. *Classification of Irrigable Lands*—
 Public, 44%; private, 40%; State, 1%; railroad, 2%; Indian, 8%; entered, 5%.
31. *Location Dam Town Site*—
 Six miles west of dam site in Nevada; elevation, 2,500 feet above sea level; temperatures, 20 degrees to 120 degrees.

PUBLIC SERVICE COMMISSION

The State Engineer, by virtue of his position, is also an ex officio member of the Public Service Commission.

This body is becoming more important as the State develops and the municipalities, corporations and transportation systems increase in size and influence, since it is primarily a rate-regulating body and has full responsibility in the issuance of permits for intrastate transportation.

The construction of the Hoover Dam will no doubt mean increased responsibilities for this Commission on account of the anticipated increased use of power from this source in the manufacture of electro-chemical products and mining and irrigation activities.

Several important rate cases have been heard during the past biennium, as well as hearings held on applications from transportation companies for permits to operate within the State.

Complete detailed information relative to the activities of this body

will be available in a separate report issued by the Public Service Commission.

WESTERN ASSOCIATION OF STATE ENGINEERS

The Western Association of State Engineers was formed in Denver, Colorado, in 1927, in response to a widespread need for a better understanding among the administrative officials charged with the adjudication and administration of the water resources in the arid States.

States

Nevada	Arizona	Montana
Texas	North Dakota	Nebraska
Washington	South Dakota	New Mexico
Utah	Idaho	Oklahoma
California	Kansas	Oregon
Colorado		Wyoming

Members

George W. Malone, President, Carson City, Nevada.
 John A. Norris, Director, Austin, Texas.
 Charles J. Bartholet, Director, Olympia, Washington.
 George M. Bacon, Secretary, Salt Lake City.
 Edward Hyatt, Jr., Sacramento, California.
 M. C. Hinderlider, Denver, Colorado.
 Frank P. Trott, Phoenix, Arizona.
 Robert E. Kennedy, Bismarck, North Dakota.
 Charles A. Trimmer, Pierre, South Dakota.
 George N. Carter, Boise, Idaho.
 George S. Knapp, Topeka, Kansas.
 J. S. James, Helena, Montana.
 R. H. Willis, Bridgeport, Nebraska.
 Wm. Herbert W. Yeo, Santa Fe, New Mexico.
 T. C. Harhill, Wagoner, Oklahoma.
 James Rhea Luper, Salem, Oregon.
 John A. Whiting, Cheyenne, Wyoming.

Purpose

The "Association of Western State Engineers," comprising the seventeen arid or semiarid States, has been organized and is now operating along the lines laid down in its constitution, viz:

1. To formulate broad principles, applicable to all of these States for the use, control and regulation of the waters thereof.
2. To assist one another in the solution of individual problems through the exchange of ideas and experiences.
3. To cooperate in making common cause for the preservation to the States of their inherent sovereign right to use, control and distribute the waters thereof, and to facilitate the adjustment of interstate problems.
4. To help stabilize the commercial phases of the use of water by encouraging the perfecting of the laws relating thereto, and by other proper means.
5. To circulate among members such information as may be helpful in the discharge of their official duties.

Our western States are young in experience and are constantly being confronted with new problems, the solution of which may well affect their entire future development. It is the natural procedure, then, for the men charged with the adjudication and supervision of the water in that area to cooperate with each other.

It is well-recognized in the arid area that the limit of a State's water supply is the "limit of that State's development." The interest then from the standpoint of the State is to secure the "highest beneficial use" of that supply, to the end that the "greatest amount of wealth" may be created.

Water Control and Public Domain

Two subjects that have been much discussed by this organization during the past three years are the matter of State versus Federal control of the unappropriated, unnavigable waters within the State and the control and administration of the public domain.

1929 Program

The program at the 1929 convention, held in Reno, Nevada, included the following papers and addresses:

Paper—"To Help Stabilize the Commercial Phases of the Use of Water by Encouraging and Perfecting of the Laws Relative Thereto and by Other Proper Means," by Edward Hyatt.

Paper—"Underground Water in California," by Harold Conkling.

Statement—"Underground Water in Kansas," by George S. Knapp.

Paper—"Public v. Private Ownership of Return Flow Waters," by R. I. Mecker.

Paper—"Conflict of Jurisdiction Respecting Control of Water in Western States," by Delph E. Carpenter.

Paper—"The Future Reclamation Policy of the Arid and Semiarid States," by George W. Malone.

Paper—"Range Control in Western States," by H. W. Reppert.

Address—"Proposed State Laws Governing Dam Construction," by Edward Hyatt.

The above papers and subsequent discussions are published in full in the proceedings of the organization, published and distributed yearly.

The State Engineer of Nevada called the original meeting in Denver, Colorado, in 1927, where the organization was formed, and acted as president during the remainder of that year, and was elected president for the following two years, 1928-1929. M. C. Hinderlider, State Engineer of Colorado, was president during 1930, and Edward Hyatt, State Engineer of California, has been elected for the year 1931. The 1928 convention was held at Salt Lake City; 1929, in Reno; and 1930 in Denver.

This organization has been of great value in bringing the arid and semiarid States together on controversial questions and matters of policy in the administration of the water supplies of the States, and it is expected that as time goes on it will play a greater part in not only State legislation but in Congressional matters pertinent to these States.

STATE IRRIGATION DISTRICT BOND COMMISSION

The State Engineer, by virtue of his position, is a member of the State Irrigation District Bond Commission.

The theory under which this Commission was created is commendable, since it attempts to set up a commission to scrutinize public bond issues in order to furnish protection to both the organization and the investor.

In actual practice, however, the law is faulty, for the following reasons:

1. After the proposed bond issue has been investigated by the Commission and the security for such issue is found sufficient and a favorable report made, the Commission has no authority to follow through and require the money to be properly expended, or to require periodical reports to determine if this is being done.

2. When a State commission approves a bond issue, it is very liable to give the impression that the State guarantees the payment of such bonds.

The first fault could and should be corrected to give the Bond Commission authority to require monthly reports of expenditures of money on construction work that has had the approval of such Commission, and the Commission should be empowered to estop any misuse of such funds; further, the district should be required to submit to the Commission for its approval any change that may be made in the plans as the work progresses.

The second fault can only be corrected by the State becoming actually responsible for the payment of such bonds upon the approval of the Commission, which does not seem feasible at this time, or by stamping across the face of each bond a statement to the effect that the State is not responsible for payment.

During the biennium of 1929-1930, the State Irrigation District Bond Commission acted upon the following applications:

December 29, 1928—Upon application of Lovelock Irrigation District, approval was given for issuance of \$7,500 in interest-bearing warrants.

March 1, 1929—Upon application of Truckee-Carson Irrigation District, approval was given for sale of bonds in the amount of \$24,700 for the acquisition of electrical equipment and construction of electrical transmission lines in Local Improvement District No. 10.

March 1, 1929—Upon application of Truckee-Carson Irrigation District, approval was given for sale of bonds in the amount of \$12,600 for the purpose of acquisition of electrical equipment and construction of electrical transmission lines in connection with Local Improvement District No. 9.

March 1, 1929—Upon application of Truckee-Carson Irrigation District, approval was given for the sale of bonds in the amount of \$25,150 for the purpose of acquisition of electrical equipment and construction of electrical transmission lines in connection with Local Improvement District No. 8.

July 6, 1929—Upon application of Walker River Improvement District, approval was given for sale of bonds in the amount of \$25,000

for carrying out plans for drainage conducted in connection with Local Improvement District No. 3.

July 23, 1929—Upon application of Elko County Electrical Improvement District No. 1, approval was given for issuance of interest-bearing warrants in the sum of \$5,000 for the purpose of meeting preliminary organization expenses of said district. Approval was also given on the same date for holding of special election by electors of Elko County Electrical Improvement District No. 1 for the purpose of voting upon proposed issue of bonds in the sum of \$40,000.

August 2, 1929—Upon application of the Truckee-Carson Irrigation District the State Controller was authorized to certify bonds in Local Improvement District No. 8 of Truckee-Carson Improvement District in the sum of \$24,000.

August 2, 1929—Upon application of Truckee-Carson Improvement District the State Controller was authorized and directed to certify to bonds issued by Local Improvement District No. 9 in the sum of \$12,600.

September 4, 1929—Upon application of Pershing County Water Conservation District approval was given to said district to issue interest-bearing warrants in the sum of \$7,500.

October 14, 1929—Upon application of Washoe County Water Conservation District approval was given to said district to borrow \$12,000 to defray expenses incurred or to be incurred by such Irrigation District.

October 23, 1929—Upon request of Walker River Improvement District consideration was given to application of said district to issue bonds in the sum of \$40,000, such moneys to be used for the purchase of necessary lands to acquire a site for Hoyo Canyon Reservoir. Action deferred until later date.

November 6, 1929—Upon application of Truckee-Carson Improvement District approval was given for issuance of interest-bearing warrants in the sum of \$3,000 in connection with Local Improvement District No. 11.

November 6, 1929—Upon application of Walker River Improvement District approval was given to issuance of bonds in the sum of \$40,000 in connection with purchase of lands at Hoyo Canyon Reservoir site.

December 20, 1930—Upon application of Truckee-Carson Improvement District approval was given for issuance of interest-bearing warrants by said district in the sum of \$6,000, in order to secure funds for the purpose of constructing electrical power and transmission lines to and in the town of Wadsworth.

THE COMMITTEE ON CONSERVATION AND ADMINISTRATION OF THE PUBLIC DOMAIN

Appointed by Herbert C. Hoover, President of the United States

The proper utilization of the public lands of our State has been a perplexing problem for a number of years. Our Stock Water Law, enacted in 1905, making the utilization of the range the criterion for

granting further rights to water stock on the public domain, is recognized by most stockmen as a long step forward in the solution of this question.

In 1929 President Hoover proposed a study of the public domain question and its related problems to determine the policy that should be adopted in the management of this important resource, and later in that year appointed a committee for that purpose.

Members

Ray Lyman Wilbur, Secretary of the Interior.
Arthur M. Hyde, Secretary of Agriculture.

Ex Officio Members

James R. Garfield, Former Secretary of the Interior, Chairman.
H. O. Bursum, New Mexico.
I. M. Brandjord, Land Commissioner, Montana.
Gardner Cowles, Newspaper Publisher, Iowa.
James P. Goodrich, Former Governor of Indiana.
Col. W. B. Greeley, Former Head of the Forest Service, Colorado.
Perry W. Jenkins, Land Commissioner, Wyoming.
Rudolph Kuchler, Land Commissioner, Arizona.
George Horace Lorimer, Publisher Saturday Evening Post.
George W. Malone, State Engineer, Nevada.
Elwood Mead, Commissioner of Reclamation, Washington, D. C.
Charles J. Moynihan, Colorado.
I. H. Nash, Land Commissioner, Idaho.
William Peterson, Agricultural College, Utah.
Mary Roberts Rinehart, Writer, Washington, D. C.
Huntley N. Spaulding, Former Governor of Massachusetts.
R. K. Tiffany, Washington.
Wallace Townsend, Arkansas.
E. C. Van Petten, Oregon.
Francis C. Wilson, New Mexico.
Hugh A. Brown, Executive Secretary, Department of the Interior, Washington, D. C.

Problems

1. Administration of the Public Domain—
 - a. State ownership.
 - b. Continued Federal ownership.
 1. Supervision under Federal Bureau.
 2. Under State laws.
2. The future reclamation policy.
3. Federal aid for road construction.
4. Completion of the public land surveys.
5. Oil, gas and coal development policy.
6. Development of metalliferous minerals.
7. Reclassification of forest reserve areas.
8. Recommendation to prevent overlapping of Federal bureau authority.
9. Watershed protection.
10. Administration of Forest Reserve grazing areas.
11. Water control.

Purpose

The Creation of the Committee on the Conservation and Administration of the Public Domain was brought about through the suggestion of the President, made to the Conference of Western Governors last year, that the remaining unappropriated unreserved public domain might better be given over to the States, and suggesting the appointment of a committee to study the problem. The Governors agreed that such a study was desirable, and subsequently Congress created the Committee, providing for the expenses and setting a definite date, December, 1930, for its final report.

The administration of the public domain has been one of the outstanding problems of our Government from the beginning; as early as 1780 we find a resolution passed by the Congress of the Confederation to care for the unappropriated lands that might come into possession of the United States.

Past and Present Policies

During the early days the public lands were considered as a source of revenue and settlement of these areas was not encouraged.

It was soon realized, however, that progress could only be made by encouraging settlement of the land and the general trend of congressional action began to encourage private ownership. This led to the Preemption Act in 1841, giving the right to purchase such land based upon settlement.

Homestead Laws

The first homestead law was passed in 1862 definitely establishing the policy of passing the public lands into private ownership at a minimum cost to the settler, regardless of the value of such lands. During the period from 1862 to 1900 most of that great area from Ohio to the Rocky Mountains, containing some of the richest farm land in the United States, passed into the hands of the settler for a nominal filing fee to cover the cost of the transfer, no charge being made for the land, the only requirement being that the settler make his home on such land and farm it.

As the land settlement began to reach the semiarid and arid sections west of the Mississippi River and beyond the Rocky Mountains it was found that 160 acres were not enough land to support a family. This condition led to the passage in 1909 of the Enlarged Homestead Act and later, in 1916, the Stock Raising Act, all calculated to provide the settler with enough land to supply his family. It was soon apparent that even with these later Acts, which in all provided that one man might acquire approximately 1,000 acres of land, it was not sufficient in the arid sections; therefore the land could not be settled. Abundant evidence can be found of the failure of all homestead laws in the arid sections by the abandoned homesteads through that area.

At the present time practically all of the land of any value is in Government or State forest reserves, or parks, or has been withdrawn from entry for some specific purpose, or has passed into private ownership. Therefore the problem now confronts us, just what are we to do with these remaining lands of little per acre value? Shall we revert to the original policy of 1780 of considering them a source of revenue to the States and Nation, or shall we try to continue the policy of

passing them into the hands of actual settlers at the least possible cost? If they are to be passed into the hands of the settlers a complete reorganization of the land laws will be necessary.

Private Ownership of Lands

It is generally concluded from past experience that the ultimate objective for all publicly owned lands should be private ownership by individuals, except those areas that may be properly reserved by the Government or the States for parks, forest reserves, Indian reservations and other proper reserves that may promote the highest ultimate use of such land for the States and the Nation.

It is thought that any system pointing to perpetual ownership of the land or the natural resources by either the separate States or the United States, except such reservations as already mentioned, would be doomed to failure.

Highest Beneficial Use

The development of the States depends upon a policy that will allow the development of the natural resources in such a manner that the highest beneficial use of them may be made over a long period of years.

The only value contained in the western States, where the rainfall is not sufficient to produce crops and where irrigation is not economically feasible, is the grazing value of surface area and such sub-surface values as the lands may contain, such as metalliferous minerals, oils, gas, coal and other valuable deposits that may be found from time to time.

If the forest reserves, parks and other reservations are to be preserved and the intermountain States are to continue to develop they must provide for the orderly development of whatever natural resources they may have. These resources are not easily discovered, and when found are not easily developed.

Sub-Surface Development

Only a very small area of the States, perhaps five to ten per cent or less, have any sub-surface value at all and these areas are widely scattered and, except in isolated cases, are of doubtful value until large expenditures have been made in development work, and then more often than not it is found that because of the cost of marketing the product it is economically unsound and the venture must be abandoned, with a consequent loss of the investment. It is well-known that only a very small percentage of mining and oil companies are successful. The possible gain then must be made attractive to offset the hazards.

Public Domain Areas

State	Forest reserves	Area	Unreserved public land	Unsurveyed
Arizona.....	11,466,626	72,838,400	16,911,367	7,846,000
California.....	19,026,819	99,898,880	20,209,421	5,749,684
Colorado.....	13,309,549	66,341,120	8,218,875	1,136,694
Idaho.....	19,300,773	53,346,560	10,734,420	1,882,805
Montana.....	16,170,658	93,296,640	6,900,144	78,320
Nevada.....	4,978,198	70,285,440	53,410,938	21,915,318
New Mexico.....	8,491,831	78,401,920	16,282,582	1,164,627
Oregon.....	13,297,838	61,188,480	13,227,141	92,411
Utah.....	7,475,762	52,597,760	25,147,867	11,955,734
Washington.....	9,598,372	42,775,040	951,903	14,202
Wyoming.....	8,460,755	62,460,160	17,035,537	617,501

Grazing Areas

The chief value of these lands, in fact the only value they possess at this time, except where minerals are found, is for grazing purposes and they are being completely utilized for that purpose at this time.

The reason for the small value attaching to these lands is, of course, primarily the lack of rainfall; wherever the precipitation reaches as much as twelve to fifteen inches per year there is no problem, because dry farming can be practiced on suitable areas and abundant grazing values are available on the remainder; but when the rainfall is only from three to six inches annually, no farming of any kind is possible and large areas are necessary to support live stock; in fact, government reports show that the remaining unreserved public lands in Nevada require on an average of 140 acres to support one cow unit and approximately 40 acres for a sheep unit. It can be readily seen that an enormous acreage is necessary for the support of a family, since the original 160 acres allowed under the old homestead laws would support only a little more than one cow unit. There is the problem.

It will be seen that for the support of a family an enormous acreage of this range is necessary and to set up what is known as an economic unit of 250 to 500 cattle or 1,500 to 2,000 sheep an area of 30,000 to 70,000 acres would be necessary and this would correspond to the original 160 acres of land in the more productive areas. Any reorganization of the land laws that might be attempted to permit private ownership must of necessity be flexible enough to cover the highly variable conditions found in these States.

Development Policy

The west and the east hold in general two diametrically opposed ideas as to the undeveloped resources of the west; the west believes that the resources contained within a State, subject to proper reserves, should be developed in an orderly manner and considered as an asset of that State, while a large part of the east believes that the undeveloped public domain in the western States should be considered as an asset to the National Government, belonging to all of the people and should be preserved for that purpose the same as any other investment. Little conception is had of the magnitude of the development problem of the arid sections.

Reclamation Development

The major development in the arid section is irrigation, and the area affected can be roughly designated by the area west of the line drawn north and south through central Kansas, which includes approximately all of the arid and semiarid region, and includes approximately 45 per cent of the entire area; about 20 per cent of the population, and approximately 5 per cent of the cultivated area of the United States.

The entire irrigated area is approximately 18,500,000 acres, of which approximately 35 per cent has been brought under irrigation by individuals; 10.5 per cent by irrigation districts; 8.5 per cent by the Federal Government, and 46 per cent by all other agencies, including operation under the Carey Act.

Irrigation Development

States	Individuals	Irrigation Districts	Government	All others	Total
Arizona.....	80,511	300	257,547	129,207	467,565
California.....	1,502,870	577,168	37,319	2,101,638	4,219,040
Colorado.....	1,014,412	248,409	75,411	2,010,153	3,348,385
Idaho.....	513,350	359,995	290,534	1,328,927	2,488,806
Kansas.....	14,546	-----	-----	32,766	47,312
Montana.....	976,615	35,153	187,178	482,783	1,681,729
Nebraska.....	68,140	206,206	87,558	80,786	442,690
Nevada.....	355,901	80,000	49,645	30,901	516,447
New Mexico.....	151,351	15,008	86,750	285,268	538,377
North Dakota.....	300,306	-----	8,766	-----	12,072
Oklahoma.....	969	-----	-----	2,000	2,969
Oregon.....	590,626	92,081	58,981	224,474	986,162
South Dakota.....	31,664	-----	56,658	12,360	100,682
Texas.....	110,680	88,571	20,284	366,585	586,120
Utah.....	160,887	21,143	54,555	1,129,066	1,371,651
Washington.....	142,215	79,918	192,379	115,387	529,899
Wyoming.....	724,620	22,935	75,555	364,872	1,207,982
Totals.....	6,448,663	1,822,887	1,539,120	8,437,218	18,547,888

These figures were compiled in 1920, and there has been very little change since that time.

Present Policy

The present policy of the Government in the management of the public domain includes close supervision of the forest reserves, parks and Indian reservations, the supervision of livestock grazing within these areas, and the leasing of certain areas for mineral development. The unreserved unappropriated public domain is not supervised in any manner by any government agency.

Western States Development

It is not generally realized by people of the midwest and eastern States just how small our western development really is in comparison to the total development of the United States, or the obstacles that must be surmounted for further development.

Nevada for example has a total area of 70,285,440 acres, of which less than 500,000 acres are under cultivation, or approximately three-quarters of one per cent (.75%). The total irrigated acreage in the seventeen western States is approximately 18,500,000 acres, which is in itself insignificant compared to the estimated total of 400,000,000 cultivated acres in the United States. Approximately 1,500,000 acres of the 18,500,000 have been brought under cultivation on the Government reclamation projects.

The Committee has held three meetings in Washington, D. C. Tentative conclusions have been reached and it is thought that at a further meeting to be held in January, 1931, a complete report will be prepared and that it will be delivered to the President not later than February 15, 1931.

The Committee is taking into consideration the various conditions found in the eleven public land States and any report to the President will probably recommend that:

1. The State's method of range control be recognized, when it is not desired by the Legislature of that State to take over the public lands or to be supervised by a Government bureau.

2. That if any State so desires, the lands within its boundaries may be included in the forest reserve or in a national range designation, to be supervised by the Government.
3. That any State desiring to take over the lands in fee simple, classified as nonmineral at the time of the transfer, may do so.
4. That the reclamation program and Federal aid for roads be continued.

It is thought that the foregoing provisions are broad enough to cover the varied stages of development within the States and that a definite program can be adopted by each State Legislature conforming to its needs, and all pointed towards the conservation and upbuilding of the natural resources within the State.

Recognition by the Government of the State's method of individual control pending the transfer of such lands to the State, or their appropriation under the Federal Land or Mining Laws—

This method seems the most feasible where the land cannot be taken over by the State at once, since it will result in complete individual control of range units, with the consequent and immediate result of the "building up" of the range in accordance with "good practice" and adequate watershed protection, which will be the natural result of range conservation, without any additional expense or personnel on the part of the Government whatever, and very little on the part of the State.

Supervision by a branch of the Government, such as the Forest Service—

Under conditions obtaining in some of the States where land is very valuable for grazing purposes, or where such service is desirable from the State's standpoint, it may very well be that for a temporary period such an arrangement might be satisfactory. The chief objection to this method, however, is the enlarging of the central government authority and personnel, as well as establishing a definite system of grazing charges for all of the land. These grazing charges must be met by the stockmen, and even in that event it generally results in a net loss to the Government. In any case, if a decentralization of authority is desired, it would seem unwise at this time to continue immediately the building up of the bureaus of the central government at the expense of the States.

State Ownership—

State ownership is feasible where the State has developed to the point where the taxable property is of sufficient amount to stabilize and safeguard a complete unit of State government, or where the mineral or other values of such land insure the expense of administration. But in the case of some of the less-developed States it may very well be that some time will elapse before that condition is brought, and it is thought that our State has not as yet reached that stage of development.

The reclamation policy was inaugurated in 1902 under a system of pooling of funds from the sale of public lands, oil and gas leases, etc., within the public land States, and it will be continued.

The policy of Federal aid for roads is well-established for the purpose of making cross-country travel possible and for military purposes,

and is not confined to the public land States. This policy will be continued until the objective is reached.

In addition to the foregoing recommendations the report will probably retain the tentative conclusions on the following:

1. That a fund be established by Congress to be loaned at a low rate of interest over a period of years for refinancing irrigation districts.
2. That the State laws relative to the appropriation, use and control of waters within the State be recognized.
3. That the President be given authority to realign the work of the various departments and bureaus to conform to good practice.
4. That in the development and utilization of the natural resources in the "Public Land States" the sovereignty of the States be recognized through the use of the interstate compact method of settling controversies with the advice and cooperation of the Federal Government.

It is thought that if Federal recognition can be had of the State's method of range control, an Act supplementing the "Stock Water Law" may be passed and range unit boundaries fixed in conformance with actual use of such range upon the public lands, thereby establishing individual control; and if a range user is allowed to control his unit, it is believed he will build up the range.

This method would in no way interfere with the mining industry, the representatives of which have expressed themselves as being satisfied with the present status of the lands.

RANGE COMMISSION

The State Range Commission was created by the Legislature in 1929 to "conduct a study and investigation to determine the principles, laws or policies that should apply to the grazing uses of the natural range forage resource of the publicly owned lands within Nevada * * * that should prevail for the best public interest." The State Engineer was made a member of this body by legislative enactment.

The statute is designed to protect the livestock industry and the public interest, by providing ways and means for the most feasible method of administering and utilizing the public range, and its ultimate object is the protection of the revenues of the livestock industry in this State and its ability to maintain the herds and ranches and tax contributions for the support of the county, State and National Government.

The Commission has held hearings and taken testimony, as directed, from the Nevada Livestock Association, the Mine Operators, the Bankers Association, the Extension Service of the University, the Farm Bureau, the Chambers of Commerce, the various clubs, and in fact the record as built up contains testimony from all persons and organizations desiring to be heard.

There will be a report rendered by this Commission in time for legislative action by the 1931 Legislature if such be desired; such report will probably be delayed, however, until the report of the

National Public Domain Committee has been delivered to the President of the United States, in order that our Commission may have the benefit of whatever recommendations may be made by that body.

There have been no conclusions or recommendations made by this body as yet, but it would appear that if the Nevada Stock Water Law can be supplemented by a recognition by the Government of the State's method of control, range boundaries could actually be fixed by a system of hearings, conducted as in the case of water applications, thereby establishing a system of individual range unit control that would be effective in building up the grazing value of the ranges and protecting individual property investments from encroachment.

The argument in favor of such control is that if a range user is allowed to protect his range unit he will build it up in the same manner as he does his ranch property, and that overgrazing is the result of trying to get the feed before someone else can get on the range, or of feeding it down so it is not worth while for anyone else to enter that area, so that if a method is provided for individual control of unit ranges by recognition by the Government of the State's method of control, it only remains for the Legislature to work out the method whereby the right to the use of such unit can be determined, based on use of range.

Where more than one user is entitled to use a certain area there is apparently no reason why a community range cannot be allowed, or even grazing districts established.

The further argument for this method is found in the fact that there is no expense to the Government for supervision, and no expense to the user of the range unit, except such amounts as he may spend in improving the range after he is convinced that he will get the benefit of any improvements he may make for the betterment, or more effective utilization of his unit.

There may be certain areas in the State where it might be advisable to extend the limits of the forest reserve boundaries; and it may be that it would be found advisable to exclude certain areas now within the forest reserve where no timber is found of a commercial value, but in general it is concluded that if by individual control the improvement of the range can be brought about, it would be unwise at this time to enlarge or create any system whereby charges for the value of the feed on the ranges would be made, as in the case of the forest reserve at this time.

It is freely predicted by range users that if a system such as outlined can be obtained, the number of live stock within the State can be increased from twenty to fifty per cent, thereby creating substantial, permanent returns to the State through the increased taxable wealth.

In the event that such recognition cannot be obtained from Congress by recommendation of President Hoover's "Public Domain Committee," then any State regulation must be exercised under and by virtue of the police power of the State as in the case of our 1925 "Stock Water Law," where we exercise our discretion in granting further stock water rights on the public domain to where the feed is not all being utilized from a subsisting right, to prevent conflicts and to keep the peace; or as in the case of the Colorado law, which

provides for the determination of preferred rights to graze live stock upon any particular portion of the public domain, such determination to be made in accordance with prior use of the range, as to whether such use was for a cattle or sheep range. The jurisdiction to determine these rights is vested in the District Court with the power to apportion, after final hearing, any range in accordance with the equities and rights of the owners of different kinds of live stock using such range. Whenever any cause is at issue, the court in the first instance refers all questions of fact to three referees, who in turn render a report of their findings to the court. Ten days are allowed within which any person feeling himself aggrieved by such findings as contained in said report may file an objection requesting a modification or disapproval of the findings, as the case may be. Upon final hearing on the referees' report, or any other hearing before the court, the court shall enter a decree, finding as definitely as may be the boundaries of the disputed range area, those portions which shall be designated as sheep or cattle range, and further apportioning the number of head of live stock of each kind which may be grazed within their respective areas.

As between the users of any range in process of adjudication and adjudged to be overstocked range, those who have made prior continuous use of said range in accordance with customary use thereof, and those who have privately owned lands accessible to said range upon which their said live stock may be fed or grazed when not on the public range, are given the preferential right up to the allotted number which may be fixed by any decree.

A careful study of the Colorado law indicates that the objectives in view by the enactment of such legislation were fundamentally the same as that which prompted the enactment of the so-called Stock Watering Act of Nevada, viz, regulation and control of range privileges on the public domain in accordance with customary usage. Both Acts are based upon recognized rights of the State to prescribe police regulations applicable to the public domain in the interest of the general welfare of the community and the people.

After reviewing the testimony submitted, the Range Commission will probably recommend further legislation tending to regulate the movement of live stock on the public range, in the public interest, to prevent conflicts on the open range.

It is hoped that Congress will then accept the recommendations of the National Public Domain Committee and that the "State's method" of range control will be recognized.

BUREAU OF INDUSTRY, AGRICULTURE AND IRRIGATION

The State Engineer, by virtue of his position, is a member of the Commission of Bureau of Industry, Agriculture and Irrigation.

This Commission has not been active, due to lack of appropriation to support investigations and operations necessary to the proper functioning of this body.

Range Control

The problem of proper utilization of the public range in our State is difficult of solution due to the extremely low grazing value. According to Government reports covering the approximately 55,000,000

acres of unappropriated and unreserved public domain, it requires an average of 140 acres to graze a cow unit and 40 acres to graze a sheep unit for one year. It is obvious then that any solution of our range problems must be such that a very small expenditure for supervision will be required.

Range All Utilized

It is well-known to the stockmen and those familiar with range conditions that all of the public range in Nevada has been utilized for 25 or 30 years, and during that period any new user who has placed additional live stock upon the range has only displaced stock that were already there or caused the range to be overgrazed. No new wealth has been created—rather it has tended to decrease the resources of the State on account of the deterioration of the range due to overgrazing.

Ranches Dependent Upon Range Land

The value of the ranches scattered widely throughout the public lands of our State is for the most part directly dependent upon the surrounding range. To preserve such value enough of the adjacent range must be retained to graze the number of live stock during the spring, summer and early fall that the ranch will provide feed for in the winter.

The assessed valuation of such ranch property is based upon a complete unit in nearly every case, and if the range is to be considered separately or taken from the control of the ranches, then the assessed value of the ranch must be reduced accordingly.

If each individual were to be given the range unit used by him no new values would be found or created, but the present assessed value would merely be redistributed. The only new value created would be whatever development of the range could be brought about by virtue of more perfect control of the range unit, and it would require considerable time to become noticeable.

Forest Reserve v. State Methods

The Forest Service has done and is doing a splendid work in conservation of the forests; however, when any branch of the government created for a special service enlarges its field of activity and enters into an entirely new work, its methods should be scrutinized carefully and the personnel of such branch of the government should study local conditions carefully and consult men familiar with the particular territory before establishing principles and policies affecting an important industry.

The Forest Service follows the policy of redistribution of range and of charging the stockmen the full value of the feed. Redistribution in some instances means taking part of the range from one user and giving it to another under certain conditions and at certain periods.

The State's method is to protect the range units, in so far as possible, as established by long use, allowing the natural economic situation to take care of any redistribution and appropriating sufficient funds for the actual expense of supervision.

It would seem that when a complete livestock unit has been built

up over a period of years, such unit consisting of a summer, winter, spring and fall range, with a ranch of sufficient size to balance same, one part of the unit as the summer range—which is largely controlled by the Forest Service—should not be arbitrarily decreased, leaving the owner of such unit with a reduced carrying capacity and with the same investment in his plant.

In the matter of the charges for the use of such range, where the land is of such small grazing value, it is concluded that any system of charges must be subject to close scrutiny or a real injustice may be done.

Stock Water Law

The Stock Watering Act of Nevada became a law on April 1, 1925. This Act is predicated upon the principle that the value of a right to the use of water for stock watering at a particular source upon the public domain is directly dependent, not upon the number of stock that can water at said watering place, but upon the number of stock that can graze and feed upon the available range readily accessible to livestock watering at such place. In other words, there has been a definite relationship established between the water and range value. Thus, it would seem that the Nevada Stock Watering Act accomplished indirectly that which is intended by the Colorado regulation. The constitutionality of the Nevada Act has been upheld by the Nevada Supreme Court in the Calvo Case, decision No. 2747, February 21, 1927. The validity of this Act therefore seems to be unquestioned, while the Colorado law remains to be tested in a higher court.

Contrary to the opinion held by many, the Nevada Stock Watering Act did not change the manner or procedure in which a valid stock watering right could be acquired. It has, however, fixed a method for the more exclusive control of range by virtue of valid stock watering rights and protects prior or vested users against subsequent appropriation. Neither has the Act, as asserted by some of its opponents, granted any additional rights not previously enjoyed by stockmen, such as a right to one day's watering without penalty, as prior to the enactment of this legislation there was no limit to the number of times stock could be watered at a particular place.

Range Maps

In order that the State Engineer, who is charged with the administration of the Stock Watering Act, could intelligently formulate departmental policies governing the administration of this Act, it has been necessary to make a comprehensive study of the whole stock watering and range problem during the past four years. As an aid in making this study and formulating policies, numerous stockmen throughout the State have, upon request, submitted maps showing boundaries of the range claimed by them. With these maps as a working basis a State Range Map has been compiled, showing the relative locations of ranges claimed by various stockmen throughout the State of Nevada. Up to the present time 224 range claimants have submitted maps, which have proved an invaluable source of range and stock watering information, and which will undoubtedly form the basis for the ultimate determination of range rights and the settling of range disputes.

Vested Rights in Range

There has been considerable discussion as to whether or not a vested right should be gained by long use of the range on the same principle as laid down in our water law. Whether rights are vested or not, it is generally conceded that any division of the range or the fixing of range boundaries should be based on "use of range." The State's method of control of range units built up over a long period of years must be recognized as economically sound and protected as far as possible under the police power of the State, provided Federal recognition can be secured of the State's method of control.

Further Range Legislation

It is proper at this time to proceed with further legislation under the police power of the State to protect established range units from further encroachment in order to prevent range conflicts, with the consequent overgrazing and abuse of the range.

The incoming Legislature should go as far as possible in working out this problem, and if Congress follows the recommendations that the President's Public Domain Committee will make and will recognize the method set up by them for range control, the next Legislature can provide machinery to complete the working out of the established units.

CHAPTER XI

Supreme Court Decisions Relating to State Engineer's Office

No. 2883

STATE OF NEVADA EX REL. GEORGE W. MALONE, AS STATE ENGINEER
OF THE STATE OF NEVADA, AND GEORGE W. MALONE, *Relators*,

v.

DISTRICT COURT OF THE SIXTH JUDICIAL DISTRICT OF THE STATE OF
NEVADA, IN AND FOR THE COUNTY OF HUMBOLDT, FRANK T. DUNN,
ACTING DISTRICT JUDGE OF SAID COURT, *Respondent*.

(Decision filed March 28, 1930)

By the Court, COLEMAN, J.:

This is an original proceeding in mandamus to compel the respondent to assume jurisdiction in a contempt proceeding in which he had refused to proceed on the ground that he had no jurisdiction.

* * * The only question involved is the interpretation of one section of our Water Law.

The State Engineer, pursuant to proceedings theretofore had, filed with the Clerk of the Sixth Judicial District Court in and for Humboldt County his Order of Determination of the Relative Rights of the Water Appropriators of the Humboldt River Stream System and Its Tributaries.

Thereafter the Honorable George A. Bartlett, District Judge, entered upon a hearing of said matter preliminary to making a decree therein.

Thereafter one J. A. Millar and one Albert Quill were, pursuant to statute (Stats. 1915 p. 382), appointed Water Commissioners to distribute the water of said river in accordance with the order of determination of the State Engineer. After they had entered upon the performance of their duties as such Water Commissioners, and in pursuance thereof had constructed a dam for the diversion of water, W. W. Whitacre and Emeterio Plaza, in defiance of their authority, destroyed said dam, whereupon contempt proceedings were initiated against them. The Honorable Frank T. Dunn was called in to hear the same. Objection was made to his proceeding upon the ground that he was without jurisdiction in that it was not charged that the contemnors had violated any order of court. The respondent, being of the opinion that the objection was well-founded, declined to proceed further in the matter.

* * * * *

While no order has been made by the court as to the adjudication of the matter or as to the distribution of the waters of said stream system, it is contended by the Attorney-General that the Water Commissioners were officers of the court and the action of the contemnors constituted contempt. In support of this contention reliance is had upon section 361½ of the Water Law, as amended (Stats. 1927, p. 337), which reads:

From and after the filing of the order of determination in the district court the distribution of water by the state engineer or by any of his assistants or by the water commissioners or their assistants shall, at all times, be under the supervision

and control of the district court, and said officers and each of them shall, at all times, be deemed to be officers of the court in distributing water under and pursuant to the order of determination or under and pursuant to decree of the court.

* * * * *

This leads us to inquire what could have been the purpose and intent of the Legislature in thus amending the Water Law? To our mind it is very clear. There is no room for a difference of opinion. It means exactly what it says, that is, that from the time of the filing the Order of Determination in the clerk's office the water shall be distributed by those charged with that responsibility, in accordance with the terms of the order, and that such officials shall be officers of the court and that such distribution shall be under the supervision and control of the court.

* * * * *

* * * It may be safely stated as a general rule than any interference with an officer of the court in the discharge of his official duties constitutes contempt.

* * * * *

Pursuant to the statute in question the officers whose efforts in the distribution of the water of the Humboldt River was interfered with were officers of the court, under whose supervision and control it was being distributed. This being so, if the reasoning in the above cases is good law, as we think it is, there can be no doubt but that the section of the statute quoted and the allegations in the complaint are ample to confer jurisdiction upon the respondent to hear and determine the question of the guilt of the contemnors.

Pursuant to the statute quoted, from and after the filing of the Order of Determination with the Clerk of the Court by the State Engineer, the water of the Humboldt River Stream System, during the irrigation season, was in *custodia legis*. Such was clearly the intention of the statute.

Holding these views, it follows that the writ must issue as prayed. It is so ordered.

No. 2853

In April, 1924, G. Gallio filed a complaint in the Sixth Judicial Court against Margaret Ryan. This suit was instituted for the purpose of establishing the rights of said Gallio in the waters of Star Canyon Creek. Gallio's rights to the use of said waters were evidenced by a filing made in the State Engineer's office in March, 1914. The evidence introduced at the hearing in the District Court brought forth clearly the fact that all the waters used by Gallio were waste waters from lands being irrigated by Ryan. The District Court rendered a decision in favor of Gallio, establishing his right to the use of waters in Star Canyon Creek. Ryan, being dissatisfied with the Court decision, filed a motion for a new trial. The District Court denied the motion and Ryan appealed to the Supreme Court, requesting an order for a new trial in the District Court.

On April 25, 1930, the Supreme Court handed down a lengthy and complete decision which set aside the judgment and decree of the District Court and remanded the case for a new trial.

The substance of the Supreme Court's findings was that waste water

is not subject to appropriation until such waste waters had returned to the parent stream.

No. 2920

PACIFIC LIVE STOCK COMPANY (A CORPORATION), *Petitioner*,

v.

GEO. W. MALONE, STATE ENGINEER OF THE STATE OF NEVADA,

Respondent.

A study of this decision discloses the fact that the waters of Quinn River had been adjudicated by the Second Judicial District Court on April 9, 1919. An appeal was taken from this decree to the Supreme Court of the State of Nevada.

On April 2, 1930, the Supreme Court entered an order dismissing the appeal, thereby affirming the judgment and decree of the Second Judicial District Court.

The State Engineer's office was not involved in any of the proceedings enumerated above.

July 1, 1930—The State Engineer received a petition from the Pacific Live Stock Company requesting the State Engineer to assume charge of the distribution of the waters of Quinn River. This request was made pursuant to the provisions of section 54, chapter 140, Statutes of 1913.

July 2, 1930—The State Engineer refused to comply with the request outlined in the above petition on the grounds that the rights of the various water users of Quinn River had not been adjudicated in accordance with the provisions of sections 18 to 50 of the Water Law, wherein the State Engineer compiles an Order of Determination defining the relative rights of the claimants and appropriators of any stream system and files same with the court of jurisdiction.

August 12, 1930—The Pacific Live Stock Company filed a petition for an alternative writ of mandate in the Supreme Court against the State Engineer, requesting the Supreme Court to issue a writ of mandate commanding the State Engineer to assume and take control of the waters of Quinn River and its tributaries.

January 2, 1931—The Supreme Court handed down a decision which quashed the alternative writ and dismissed the proceedings.

NOTE—There are several streams in Nevada that have had their water rights adjudicated directly through court procedure and these streams face the same problem in securing the services of the State Engineer in their distribution problems as confronts the water users on Quinn River. It is suggested that the water users on these streams either apply to the court of jurisdiction for the appointment of a water commissioner or initiate proceedings which will bring about a statutory adjudication.

No. 2895

STEPTOE LIVESTOCK COMPANY (A CORPORATION), *Respondent*,

v.

ROBERT F. GULLEY, THOMAS J. McMILLAN, FIRST DOE AND SECOND DOE, *Appellants*.

A resumé of the litigation involved in this lawsuit shows that for a period of over forty years last past the Steptoe Livestock Company and its predecessors had been watering live stock from certain springs

and creeks in Elko County, Nevada, without resorting to artificial means of diversion and had grazed a sufficient number of live stock upon the adjoining range to utilize all of the available range. During the month of May, 1929, the appellants in this cause grazed some 2,000 head of sheep on this range and watered this stock from the streams traversing the range without the consent of the respondent. The Steptoe Livestock Company sought relief from this invasion of their range by filing suit in the District Court requesting the District Court to issue an injunction restraining the appellants from watering their live stock from certain creeks and springs.

The Honorable E. P. Carville of the Fourth Judicial District Court presided at the hearing held in the District Court, and upon conclusion of the trial issued an order enjoining the appellants from watering their live stock from creeks and springs claimed by the respondent.

The principal argument advanced by the appellants was that an artificial diversion of water was required for the watering of live stock before a lawful right could be established to the exclusive use of the waters of any spring or stream.

At the conclusion of the District Court hearing, the appellants appealed to the Supreme Court of the State of Nevada, requesting the Supreme Court to set aside the injunction issued by the District Court. The following excerpts are taken from an opinion handed down by the Supreme Court on February 4, 1931:

Incident to making the order granting an injunction *pendente lite* the court made specific findings of fact. It found, *inter alia*, that for more than forty years last past the plaintiff and its predecessors in interest have had and now have a subsisting right to water in excess of 500 head of live stock at and upon the watercourses in question, and have watered their live stock in sufficient numbers to utilize substantially all that portion of the public range available to livestock watering at such places; that said watering places on said watercourses are natural watering places formed by natural depressions and by the making of cattle trails into such particular watering places on said watercourses; that said watering places on said watercourses could not have been and could not be improved by the construction of dams, ditches, pipe lines, troughs or other artificial means; that the use of said waters and range by such live stock of the plaintiff and its predecessors during said period was exclusive, except as to other live stock that would drift or stray in, and that said right on the part of the plaintiff to water their said live stock in sufficient numbers to utilize substantially all that portion of the public range readily available to livestock watering at said places was recognized by other owners of live stock whose stock drifted or strayed to such places.

The evidence taken upon the hearing of the motion to dissolve the temporary injunction failed to show that any dam, ditch, reservoir, or other artificial means was used by the plaintiff, or its predecessors in interest, by way of appropriation of the waters in question for the watering of stock.

Counsel for appellant state in their opening brief:

"This appeal is upon the sole question of whether or not mechanical means are necessary to appropriate water for stock watering purposes. The plaintiff and respondent maintain that no mechanical means are necessary to appropriate water for live stock; that the turning of cattle upon the public domain adjacent to a stream system constitutes the mechanical means of appropriation. The defendants and appellants maintain that in order to appropriate water it is necessary that some mechanical means be installed; that the mere turning of live stock upon the public domain does not constitute such act or acts as will constitute an appropriation."

* * * And when, in addition, it is known that the livestock industry is our second, if not first, most stable industry, it can be fully appreciated why the little water which we have is almost as priceless as rubies. In this situation it was but natural that the people from the very earliest territorial period should put the available water to some beneficial use. This they did for many years without statutory or constitutional direction as to the manner of so doing, and though statutes were finally adopted specifying the manner whereby water might be appropriated, it was subsequent to the date of the alleged appropriation relied upon by the plaintiff, and hence cannot influence the determination of this case.

* * * * *
 * * * While the right to thus appropriate the public waters of Nevada was recognized from the very earliest days, no specific method of appropriation was ever declared to be necessary, other than by putting it to an economical beneficial use, except as was the customary practice, and since it was the custom in those days to build dams and ditches to divert the waters of streams for agricultural, milling, mining and fluming, it is insisted that in pre-statutory days it was necessary to use some mechanical method of diverting water by way of appropriation for the watering of live stock. We are unable to follow this line of reasoning, for at least two reasons. First, all the cases cited to support the contention, except as hereinafter noted, are cases pertaining to the appropriation of water for irrigation purposes, and while all of those cases are founded upon a recognized custom, proponents of the rule are willing to overthrow a custom just as longstanding and well-established as to watering live stock. All of the authorities hold that no one can appropriate for irrigation purposes more water than he can put to a beneficial use, and this element would naturally lead to a repudiation of the contention asserted by respondents in *Walsh v. Wallace*, supra, under the facts of the case. The method of diverting water from streams by the use of dams, ditches and the like for irrigation purposes was but the natural thing to do, since water, to be put upon a tract of land, had to be taken out of the stream, and this could not be done except by some artificial structure. * * *

While it was absolutely necessary to divert water from a stream to appropriate it to agricultural uses in an economical manner, and the custom of so doing was recognized as an appropriation, it would not seem necessarily to follow that it would be necessary to do so to constitute an appropriation of the water where it could be put to a beneficial use without such diversion, where there was a practice of appropriating the waters of the streams to a beneficial use without such diversion, where it could be done just as well or better, at less cost and economically, so far as the use of the water is a factor, and where the practice of so doing has developed into a well-established custom, we see no reason for holding that such appropriation is not valid.

* * * * *

* * * In this case the court below found that a well-established, well-recognized custom, of over forty years duration, of appropriating waters in the manner shown for the watering of live stock, existed in the State of Nevada. We think that our conclusion is not only justified by such well-established custom, but that it is fortified by the Act of Congress referring to streams upon the public domain, which provides that rights based upon priority of possession, which have vested and accrued and are recognized and acknowledged by local custom, shall be maintained and protected.

* * * * *

Counsel * * * urges that since all authorities hold that a diversion of water must be made with the intent to apply the same to a beneficial use, if the drinking by cattle constitutes a diversion then the necessary intent must be that of the cattle, since the owner could not make the cattle drink. It is certainly true that the owner cannot make cattle drink; if he built the most expensive pipe line conceivable and the most beautiful trough that human ingenuity and skill could produce for the cattle to drink out of, there would be no way of compelling the cattle to drink out of the trough instead of out of a puddle made by the overflow from the trough. No doubt it was this consideration which lead the hardy and practical livestock men of half a century ago to adopt the well- and widely - established custom which the court found to prevail.

It is clear to our minds that the conclusion of the trial court as to the appropriation alleged was right, and in view of the law as enunciated in *Re Calvo*, 50 Nev. 125, 253 Pac. 671, the judgment and decree should be affirmed.

It is so ordered.

The State Engineer's office has maintained that the only feasible method of exercising supervision of our public range is to so limit the right of various claimants to use of water for stock watering purposes as is consistent with the ability of the public range to support the live stock of those claimants who have a prior right to the use of any particular range area.

The decision as rendered clarifies to a considerable extent what has heretofore been a vexatious question as to what constitutes a vested right for the watering of live stock upon the public domain, and virtually means that whenever a livestock owner has been grazing his stock upon the public domain since a time prior to 1905, he would have a vested right to the use of the waters of any spring or watering holes which were used by stock in connection with such grazing use. It would seem that the decision is in line with the policy which has been pursued by this office during the past four years, since it gives to the person who has been making continuous beneficial use of any range a priority right to such use as against a subsequent user, or in other words the State Engineer must reject any application for permission to appropriate water for stockwatering purposes where the rights sought would deprive a prior user of the range in the vicinity of the watering hole applied for, even though such prior user had never installed any artificial means of diversion. We do not believe, however, that the decision will take away any rights which have already been granted in the form of permits, as such permits have always been granted subject to any prior or existing rights, and once a permit has been granted all that is necessary for the applicant to consummate his water right is to complete the appropriation in accordance with the terms of the permit. It would seem that those who now enjoy the privilege of a permitted right would have a certain amount of advantage over any one who claims a vested right, as the permitted right is determinate and fixed, while with respect to a vested claim, until such rights were adjudicated, the burden would always be on the claimant in any proceeding affecting his rights to substantiate his vested claim with evidence as to prior usage of range and water.

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CHAPTER XII

Opinions of Attorney-General

Following are several of the more important opinions of the Attorney-General rendered to the State Engineer during the past biennium in response to definite requests. These opinions have been condensed into brief statements, with the exception of those relating to Boulder Dam:

Carson River Adjudication—Opinion of April 27, 1929. The State Engineer is prohibited from proceeding in the administration and distribution of the waters of the Carson River for such time as the writ of prohibition issued by the Supreme Court in the matter of the Mexican Dam and Ditch Company et al. v. District Court of the First Judicial District is effective, and until the final determination of such matter in the Supreme Court.

State Engineer's Authority To Deliver Water To Users in Community Ditches—Opinion of July 20, 1929. The State Engineer is authorized and has authority to regulate and distribute the water among the various users under any ditch or reservoir where such user's right has been adjudicated or listed with the Clerk of any District Court; provided, however, that the water user has not transferred his ownership of such water to a ditch company or corporation in lieu of shares of capital stock. If such water rights were evidenced by shares of stock in a corporation the duty of delivering water to the water users would come under the jurisdiction of the parent corporation.

Boulder Dam—Opinion of February 10, 1930. (Questions) 1. Is there a limit, under our Constitution, to the amount the State Legislature can obligate the State for annual payments, where no bond issue is required?

2. If so, what is such limit?

3. Is there any reason why the State Legislature cannot act as a "medium" in case any certain amount of Boulder Dam power is allocated to the State, securing the necessary funds or bonds from other sources, with which to make proper contracts with the Government, and fully protect the interests of the State through a direct contract?

4. Could the State Legislature, under our Constitution, set up an organization or authority such as the New York "Port of Authority" to handle any particular business of the State, such as the "Boulder Dam power allocation," with proper authority to secure proper means of financing from other sources to properly safeguard the Government against loss from any power allocated the State and in turn fully protect the State's interest in a separate contract?

5. What is the procedure and the minimum time required to change the Constitution of the State of Nevada?

Opinion—Points 1 and 2. These two questions may be considered together, and they are answered by the provisions of section 3, article IX, of the Constitution of the State of Nevada, which provides:

For the purpose of enabling the State to transact its business upon a cash basis from its organization, the State may contract public debts; but such debts shall never in the aggregate, exclusive of interest, exceed the sum of three hundred thousand dollars; except for the purpose of defraying extraordinary expenses as hereinafter mentioned, every such debt shall be authorized by law for some purpose or purposes, to be distinctly specified therein, and every such law shall provide for levying an annual tax sufficient to pay the interest semiannually, and the principal within twenty years from the passage of such law, and shall specially appropriate the proceeds of said taxes to the payment of said principal and interest; and such appropriation shall not be repealed, nor the taxes be postponed or diminished until the principal and interest of said debts shall have been wholly paid. Every contract of indebtedness entered into or assumed by or on behalf of the State, when all its debts and liabilities amount to said sum before mentioned, shall be void and of no effect. Except in cases of money borrowed to repel invasion, suppress insurrection, defend the State in time of war, or if hostilities be threatened, provide for the public defense.

To enable the State to function on a cash basis, authority is given to incur indebtedness not exceeding three hundred thousand (\$300,000) dollars, exclusive of interest.

Answering your questions propounded under points 1 and 2, you are advised that the limit for which the State may become obligated is the sum of three hundred thousand (\$300,000) dollars, and this amount controls irrespective of the form which may constitute the evidence of such indebtedness.

Points 3 and 4. These questions are answered by that portion of section 3, article IX, reading as follows:

Every contract of indebtedness entered into or assumed by or on behalf of the State, when all its debts and liabilities amount to said sum before mentioned, shall be void and of no effect.

An arm or agency of the State would possess no greater right than the State itself. Any contract, therefore, entered into by such an agency as you describe would be a State contract.

I am of the opinion that the Legislature might legally set up an organization to handle Boulder Dam power allocation, but such agency could not enter into contracts which the State would be prohibited or incapacitated from entering into by virtue of the provisions of the Constitution.

Point 5. In reply to interrogatory No. 5, the Constitution may be amended under the provisions of article XVI, section 1. In the absence of a special session of the Legislature, a six-year period would have to elapse before an amendment could properly be made under this provision.

Under the amendment of article XIX of the Constitution adding section 3 relating to the initiative and referendum, the people are given the power to amend the Constitution by initiative petition. The

Legislature, however, has failed to provide a method for carrying into effect this amendment to the Constitution and, until such procedure is adopted by the Legislature, in our opinion this method may not be used.

Boulder Dam—Opinion of February 14, 1930. (Questions) 1. If a special session of the Legislature was held and a definite procedure laid down by them to proceed under article XIX, section 3, then by following such procedure could the proposed amendment to the Constitution of the State of Nevada be decided by the vote of the people at the general election in November, 1930?

2. If, in the regular session of the Legislature in 1931, such procedure should be laid down, then could the matter be determined by a special election following such regular session?

3. If the Boulder Dam power should be divided among the States by compact, or allocated to them by the Secretary of the Interior, with the understanding that such allocation could be assigned or transferred to municipalities or other agencies, allowing such municipality or agency to become primarily responsible to the Government for such allocation, could our State legally accept such allocation and make such assignment or transfer?

4. If assignment or transfer of such power is made, may the State legally specify the conditions under which such assignment or transfer be made, to fully protect the interests of the State, or may the State and such municipality or agency mutually agree on the conditions to be written into the contract between the Secretary of the Interior and such municipality or agency for the full and complete protection of the interests of the State?

Opinion—Before answering the foregoing inquiries, I desire to make a correction in the statement contained in Opinion No. 360 (opinion of February 10, 1930.) In this opinion it was stated that the limit of the State's indebtedness was the sum of three hundred thousand dollars. This statement is incorrect. Under the Constitution, as amended, the State's indebtedness shall not exceed the sum of one (1%) per cent of the assessed valuation of the State.

1. An answer to this question requires a conjecture as to the possible procedure to be adopted by the Legislature. It is usually customary in cases where an amendment to the Constitution is authorized by direct vote of the people, for the Constitution itself or the Legislature to provide a method of procedure to accomplish this purpose. The method usually adopted is for the Legislature to designate the number or percentage of electors whose names must be affixed to the petition requesting an amendment to the Constitution, to designate the time when such petition must be filed and the office where the same must be deposited, and then a further provision that the amendment be submitted to the people for their approval or disapproval at either a general or special election and a limitation of time before such election when the petition must be filed.

2. If the procedure adopted by the Legislature authorized the submission of the question at a special election, the amendment could then be determined at a special election.

3. If the rights of the State are fixed by compact or allocated by

the Secretary of the Interior and the State's primary obligation does not exceed the amount specified in the Constitution, the State could legally accept such allocation. An Act of the Legislature, however, will be required to divest the State's interest by assignment or transfer.

4. An answer to this question would require an intimate knowledge of this State's position as heretofore asserted before the Secretary of the Interior and in the several conferences had between this State and other States in the attempted reconciliation of their differences. In view of the fact that this office did not participate in any of these negotiations before the Secretary of the Interior nor was this office consulted regarding any of the legal phases arising thereunder, we have not sufficient information as to the stipulations or terms that may be lawfully inserted in the compact between the States or in the allocation of the Boulder Dam power by the Secretary of the Interior to this State and, therefore, cannot intelligently answer this question.

What procedure should the State Engineer follow when administering a stream where the date of priority in the Order of Determination does not agree with additional findings—Opinion of May 18, 1930. When priorities being served on a stream are cut below the date of a water user and there is a reference in the Order of Determination which states that the water user is entitled to the entire flow of said stream reaching his point of diversion, it therefore follows that the water user is entitled to water regardless of priority.

CHAPTER XIII

State Water Right Surveyors

In 1921 the State Legislature enacted the following amendment to the Water Law (Chapter 106, Statutes of 1921):

SEC. 91. All maps and surveys and measurement of water required under the provisions of this Act shall be made by State water right surveyor, as hereinafter provided.

Any engineer or surveyor who has a practical knowledge of surveying or engineering and who is familiar with land surveying and mapping and the measurement of water, and who is of good moral standing, shall be entitled to be appointed a State water right surveyor, upon application to the State Engineer, such applications to be in the form prescribed by the State Engineer.

Every applicant for appointment as State water right surveyor shall pay a fee of five dollars (\$5) at the time of making his application to the State Engineer. If the application be not granted the amount of such fee shall be returned to the applicant.

Whenever the State Engineer shall approve the qualifications of an applicant, he shall issue a certificate to such applicant designating him as a State water right surveyor, and such applicant shall, within ten (10) days thereafter, file with the State Engineer a good and sufficient bond, payable to the State of Nevada, in the sum of five hundred dollars (\$500), conditioned for the faithful performance of his duties as such officer. Said appointment may be revoked by the State Engineer at any time for good cause shown.

The State Engineer may require any applicant for appointment to the position of State water right surveyor to pass such reasonable examination as to his qualifications as may be provided by the State Engineer. The State Engineer may also provide such additional rules and regulations governing the qualifications and official acts of State water right surveyors as may be reasonable, and not inconsistent with this Act.

No survey, map, or measurement of flow of water, shall be approved by the State Engineer unless such survey is made by a State water right surveyor, as herein provided.

The State of Nevada shall not be liable for the compensation of any State water right surveyor, but said surveyor shall be paid by the party employing him.

Since this statute has been effective, 117 State water right surveyors have been licensed to practice before the office.* Of this number 80 are at the present time still in good standing, the remainder having been dropped from the roster on account of death, removal from the State or for other causes.

It is desired to express sincere appreciation for the spirit of cooperation shown by the practicing water right surveyors, as evinced by their

Tuscarora—Chester L. Woodward.

John W. King.

Winnemucca—W. W. Fisk.

J. A. Millar.

F. R. O'Leary.

H. H. Sheldon.

California

Alturas—A. M. Green.

Berkeley—R. E. Tilden, 2829 Benvenue Street.

Fort Bidwell—George T. Cline.

Sacramento—G. F. Engle, 2680 Ninth Avenue.

San Francisco—J. H. McClymonds, 65 Market Street.

D. R. Warren, 1303 Waller Street.

J. W. Williams, Mills Building.

Los Angeles—L. C. Stubbins, 858 S. Normandie Avenue.

Ventura—Robert B. Swadener.

Utah

Garrison—G. S. Quate.

Ogden—H. B. Way, Utah Construction Company.

Louis H. Baukol, Southern Pacific Company.

Salt Lake City—Norman Blye, 530 Scott Building.

L. G. Burton, 252 E. 13th Street.

C. J. Ullrich, 422-23 Ness Building.

Idaho

Twin Falls—Harold Wm. Merritt.

Oregon

Bend—L. D. Wiest, 1309 E. Third Street.

CHAPTER XIV

Upstream Storage Investigations

The unusually low run-off of several of the larger streams in the State during the past biennium has been responsible for renewed activity on the part of the irrigation interests toward the development of storage facilities. Studies that have been made of feasible storage sites bring forth the fact that it will be necessary to enlist the aid of Federal agencies in any future construction work, as the cost of these various projects will be so great that it will be imperative that the water user be granted a long period of time in which to repay these costs, as well as a low rate of interest on advanced moneys.

The State Engineer has worked with the Congressional representatives of the State and others during the past biennium to interest the United States Reclamation Service in our need for storage facilities on several of our streams, and as a result of these efforts the Commissioner of Reclamation, Dr. Elwood Mead, has indicated his intention of making a personal investigation of our irrigation projects. It is hoped that this visit of Dr. Mead will result in the initiation of a definite program of storage construction.

A brief resumé of the major storage projects now under way or contemplated in the future is herewith given:

TRUCKEE RIVER

On January 12, 1927, Congress approved an appropriation of \$50,000 for the purpose of making surveys and examinations of water storage reservoir sites on the headwaters of the Truckee River, investigation of dam sites at such storage reservoirs, examination and survey of lands susceptible of irrigation from waters so impounded, etc.

On May 29, 1928, a second deficiency Act was approved by Congress continuing the appropriation for the unexpended balance of the \$50,000 appropriation, authorizing examinations and surveys to be conducted of water storage reservoir sites on the Carson River, these examinations and surveys to be conducted in conjunction with the surveys of reservoir sites on the Truckee River.

These examinations and investigations were undertaken by the United States Reclamation Service and resulted in the compilation of a complete report on storage possibilities on the Truckee River. The report of the investigations of reservoir sites on the Carson River is not available at this time.

Excerpts from the Truckee River Report, written by E. B. Debler, are as follows:

The locality usually referred to as the headwaters of Truckee River is that portion of the drainage area lying above the Reno valley and largely located in the State of California. Some consideration has also been given the Spanish Springs and King Basin reservoir sites, located in what might be called the intermediate headwater region. Preliminary studies of the Washoe Lake site indicate that it has relatively little bearing on the utilization of the Truckee River by Truckee River irrigation canals and consideration

of the site is being left to be covered by the report on the Carson River investigations to be completed at a later date.

RESERVOIR SITES

On account of unsatisfactory foundation conditions storage reservoirs are impractical at the following sites: Squaw Valley, Prosser, Twin Valley, Henness Pass, Holcomb, Martis Valley, Boca, and King Basin.

At the Squaw Valley, Twin Valley and Holcomb reservoir sites the dam sites are in each case apparently on glacial moraines largely made up of sand, gravel and cobbles through which leakage losses would be large, while the cost of a safe dam would in each case be high per acre foot of storage capacity. At the Henness Pass reservoir site there is grave danger of excessive leakage through the lava ridge bordering the reservoir site on the south and west. At the Martis Valley site heavy leakage is anticipated through the west abutment which is largely of loose sand and gravel with the cost for any plan to cut off such leakage unduly high. At the Prosser, Boca and King Basin reservoir sites lava formations at and above stream levels would be conducive to undue percolation losses although the dams themselves could be built to a safe design.

Upper Martis Creek and Webber Lake reservoir sites are limited in water supply and the cost of dams would be excessive per acre foot of storage capacity. While the impounding dam at the Dog Valley site would not be excessive in cost nor is there apparently any material danger of leakage, the water supply available from the local watershed is too small to warrant storage construction for agricultural purposes. A feed canal from Little Truckee River to augment such water supply would be excessive in cost. Little Truckee Canyon reservoir site has an excellent dam site but its capacity is limited to a maximum of 42,000 acre feet. The cost for this capacity would be somewhat less than for an equal capacity at the Stampede site which is, however, adapted to a maximum capacity of 150,000 acre feet. The water supply for the two reservoir sites is practically identical.

Donner Lake. Constructed recreational facilities and highways will not permit raising the level of the lake much, if any, above the high level of past operations. Avoidance of unsightly shores in turn preclude extensive lowering of the lake during the late summer months, when recreational uses and demand for irrigation are at a maximum. The plan of operation contemplated is to lower the lake but little during the irrigation season and to withdraw all storage in the non-irrigation season at which time Donner Lake waters would be furnished the Truckee River power plants in lieu of waters now supplied from Lake Tahoe, establishing a credit in Lake Tahoe for owners of Donner Lake storage. Waters so accumulated at Lake Tahoe would be released upon demand. Low levels in Donner Lake would occur at times when unnoticed

by the general public. A range of 15 feet in lake levels is contemplated with a storage capacity of 11,600 acre feet. A feed canal roughly 6,000 feet long would bring in waters from Cold Creek and the combined supply would then in most years be materially greater than the proposed storage capacity.

The owners of lake shore property have asked \$300,000 for the privilege of lake regulation which amount, together with the cost of the necessary changes in the present outlet works, the deepening of the outlet channel and the feed canal, would bring the total cost to \$396,000.

Independence Lake Reservoir Site. The plan of utilization is in every way similar to that described for Donner Lake, the storage capacity with a proposed lake range of 25 feet being 16,300 acre feet and the total cost, including \$100,000 for the privilege of lake regulation, \$210,000.

Stampede Reservoir Site. The site occupies a sparsely timbered mountain meadow on Little Truckee River where this stream is crossed by the Truckee-Loyalton road. At the dam site, located immediately below the mouth of Stampede Creek, the valley width at stream level is 350 feet, the abutments sloping upward sharply. Extensive drilling and test pits show the abutments to be but thinly mantled with loose materials which reach a maximum depth of 30 feet on the valley floor, the underlying rock being a conglomerate tuff suitable for foundation of an earth dam and unlikely to be subject to material leakage losses. For a capacity of 150,000 acre feet, the maximum for which the site is adapted, the dam would be 195 feet high with a top length of 1,300 feet and the reservoir cost for this capacity is estimated at \$2,959,000. The cost for a reservoir of 42,000 acre feet capacity has been roughly estimated at \$1,245,000, with costs for intermediate capacities in direct proportion. The cost of a feed canal from Prosser Creek diverting about one mile above Hobart Mills and with a total length of 12 miles and capacity of 300 second feet is estimated at \$400,000.

Little Truckee Canyon Site. This site is located on Little Truckee River just below Stampede site. At the dam site located about four miles from Boca, California, the valley width at river level is 80 feet with the sides sloping steeply. Diamond drilling and test pits show a tuff formation somewhat weathered at the surface and covered to a maximum depth of 15 feet. For a capacity of 42,000 acre feet, the maximum for which the site is adapted, the dam would be 155 feet high and 700 feet long at the top. The reservoir cost for an earth fill dam for this capacity would be \$1,002,000.

WATER SUPPLY

The principal controlling factors in determining Truckee waters available for additional storage development are the requirements of the Newlands project for diversion by the

Truckee canal with a capacity of 1,000 second feet, at Derby Dam, and the requirements for the power plants on Truckee River between Iceland, California, and Reno, Nevada.

The Newlands project irrigation works were by contract with the Truckee-Carson Irrigation District transferred to that district for operation at the end of 1926. This contract dedicates to the district out of the water rights of the United States a prior supply adequate for the irrigation of 80,000 acres of Carson lands served from Lahontan reservoir and 7,500 acres of Truckee lands.

A study of the demands on Truckee River for the district lands based on inflow to Lahontan reservoir of Carson River waters as in the past indicates that the Truckee canal would not have to be operated to full capacity at all times in order to furnish waters which can beneficially be used for irrigation. It was further found, however, that surplus Truckee River waters are largely winter waters which cannot be withheld in the headwaters of the Truckee River but must pass down the stream for use by the power plants.

BENEFITS TO SIERRA-PACIFIC POWER COMPANY

The benefits that might accrue with additional storage are intimately dependent on the administration of the tentative Truckee River decree. Should all artificial Lake Tahoe storage be accorded the Newlands project and storage be developed for that project only, then the water capacity of existing plants would be filled except for very short periods of infrequent intervals. Such a contingency appears unlikely. Starting with the probable result of Truckee River administration, additional storage, wherever used, will increase power output in an amount conservatively estimated at 1,000,000 KWH annually after allowing for load fluctuation in the power company's operations. Tentatively a value of .4 mill might be placed on this power or \$4,000 per year.

CONCLUSIONS

- (a) Storage possibilities in Truckee River headwaters permit a wide range of irrigation development.
- (b) Storage costs, per acre benefited, increase rapidly as the area benefited is expanded.
- (c) While no estimates have been prepared on the cost for added distribution works in Reno valley, it is apparent that the combined costs for storage and distribution works will not at this time warrant the development of lands now entirely without water and located largely in Spanish Springs Valley.
- (d) The area of Truckee lands that may be served with water can be expanded to 18,000 acres at moderate cost for distribution works but the undue increase in storage costs with increasing areas does not warrant a large increase in the irrigated Truckee lands area.

RECOMMENDED PLANS

M—Use of Lake Tahoe Waters by Reno Valley—Not designated and would be taken into consideration only when costs

are apportioned. Area of Truckee lands to receive water supply—In Truckee-Carson Irrigation District, 7,500 acres; new lands under Truckee canal, 2,500 acres; total, 10,000 acres. Area in Reno valley to receive added water supply—Present canals, 26,800 acres; lands with partial supply, 5,100 acres; total, 31,900 acres. Additional storage facilities to be provided—Little Truckee Canyon reservoir, capacity 42,000 acre feet, with exchange privilege in Lake Tahoe. Cost of storage feature—\$1,002,000 with earthfill dam.

N—Use of Lake Tahoe Waters by Reno Valley—Not designated and would be taken into consideration only when costs are apportioned. Area of Truckee lands to receive water supply—10,000 acres. Area in Reno valley to receive added water supply—Present canals, 26,800 acres. Additional storage facilities to be provided—Donner and Independence Lakes with exchange privilege in Lake Tahoe. Cost of storage feature—\$606,000.

RECOMMENDATION

It is suggested that consideration be given by interested parties to Plans M and N of the preceding paragraphs and here designated Plans I and II. In allocating benefits, no part of the storage cost has been allocated to the power company, it being suggested that the company in return for such benefits create pondage in the immediate vicinity of its plants to eliminate operating wastes. With both plans an area of 2,000 acres is indicated as the equivalent of municipal use in Reno and Sparks. With the plans for storage on Little Truckee River, 5% of the storage cost has been tentatively allocated to Reno and Sparks on account of flood control benefits. No part of the cost is allocated to the 7,500 acres of Truckee lands now within the Truckee-Carson Irrigation District, the benefit to this area being considered an off-set to the use of Lake Tahoe storage capacity for holdover purposes. The allocations shown are tentative only and the plan and allocation should be considered a suggestion only for a concrete feasible development:

	— PLAN I — Donner and Independence Lakes	— PLAN II — Little Truckee Canyon or Stampede
Storage Reservoirs		
Reservoir capacity, acre feet.....	27,900	42,000
Storage cost, total.....	\$606,000	\$1,002,000
Storage charged to irrigation.....		\$952,000
Area benefited (in acres)—		
Reno valley—		
Present canals	26,800	26,800
Partial supply lands.....		5,100
Municipal use	2,000	2,000
Truckee lands (outside district).....	2,500	2,500
Total.....	31,300	36,400
Cost per acre benefited.....	\$19	\$26

While Plan II costs per acre are somewhat higher than Plan I, the apparent advantage may readily be lost through increased costs for the privilege of controlling the lakes and through unforeseen interference in their operation by interests concerned only with recreational matters.

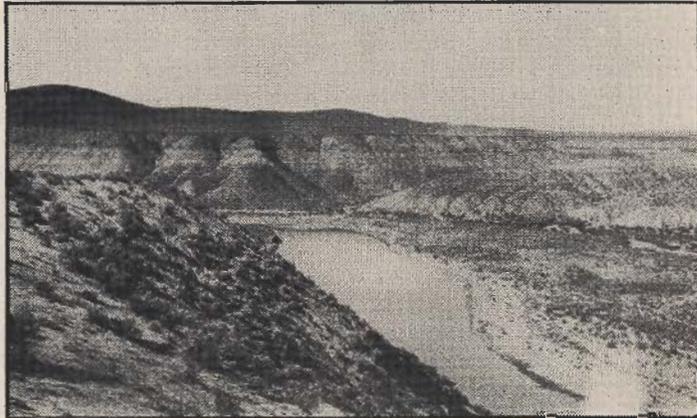
During the past biennium many conferences have been held between the various water users diverting water from the Truckee River and its tributaries looking toward an amicable settlement of the controversial problems that must be concluded before the construction of upstream storage is possible.

On December 5, 1930, a bill was introduced in Congress requesting an appropriation by the Government of \$750,000 for the purpose of constructing upstream storage.

WALKER RIVER

Investigations of additional storage or reservoir sites on the Walker River have been under way for several years. The Topaz Lake Reservoir has a capacity of 50,000 acre feet, which may be increased to 87,000 acre feet by the construction of a 3,500 foot embankment on the south rim of the lake and increasing the size of the feeder canal from the West Walker River.

There is being conducted, at the present time, an investigation of a



Oreana Reservoir Site On Humboldt River Near Lovelock, Nevada.
(Courtesy of Lovelock Review-Miner)

reservoir site in Hoye Canyon, and when completed will give a basis for comparison as to which one of the two reservoir sites is the most economical.

HUMBOLDT RIVER

There are several reservoir sites on the Humboldt River that are possible of development with a reasonable cost per acre foot for storage. There is no question but that construction of storage reservoirs will be undertaken on this stream as soon as Federal aid is available or funds can be secured through the sale of bonds.

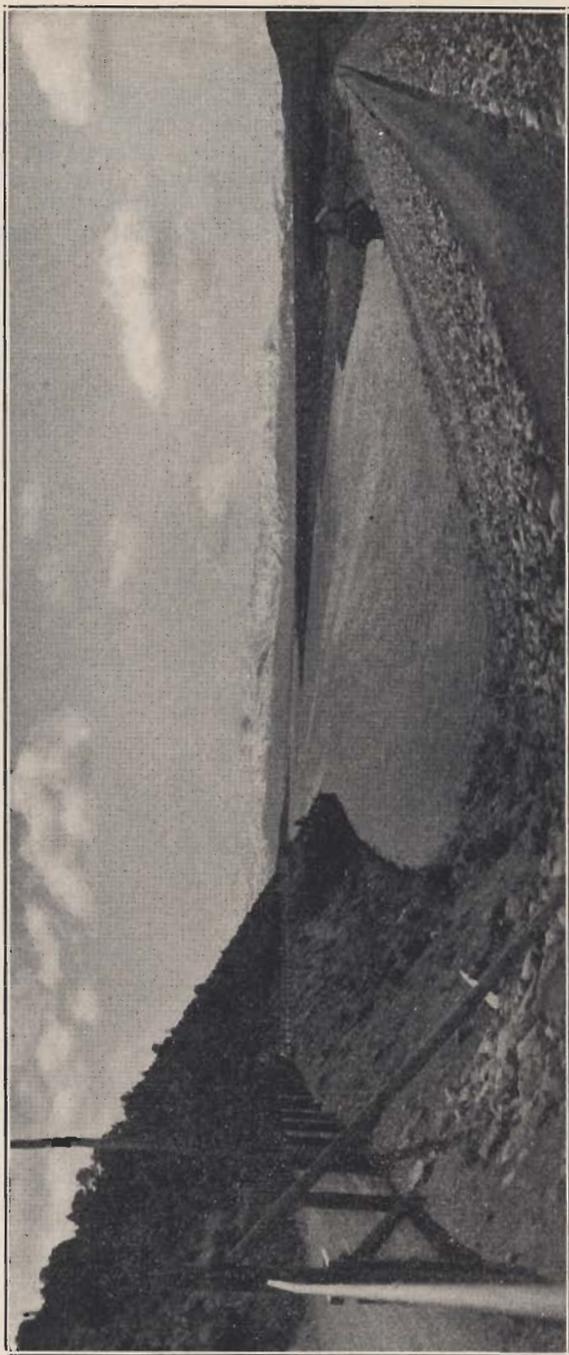
CARSON RIVER

Investigations of upstream storage on the Carson River have been intermittently carried on for a period of several years. There are several controversial problems among the various water users that must be settled, either by arbitration or by Federal Court decree,

before a definite storage program can be started which will lead to the initiation of actual construction.

MUDDY RIVER

During the year 1929 an application was received by the State Engineer's office for permission to appropriate 10,000 acre feet of the waters of Muddy River for storage purposes. This 10,000 acre feet is to be applied to 8,000 acres of land now holding a partial water right. Construction of this proposed reservoir site is being held in abeyance until such time as it is possible to secure financial aid from the Federal Government.



Bridgeport Reservoir—Capacity 42,000 Acre Feet.
(Courtesy Walker River Irrigation District of Nevada)

CHAPTER XV

Irrigation Districts and Canal Companies in Nevada

The information herewith presented has been gathered by the office of the State Engineer through the medium of questionnaires that have been mailed to the officials of the various districts in the State of Nevada. This office has been in receipt of numerous inquiries during the past biennium from financial institutions, loan companies and homeseekers requesting information of the salient features of our various projects.

It is desired to express the appreciation of this office for the cooperation of irrigation district and canal company officials in responding to requests for information.

WALKER RIVER IRRIGATION DISTRICT

By S. P. KAFOURY, *Secretary*

Organized—April 14, 1919.

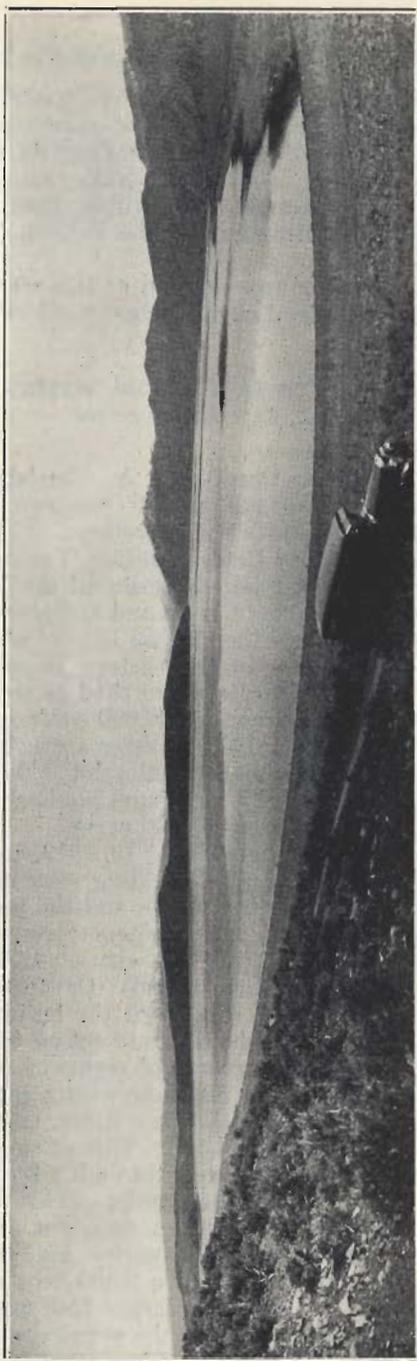
Officers—Joseph I. Wilson, President; A. Charlebois, Vice President; George Parker, Treasurer; Frank W. Simpson, Director; Fred M. Fulstone, Director; S. P. Kafoury, Secretary.

District Office—Lyon County Bank Building, Yerington, Nevada.

Walker River Irrigation District comprises all the irrigable land of the East, West and Main Walker Rivers and tributaries, in the State of Nevada, with the exception of the Walker River Indian Reservation. These rivers have their source in the eastern slopes of the Sierra Nevada Mountains, drawing from a water shed of some 3,000 square miles. The total area of the district is 260,000 acres, of which 160,000 acres are irrigable. At present, 151,153 acres are held under private ownership, desert land or homestead claim by 450 owners, with a minimum holding of 3 acres and a maximum holding of 13,720 acres. The irrigated area is approximately 85,000 acres.

The electors of the district on September 19, 1919, authorized a bond issue of \$918,500 for the purpose of building reservoirs to conserve the run-off during the nonirrigating season and the peak of the floods which occur normally in June. The Bridgeport reservoir which was completed in December, 1924, with a capacity of 42,000 acre feet, is situated in Bridgeport Valley, Mono County, California, on the East Walker River. The construction comprised the building of an earth embankment of 132,000 cubic yards, concrete cut-off walls and syphon spillways. The cost, including purchase of rights of way, in bonds at par, is \$422,000. The Topaz Lake reservoir with a capacity of 50,000 acre feet, is situated near the West Walker River, and was completed in 1922, at a cost, in bonds, of \$424,500. This reservoir is a natural lake. Water is conveyed to the reservoir through a feed canal of about 650 second feet capacity. The outlet works consist of a 2,100 foot tunnel of a diameter of 9½ feet, and an open cut of 10,000 feet in length to the river. This reservoir capacity may be increased to 87,000 acre feet by the construction of a 3,500 foot embankment on the south rim of the lake and adding a larger feed canal. This, however, will receive consideration only in the event the present investigations conducted in Hoyer Canyon prove less economical.

The rights to the natural flow of the Walker Rivers were adjudicated



Topaz Reservoir—Capacity 50,000 Acre Feet.
(Courtesy Walker River Irrigation District of Nevada)

and set out in Decree No. 731 of the United States District Court of Nevada. These vested rights range in priority from 1860 to 1907 for 83,613 acres, of which 57,784 acres are situated in Walker River Irrigation District. The average duty of water in the district is 3.5 acre feet of water per acre. The average growing season is six months, and irrigation generally commences about March 20 and ends about September 10. Irrigation water is served entirely by gravity flow.

The schedule of bonds maturities of the district's original issue is as follows:

January 1, 1931.....	\$46,000
January 1, 1932.....	56,000
January 1, 1933.....	65,000
January 1, 1934.....	73,000
January 1, 1935.....	82,000
January 1, 1936.....	91,000
January 1, 1937.....	101,000
January 1, 1938.....	120,000
January 1, 1939.....	138,000
January 1, 1940.....	146,500
Authorized issue	\$918,500

These bonds are dated January 1, 1920, and bear interest at six per cent per annum payable semiannually. Of the authorized issue, \$890,500 are now outstanding.

The average assessment per acre for 1930, is as follows:

For interest	\$0.90
For redemption .....	.71
Current expense .....	.12
For operation and maintenance .....	.10
Water distribution* .....	.06
Total	\$1.89

*River administration only.

These assessments do not take into account the ditch riders' services paid for by ditch companies, nor do they include assessments for interest and retirement of Local Improvement District Bonds, which assessments do not affect the district in general. Assessments for district purposes are applied to the county tax roll and collected in the same manner as State and county taxes. The delinquent rate over a period of years is negligible, being around 2 per cent.

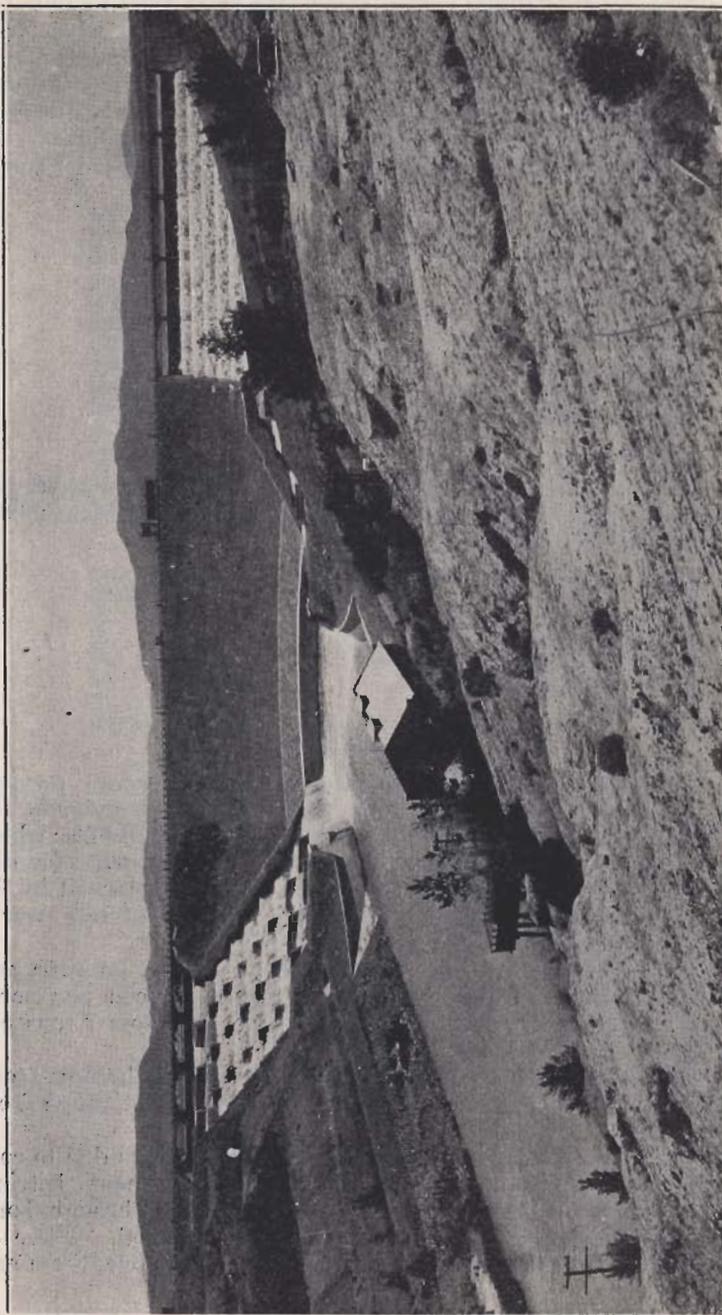
The principal crops grown are alfalfa, wheat, barley, potatoes and alfalfa seed—average yields as follows: Alfalfa, 4 tons per acre; wheat, 1¼ tons per acre; barley, 1 ton per acre; potatoes 7 tons per acre; alfalfa seed, 250 pounds per acre.

The average date of the last frost is May 20, and of the first frost, September 15. The elevation of the lands in the district range from 4,500 to 5,000 feet.

For the purpose of furnishing relief to certain localities due to conditions peculiar only to those sections, local improvement districts have been formed for the purpose of securing funds through bond issues which are lienable only against the areas affected. Three of these local districts have been formed, namely, numbers one, three and four.

Local No. 1

Area—13,850 acres, located in the northern portion of Smith Valley.



Lahontan Dam and Power Plant Spillways Operating Truckee-Carson Irrigation District.
(Courtesy D. S. Stuver, Project Manager)

Purpose—Drainage; 12 miles of open drains now completed.
 Bonded Debt Authorized—\$30,000. 6%, maturing annually beginning July 1, 1930, for 10 years.
 Bonds Redeemed—\$4,000.
 Bonds Outstanding—\$20,000.
 Bonds Unissued—\$6,000.
 Average assessment for 1930, for interest and redemption, 51 cents per acre.

Local No. 3

Area—41,745 acres, comprising all lands of the east side of Mason Valley from the East Walker River bridge south to the northern boundary of the Schurz Indian Reservation, with the Main Walker River as the western boundary.

Purpose—Drainage: 16 miles of open drains and laterals now completed. Approximately 10 miles more contemplated.

Authorized Bond Issue—\$90,000. 6%, maturing annually beginning July 1, 1929, for 20 years.

Bonds canceled and retired—\$8,000.

Bonds Outstanding—\$35,000.

Average assessment per acre for 1930, 16 cents.

Local No. 4

Area—10,382 acres located in the southern portion of Smith Valley and comprising all the lands irrigated by the Saroni Canal. Organized for the purpose of purchasing the irrigation canal and laterals, and for the reconstruction and repair of the same.

Authorized Bond Issue—\$120,000. 6%, maturing January 1 and July 1 of each year from January 1, 1927, to January 1, 1946, inclusive.

Bonds sold—\$85,000.

Bonds retired—\$10,000.

Bonds outstanding—\$75,000.

Average assessment per acre for interest and redemption for 1930, \$1.75.

Average assessment per acre for operation and maintenance, including ditch rider, 1930, \$0.40.

General

In addition to the crops mentioned, the development of the dairy industry is notable. Dairying, hog raising, poultry and sheep and cattle contribute in a very large measure to the success of Walker River Irrigation District. A safe estimate of the value of agricultural products grown in the district is \$2,000,000.

NEWLANDS RECLAMATION PROJECT, NEVADA

Truckee-Carson Irrigation District

By D. S. STUVER, *Project Manager*

Historical and Organization

The Newlands Project, located in western Nevada, embraces lands mainly in Churchill and Lyon Counties. This project was the first of the numerous Federal projects to be investigated and upon which construction work was commenced by the United States Reclamation Service under the Act of Congress approved June 17, 1902, commonly

known as the Reclamation Act. Actual construction work was commenced during September, 1903, and water was delivered to project lands from the new system of works during 1905. The project was operated and maintained by the United States Bureau of Reclamation until December 31, 1926, on which date control was transferred to the Truckee-Carson Irrigation District under a contract dated December 18, 1926. The irrigation district was organized on November 25, 1918, under the laws of the State of Nevada.

The business and affairs of the district are managed and conducted by a board composed of seven directors, the present officers being W. A. Harmon, President; Mrs. L. V. Pinger, Secretary; Geo. B. Snow, Treasurer, and D. S. Stuver, Project Manager. The district office is located in Fallon, Nevada.

Project Areas

The Truckee-Carson Irrigation District embraces within its boundaries a total area of 108,000 acres, of which 77,000 acres are irrigable, in addition to which the district has acquired custodial rights from the United States for the use and control of a considerable area of public lands outside of and adjacent to the present boundaries of the district, included in which are approximately 18,000 acres of pasture land under fence in the Carson Lake area. For development purposes the project irrigable area has been fixed at 87,500 acres of agricultural lands and 50,000 acres of pasture lands.

Irrigable areas totaling 65,492 acres are now covered by water right contracts, of which 21,775 acres are vested right lands which do not share in the repayment of original construction costs due to recognition of old natural flow rights. New water rights to the extent of 1,374 acres have been sold by the district since early in 1929. An area of about 55,000 acres was irrigated during 1930, being served by gravity flow, water deliveries being made to about 710 farms and to the Carson Lake pasture.

Pumping from drains was resorted to during the latter part of the 1929 season to supplement the water supply available from the Carson River for the irrigation of limited areas in the Stillwater and Island districts.

Water Supply

The project water supply is derived from the Truckee and Carson Rivers, the flow of these streams being combined for storage in Lahontan reservoir on the Carson River, a diversion canal 31 miles in length, with a capacity of 1,500 second feet, from the Truckee River having been provided to carry water into this reservoir. Bench lands to the extent of about 5,800 acres were irrigated during 1930 directly from this canal. The outflow from Lake Tahoe into the Truckee River is controlled by the irrigation district under a stipulated decree entered in the United States District Court during June, 1915.

Main Features

The main features of the project system of works include the control dam at the outlet of Lake Tahoe, a diversion dam in the Truckee River near Derby, the Truckee canal, the Lahontan dam and reservoir, the Carson River diversion dam, 582 miles of canals and laterals of capacities varying from 15 to 1,500 second feet, 270 miles of deep

open drains, 51 miles of telephone lines constructed for use in connection with the irrigation distribution system and transferred under an agreement to Churchill County, a pipe-line system consisting of about 9 miles of six-, four- and three-inch diameter wood stave pipe in the Fernley district, an 1,875 KW hydroelectric power plant at Lahontan Dam and 220 miles of 11000-6600-2300 volt single and three-phase rural electrical distribution lines. The type of construction is permanent, concrete and steel having been used to a large extent.

Project Costs and Charges

Commencing during September 1903, reclamation work, in various phases, has been in continuous progress. Following the transfer of the project to the irrigation district on December 31, 1926, work was continued until during May, 1929, by the United States, under special contracts with the district, for the completion of supplemental construction on drains and Truckee canal improvements. Expenditures made by the United States to the end of May, 1929, for all work except operation and maintenance, amounted to a total of about \$7,915,362, allocated to the following major cost features:

Original Construction:

Examination and surveys	\$457,755
Storage system, Lahontan dam, Lake Tahoe dam, investigations, etc.	1,699,766
Canal system	2,300,176
Lateral system	1,569,926
Drainage system	89,100
Flood protection (old Carson River).....	131,821
Power System—Lahontan power plant, Lahontan-Fallon transmission line, etc., not including rural power lines constructed by district.....	324,794
Lands, farm units, etc.	93,936
Permanent improvements	118,319
Telephone system	42,642
Subtotal, original construction	\$6,828,235

Supplemental Construction:

Canal System—Truckee canal improvements and Derby dam wasteway.....	\$92,051
Lateral system—Fernley pipe lines.....	16,003
Drainage System—Under contracts of January 22, 1921, and April 30, 1925, between United States and Irrigation District	955,243
Lands, Farm Units—Leveling farm lands under water right contract	23,830
Subtotal, supplemental construction.....	1,087,127
Total, original and supplemental construction.....	\$7,915,362

Under the Act of Congress approved May 25, 1926, the United States wrote off, as a definite loss to the Government, an amount of \$4,437,820, not including \$211,292, also charged off on account of an operation and maintenance deficit, as the result of errors, mistakes and reduction of irrigable area, leaving a construction balance after the write-off of \$3,477,542.

Repayments by the project water users to the United States for original and supplemental construction are based upon a present total amount of \$3,305,882. Original water right construction charges are

variable, ranging from \$22 to \$107 per irrigable acre, payable to the United States, without interest, over a period of not to exceed 40 years. The present charge for the sale of water rights is \$54 per irrigable acre.

Except for the activities of the irrigation district, subsequent to its assumption of control on December 31, 1926, funds for project development purposes have been advanced, without interest, by the United States.

The total cost of district operations from January 1, 1927, to July 1, 1930, amounted to \$689,544, of which the major items were as follows:

Operation and Maintenance of storage and distribution systems*.....	\$275,405
Operation and Maintenance of drainage system.....	40,260
Construction of additional new drains	44,352
Construction of electrical power distribution system	179,344
District Board expense	26,239
Adjudication of Carson River water rights.....	19,275
Operation and Maintenance of electrical power distribution system.....	36,689
Reconstruction Lahontan power plant turbines.....	16,558
Lahontan power plant operations, charge for water delivered, credited to O. & M. of storage and distribution systems.....	25,354
Carson Lake Pasture, O. & M. and construction.....	20,600
Fernley Pipe Line System, O. & M. and extensions.....	5,468

*Includes Truckee River water right expenses and upstream storage investigations.

Water Rights

A portion of the Carson River water rights claimed and used by this project have priorities extending from 1862. All of the unappropriated waters of the Carson and Truckee Rivers have been acquired and reserved by the United States for irrigation, storage, power, domestic and other purposes on the Newlands Project with priorities as of July 2, 1902.

An action, initiated by the United States with the filing of a complaint on March 3, 1913, in the United States District Court in Carson City, Nevada, has been pending for the final adjudication of the relative rights to the waters of the Truckee River. This action resulted in the entering of a temporary restraining order by the court on February 13, 1926, in accordance with which the regulation and distribution of the stream flow has been handled by a Federal Water Master. Negotiations now in progress between the interested parties indicate that this entire matter, together with arrangements for Truckee River upstream storage development, will be settled by stipulation for a final decree within the near future.

A suit for the adjudication of the water rights of the Carson River and its tributaries has been pending before the United States District Court in Carson City since May 11, 1925, on which date a bill of complaint was filed by the United States. Considerable testimony in this matter has already been presented, and a date has been set during February, 1931, for the continuation of the case, which involves all of the water rights on the stream.

Electrical Power Development

The care, operation and maintenance of the Lahontan power plant was transferred to the district, subject to the existing lease on the plant, under the contract between the United States and the district

dated December 18, 1926. This plant, which derives its water supply for power generation from the Truckee canal and Lahontan reservoir, together with the Fallon-Lahontan 33,000 volt transmission line and Fallon substation, was leased by the United States to the Canyon Power Company for a ten-year period beginning December 1, 1924. This lease, together with certain power lines and equipment owned and constructed by the Canyon Power Company and its subsidiary, the Nevada Valleys Power Company, was purchased by the Sierra Pacific Power Company, and operation of the plant by the latter company was assumed on July 1, 1930. This transfer included the Virginia City-Lahontan transmission line and other lines constructed by the power company serving the towns of Hazen, Lovelock and Rochester and mining and other properties in the vicinity of those places.

Revenues from the power generated at the Lahontan plant are made available to the irrigation district and have resulted in considerable benefit to the project water users by being applied upon drainage and other construction repayments to the United States and for the reduction of general operation and maintenance charges. The installation of additional power generating equipment at Lahontan is contemplated by the district for increasing power revenues and conservation of water supply. Revenues to the district from the power plant lease for the period January 1, 1927, to July 1, 1930, were as follows:

	Year				Total
	1927	1928	1929*	1930†	
Gross returns on KWH generated by lessee.....	\$18,870.97	\$25,433.14	\$14,440.66	\$5,934.47	\$64,679.24
<i>Less Cost to District for Operation and Betterments—</i>					
Charge for water (credit to O. & M. of project works)	5,929.35	8,081.01	6,003.34	3,385.12	23,398.82
Allowance to lessee for stubbing poles	1,836.84	118.62	.....	.....	1,955.46
Reconstruction of turbines.....	.....	6,472.32	10,085.49	.....	16,557.81
Total cost to district.....	\$7,766.19	\$14,671.95	\$16,088.83	\$3,385.12	\$41,912.09
Net cost to district.....	\$11,104.78	\$10,761.19	<i>\$1,648.17</i>	\$2,549.35	\$22,767.15

*Power plant shut down September 1, 1929, to March 10, 1930, inclusive. †January 1, to June 30. Italic figures denote deficit.

Shortly following the transfer of the project to the irrigation district, the construction of power lines and installation of equipment to serve rural consumers was quite rapid.

Commencing with the formation of Local Improvement District No. 1, embracing portions of the Sheckler and Soda Lake Districts of the project, for which an election was held on August 30, 1927, eight local improvement districts have been formed under section 49½ of the Nevada Irrigation District Act, resulting in the completion of lines and facilities for the serving of electricity to most of the farms on the project with the exception of the Old River District, north of Fallon. A few miles of power distribution lines had previously been constructed by farmers acting cooperatively without formal organization to serve a portion of the area south of Fallon.

Work in Local Improvement Districts Nos. 8 and 9, the Island and Leeteville Districts, respectively, the last districts undertaken, was completed during November, 1929.

For construction work in the local improvement districts above mentioned, funds were derived from the sale of three-to-twelve-year

bonds, bearing interest at the rate of six per cent, payable semiannually. Total bonds sold for the eight improvement districts amounted to \$152,400. The local bank and project water users purchased practically all of the bonds offered immediately following their issuance. To provide for the repayment of these bonds, benefits were apportioned against the lands affected and charges for principal and interest are collected on the county tax roll. The total construction cost per consumer's unit, including transformer and meter, upon which basis apportionments were made, ranged from \$291.27 to \$576.59 for the eight districts involved.

For the purpose of operation and maintenance, all power lines on the project constructed by local improvement districts and private individuals have been transferred to the irrigation district.

On July 1, 1930, approximately 220 miles of single and three-phase 11000-6600 and 2300 volt distribution lines were being operated by the district, serving about 450 consumers, including the town of Fernley. Extension of facilities to serve the town of Wadsworth is expected to be completed at an early date. Three substations, a portion of the main line into the town of Fernley, and the Harmon-Stillwater main line, about 12 miles in length, were constructed by and at the expense of the district to aid in the development of the rural power system.

Salient Features Regarding Newlands Project, Nevada

Construction commenced by United States, September, 1903.

First irrigation from works constructed by United States in 1905.

Control, operation and maintenance transferred to Truckee-Carson Irrigation District on December 31, 1926, by contract between United States and district, dated December 18, 1926.

Water Supply—Lake Tahoe, Truckee and Carson Rivers and tributaries.

Truckee Canal—31 miles in length, capacity 1,500 second feet.

Truckee River Diversion Dam—16 concrete sluiceways, total height 22 ft., crest length 171 ft., completed 1905, cost \$114,398.

Lahontan Dam—Earth and gravel fill, concrete spillways, total height 124 ft. (inc. cut-off walls), crest length 1,400 feet, reservoir capacity 294,400 acre feet at elevation 4164 ft., completed June 1915, cost \$1,324,782.

Carson River Diversion Dam—28 concrete sluiceways, total height 20 ft., crest length 240 ft., completed 1905, cost \$80,770.

Lake Tahoe Dam—Outlet into Truckee River; concrete sluiceway regulator, total height 14 ft., crest length 109 ft., reservoir capacity 840,000 acre feet between elevations 6223.0 ft. and 6230.0 ft., control acquired by United States under court decree entered June 4, 1915, cost \$139,500.

Canals and Laterals—Total length 582 miles, as follows:

Capacity 801 to 1,500 second ft., 42 miles.

Capacity 301 to 800 second ft., 62 miles.

Capacity 50 to 300 second ft., 82 miles.

Capacity less than 50 second ft., 396 miles.

Drains, Open—Total length 270 miles.

Telephone System—Total length 51 miles.

Pipe Lines—Domestic and stock water, 9 miles wood stave pipe, 6-inch, 4-inch and 3-inch diameters.

Carson Lake Pasture—18,000 acres under fence in community irrigated pasture operated by district.

Lahontan Power Plant—1875 KW capacity, hydroelectric, three generating units, served by 78-inch steel penstock from Lahontan reservoir and by 72-inch steel penstock from Truckee canal.

Electrical Rural Power System—220 miles of single and three-phase, 11000-6600 volt and 2300 volt distribution lines. Substations: Harmon-Stillwater, 300 KVA capacity; Soda Lake-Sheckler, 100 KVA capacity; Northam-Swingle Bench, 75 KVA capacity; Stillwater pumping plant, 300 KVA capacity.

Irrigation—Normal deliveries of water almost entirely by gravity, although three pumping plants installed for emergency use of drainage waters.

Elevation of Irrigable Lands—3,915 feet to 4,180 feet.

Average Length of Irrigation Season—March 1 to December 1.

Area Irrigated in 1930—55,000 acres.

Principal Crops Grown—Alfalfa, grain and corn, potatoes, cantaloupes, truck garden.

Principal Industries—Dairying, stock feeding and honey, turkey, poultry, swine, sheep and rabbit raising.

Principal Markets—Nevada and Pacific Coast.

Farm Population—2,600.

Principal Project Towns—Fallon, Fernley and Hazen.

Transportation—Southern Pacific Railroad, Lincoln and Victory Highways.

Operation and Maintenance Charges, Year 1930—For O. & M. of irrigation system, \$1.40 per irrigable acre; for O. & M. of drainage system, 22 cents per irrigable acre under water right and 11 cents per irrigable acre lands not covered by water right.

WASHOE COUNTY CONSERVATION DISTRICT

By THOS. R. KING, *Engineer-Manager*

The Washoe County Water Conservation district was legally formed in June, 1929.

The present officers of the district are as follows: C. W. Mapes, President; J. L. Raffetto, Vice President; J. E. Johnson, Secretary; J. F. Kleppe, Treasurer; Arthur Peckham, Director; R. C. Turrittin, Director; Peter Thomsen, Director.

The attorney for the district is Lester Summerfield and the engineer for the district Thomas R. King.

The district offices are located in the Cladianos Building, Reno, Nevada.

The district embraces 32,840 acres within its boundaries, of which approximately 26,000 acres are irrigated each year.

The source of water supply is the Truckee River. The distribution is through a system of thirty-three canals varying in capacity from five to one hundred cubic feet per second; and in length from one to thirty-seven miles.

The lands irrigated lie in a compact body surrounding the cities of Reno and Sparks in Washoe County, Nevada, in the territory generally known as Truckee Meadows.

Approximately one-half of the area is bottom land where the soil is generally uniform, of good workability and good productivity. The

balance of the area is on the gentle slopes of the western side of the valley and of varying classes. The irrigation season is approximately one hundred and eighty days.

The average elevation of the lands in this district is approximately 4,500 feet. The principal crops grown are alfalfa, potatoes, wild hay and grain. The alfalfa production is from three to five tons per acre, grain from thirty-five to sixty bushels per acre, and potatoes from six to eleven tons per acre.

There is now in existence a proposed decree issued by the Federal Court defining rights of all of the users of the waters of the Truckee River. This decree has not yet been signed as final, but has been administered for four years for trial purposes by a water master appointed by the Federal Court.

There have been occasional shortages during the latter part of the season for irrigation on the lands within this district, as well as other lands below and shortages of water for generation of hydroelectric power. Since the organization of this district negotiations between all interests on the Truckee River have been under way with a view to construction of upstream storage in sufficient amount to insure the present needs against the aforementioned shortages.

On December 5, 1930, a bill was introduced in Congress calling for an appropriation by the Government of \$750,000 for the purpose of constructing upstream storage.

IRRIGATION DISTRICT NUMBER ONE, CARSON VALLEY UNIT, TRUCKEE-CARSON PROJECT

Officers—H. F. Dangberg, President; W. F. Dressler, Director; Louis Stodieck, Director; L. A. McInnis, Secretary.

District Office—Minden, Douglas County, Nevada.

This district was organized on August 17, 1914, primarily for the purpose of creating a legal organization to be in a position to deal with the Government on matters pertaining to storage on the Carson River. The district has never initiated work on any project nor has it controlled distribution of water, therefore no detailed records are available. The boundaries of the district include practically all of the irrigable lands in Carson Valley in Douglas County, Nevada, the total area of which is 53,773 acres.

HUMBOLDT, LOVELOCK IRRIGATION LIGHT & POWER COMPANY

By V. A. Twigg, *Assistant Secretary*

Organized—1908.

Officers—George C. Stoker, President; W. C. Pitt, Director; John Holmstrom, Director; John S. Taylor, Director; George C. Stoker, Director; William Looz, Director; V. A. Twigg, Assistant Secretary.

District Office—Lovelock, Nevada.

This company was organized for the purpose of storing water during the nonirrigation season to augment the natural flow supply of the Lovelock farmers from the Humboldt River during the irrigation season. Practically every farmer in the Lovelock Valley is a stockholder in this company, and water is distributed to them in proportion to the number of shares owned at the rate of seventy-five cents

per acre foot. The water to which each stockholder is entitled depends upon the number of shares owned and the amount of water stored.

There is a total investment of \$268,182.64 in this project which is segregated as follows: \$241,557.90, dam, reservoir site and canals; \$2,774.20, permanent improvements; \$23,850.54, real estate.

The only debt owing by the company is represented by outstanding notes in the sum of \$25,500. Water was stored for the first time in 1913 and since that time the largest quantity stored in the company reservoir was 40,000 acre feet. The quantity stored each year depends entirely upon the run-off of the Humboldt River, and during the past two years only a small quantity was stored and delivered to the farmers. The year 1928 was the last year that an appreciable quantity of water was stored, and that year 10,320 acre feet was delivered to the stockholders by the company.

The capacity of the main canal for this project is 200 second feet.

The annual maintenance cost averages \$3,000 per year, regardless of the quantity of water stored and delivered.

There are eighty-two farms served by this company, the quantity of water delivered to each farm depending upon the number of shares owned and the available water supply. The irrigation season extends from March 15 to September 15 of each year, and the principal crops are hay and grain. A duty of water of three acre feet per acre is an average seasonal duty for the Lovelock Valley lands.

PRESTON IRRIGATION COMPANY

By HYRUM WHITLOCK, *Secretary-Treasurer*

Officers—M. D. Bradley, President; Hyrum Whitlock, Secretary-Treasurer.

Organized—1911.

Office—Preston, Nevada.

This company owns two small reservoirs and necessary ditches for the irrigation of about 400 acres of land in White Pine County.

The two reservoirs have a total capacity of 1,900 acre feet and were constructed at a cost of approximately \$20,000, which was represented to a large extent by labor performed by farm owners.

This farming section has a growing season of about seven months and the principal crops grown and yields are as follows: Alfalfa, three tons; grain, forty bushels; potatoes, six tons.

The maintenance cost per share of stock owned was eighty-five cents in 1928 and 1929, and sixty-two cents for 1930.

There is no outstanding indebtedness.

ALAMO IRRIGATION CANAL COMPANY

Organized—1922.

Office—Alamo, Nevada.

This company has expended a total of \$3,600 for the irrigation and drainage of about 520 acres in Lincoln County. The main canal has a capacity of eight second feet and delivers water on a rotation basis. Maintenance costs average \$1.50 per acre per year or \$1.75 per share of stock.

Average length of irrigation season is six months and principal crops

grown are hay, grain, and corn. There is no outstanding indebtedness.

LUND IRRIGATION AND WATER COMPANY

Organized—1907.

Office—Lund, Nevada.

This company delivers irrigation water to 1,200 acres of land in White Pine County through a gravity canal eight miles in length. There are twenty-five farms served by this canal from April 1 to September 30 of each year.

The total cost of permanent improvements and lateral system is estimated to be \$3,000.

Maintenance costs vary from eighty cents to one dollar an acre.

Principal crops are hay, grain and potatoes.

PERSHING COUNTY WATER CONSERVATION DISTRICT

(Formerly Lovelock Irrigation District)

Organized—February, 1926.

Officers—A. Jahn, President; L. A. Friedman, Vice President; C. H. Jones, Secretary and Treasurer; Thos. R. King, Engineer.

Directors—Frank C. Jones, C. Arobio and W. W. Carpenter.

Aggregate amount of bond issue certified by Irrigation District Bond Commission is \$1,287,000. No bonds issued.

Aggregate area in District, 34,000 acres.

Aggregate area with water rights, 22,000 acres.

The source of water for lands in this district is the Humboldt River, and it is planned to augment the present water supply by the construction of a dam on the Humboldt River near Oreana, Nevada, which will create a reservoir with a storage capacity of 120,000 acre feet.

INFORMATION CONCERNING CERTAIN LAKES IN NEVADA

Name of lake	Length, miles	Width, miles	Area, square miles	Greatest depth, feet	Average depth, feet	Elevation above sea level
Lake Tahoe.....	20	13	193	1,500	1,000	6,230
Lahontan Reservoir.....	18	2	16	120	60	4,164
Carson Sink.....	10	10	100	5	2	3,894
Carson Lake.....	6	2	11	3	1	3,909
Pyramid Lake.....	30	6 - 11	235	.....	.....	3,783
Winnemucca Lake.....	26	3 - 5.5	9.5*	.....	.....	3,771
Walker Lake.....	25	1.5 - 7	.....	.....	.....	†4,044
Ruby Lake.....	15	2 - 4	.....	.....	.....	5,800
Snow Water Lake.....	6	1.5 - 3.5	.....	.....	.....	6,000

*Approximate. †Elevations as of March 8, 1930.

Remarks—Carson Lake and Carson Sink are subject to great fluctuation in area, dependent upon the run-off conditions.

Walker Lake—Soundings, as shown by the Naval Ammunition Depot Hydrographic Map of south end of Walker Lake covering a distance of 4,000 feet easterly from the west shore and 30,000 feet northerly from the southerly shore show a depth of 180 feet below the water surface of March 8, 1930. No other data is available at this time as to its maximum depth. The water surface of Walker Lake is gradually falling, as much of the water from Walker River, the main source of supply, is being stored for irrigation. In August, 1928, the elevation was 4,050.2 feet above sea level.

Lake Tahoe—The elevation of the bottom of the outlet of Lake Tahoe to the Truckee River is 6,223 feet.

Ruby Lake—According to data submitted by B. G. McBride of Elko, Nevada, this lake contains very little water except during the very wet years.

Snow Lake—This lake has water early in the spring but dries up practically every summer, as much of the water supply is used for irrigation.

CHAPTER XVI

Pumping Development of Ground Water in Nevada

There are approximately 110,000 square miles of sparsely populated territory in the State of Nevada which offers many opportunities to the homeseeker who has sufficient financial means for developing desert acreage through the method of initiating a water supply by pumping from an underground flow.

The general type of agriculture found in any locality in Nevada will determine the limit of expense to which a new settler may go in order to reclaim his land. The greater portion of Nevada's irrigable lands are so located that the principal crops produced are those that are allied to the stock raising industry, principally hay and small grains.

Many of the areas susceptible of irrigation by means of pumping are in valleys that are far removed from ready markets that would consume special crops which could profitably be grown under irrigation from pumping; hence the expense of transporting these special crops to market consumes the profit that accrues from the production of these special crops.

At the present time much of the development in the State by pumping water from wells has been for the purpose of augmenting the late seasonal supply of water from surface streams. This augmented flow of water is being used principally for the production of hay and grain, although in several instances the farmers are securing greater yields of potatoes by the use of additional water late in the season.

Several years ago some of the foremost citizens of the State recognized the necessity of furnishing some inducement to the settler in order that he, the settler, would be justified in expending several thousand dollars in the drilling of wells in order to determine the feasibility of reclaiming areas of desert land. On October 22, 1919, the United States Congress approved an Act commonly known as the Pittman Act, which authorizes the Secretary of the Interior to grant permits for the exclusive right to explore for water in a single tract previously designated as subject to disposal under the Act. This law is only applicable to arid lands in the State of Nevada.

This Act provides:

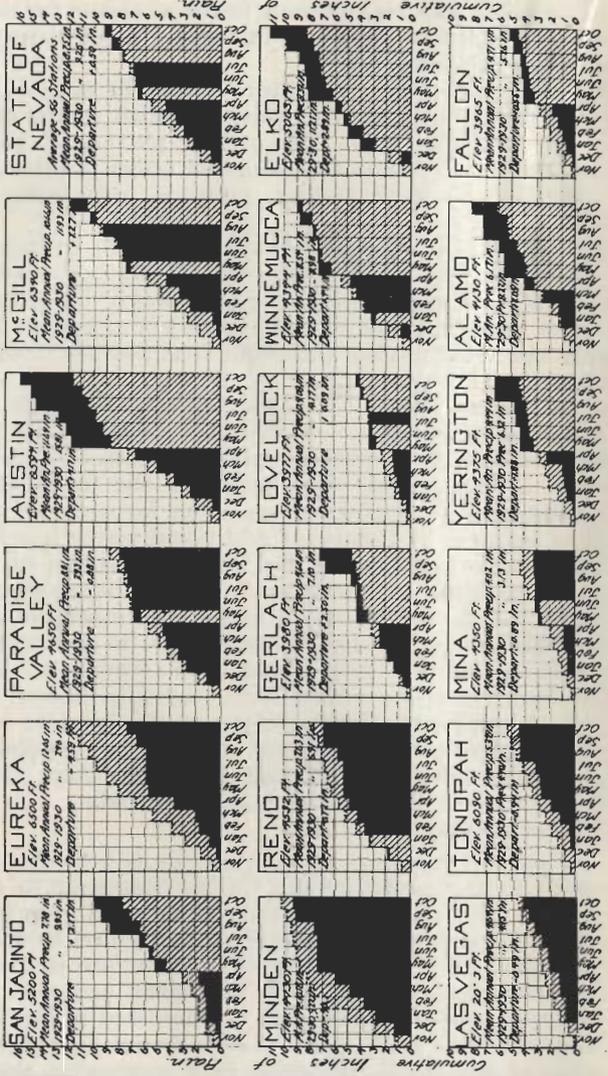
That the Secretary of the Interior is hereby authorized to grant to any citizen of the United States, or to any association of such citizens, a permit, which shall give the exclusive right, for a period not exceeding two years, to drill or otherwise explore for water beneath the surface of not exceeding two thousand five hundred and sixty acres of unreserved, unappropriated, nonmineral, nontimbered public lands of the United States in the State of Nevada not known to be susceptible of successful irrigation at a reasonable cost from any known source of water supply.

That on establishing at any time within two years from the date of the permit to the satisfaction of the Secretary of the Interior that underground waters in sufficient quantity to produce at a profit agricultural crops other than native grasses upon not less than twenty acres of land has been discovered

**DIAGRAMS OF
CUMULATIVE MONTHLY RAINFALL
SEASON 1929-1930
FOR TYPICAL NEVADA STATIONS**
Rainfall Reported Cumulatively By Months.

Nov-1929 to Oct-1930
Normal
Data taken from U.S.
Weather Bureau.

State of Nevada
Annual Report 1930
A.V.T. 12-15-1930



and developed and rendered available for such use within the limits of the land embraced in any permit the said permittee shall be entitled to a patent for one-fourth of the land embraced in the permit, such area to be selected by the permittee in compact form according to the legal subdivisions of the public land surveys.

A copy of this Act in full may be obtained by writing to the Surveyor General of Nevada, at Carson City.

Due to the fact that manufacturers of equipment for use in pumping water from wells are making rapid strides in perfecting machinery that will use cheaper grades of fuel oil, it is anticipated that there will be renewed activity in the reclamation of some of our arid lands in localities that are unable to secure electrical power for use in pumping water.

The following quoted paragraphs are excerpts from a bulletin published by the University of Nevada Agricultural Experiment Station, written by F. L. Bixby and George Hardman. This bulletin contains the latest published data on the underground resources of the State and is quoted for the purpose of rounding out the information that has been gathered by the State Engineer's office during the past biennium. The plates herewith published were also loaned to this office by the office of the Agricultural Experiment Station, and acknowledgment of this cooperation is hereby made.

RAINFALL

"The average annual precipitation for Nevada is 8.75 inches. That is, if the rainfall were uniformly distributed, every spot of land in the State would receive this amount of moisture. However, the rainfall in Nevada is, of course, not uniform, but varies within wide limits, as shown by plate in this report. In general, the valleys receive much less and the mountains more than an average of 8.75 inches.

"The altitude of the valleys in the northern and eastern sections of the State ranges from 4,000 to 5,000 feet, and these valleys receive an average of about six inches of rainfall per year. The valleys in the southeastern section are lower and somewhat drier. Las Vegas, at an altitude of 2,000 feet, has an average of 4.64 inches of rainfall.

"The total annual precipitation increases progressively with elevation, though the rate of increase is not uniform in the various sections of the State, and in any area rather wide variations may occur in the total precipitation at different stations at the same elevation. Storms occur more frequently in certain localities than in others. This is especially true of the summer thunderstorms.

"W. O. Clark and C. W. Riddell in estimating the underground water supply of the Steptoe Valley in White Pine County assembled the weather records from 17 stations in Elko and White Pine Counties. When arranged according to altitudes these stations show a fairly regular increase in precipitation with increasing elevations. The factor of increase, or rate of increase for each 100 feet of rise in elevation, was calculated to be about 0.45 inches. The elevations of these stations ranged from 4,812 to 7,977 feet. It is probable that this factor will be found to give comparatively accurate results in

estimating the precipitation for the areas represented by these stations. It may, in fact, be applicable to the entire northern and eastern part of Nevada east of the Sierra."

UNDERGROUND WATER

"There is no mystery about the supply of underground water in the desert valleys of Nevada. It must all come from the precipitation that falls in the form of rain or snow. Also, this supply is subject to the same losses as surface waters, although the losses take place at a much slower rate. Losses from surface waters may be divided into four parts: run-off, evaporation, transpiration, and deep percolation, the latter being the part of the total rainfall that enters into the underground channels and forms the ground water supply.

"Although not subject to evaporation or transpiration losses while in the deep channels, the underground water does have outlets and hence a run-off loss. These outlets may be springs, streams, lakes, swamps or merely wet lands where evaporation from the moist surface of the ground and the transpiration from the growing plants afford the outlet. If no such outlets existed, then the yearly increase in the water stored in the underground reservoirs would in time fill them to overflowing, and the water would appear on the surface. Then, instead of our interior valleys containing dry lakes, real lakes would again appear.

"If the annual rainfall over the State were 40 inches instead of 8.75 inches, this condition would obtain and Nevada would be dotted with innumerable bodies of water.

"The exact percentage of the rainfall that penetrates deeply enough into the soil to be lost to the surface and thus to become part of the underground water supply is variable and depends upon such factors as the topography or character of the surface of the ground, the texture and depth of the soil cover, and the amount and distribution of the rainfall.

"Over a considerable part of Nevada the topographic conditions are favorable for the accumulation of underground water. The narrow, flat valleys filled with deep, rather loose sediments and surrounded by barren, precipitous mountains afford ideal conditions for the catchment of a large part of the run-off. Moreover, along the bases of the mountain ranges there are long alluvial fans of coarse sediments ideally situated to absorb the run-off."

Indicators of Underground Waters

"When any considerable amount of ground water exists in any particular place there is always some visible evidence of its existence. In the case of a sheet or underground reservoir, if it is close enough to the surface to be tapped and pumped its presence will be indicated by the growth and the character of the native vegetation.

"Salt grass and alkali crusts on the surface indicate a high water table, usually within a few feet of the surface. Rabbit brush, the false goldenrod, grows where the water is down a few feet below the surface, but still quite close. Greasewood indicates a high water table, but grows over a wider range than the other plants mentioned. * * * An estimate of the probable quantity of underground flow can be made from the area covered by the growth of the

indicator plants just described; an extensive area indicating a strong underflow, a small area indicating a light underflow. * * *

"Springs and water mounds that occur in the axes of the valleys or near the valley floors are, aside from the visible flows, good indicators of ground water at a shallow depth. Their presence near the valley floors means that the reservoirs under these valleys are filled and some of the water is escaping through the springs. * * * The complete absence of springs, wet lands, and water-indicating plants can usually be taken as proof that the water table at that particular place is quite low, probably below 50 feet, since the larger greasewood sends its roots down nearly that distance in search of water."

ARTESIAN WATER

"Aside from the artesian water that has sufficient pressure or hydraulic head to cause it to rise to the surface and flow, the presence of artesian pressure is a vital factor in successful pumping from wells in many localities in Nevada. Artesian pressure causes the water to rise in a well from the depth at which it is encountered to various heights, depending on the amount of hydrostatic pressure present. In many cases where the water fails to come to the surface and flow, it still rises close enough to the surface to come within reach of a pump.

"Several conditions are necessary for the creation of an artesian water supply. The water must have a relatively free entrance into the underground strata at a comparatively high elevation above the valley floor, and the strata must be continuous, and open and porous enough to carry the stream without too great resistance.

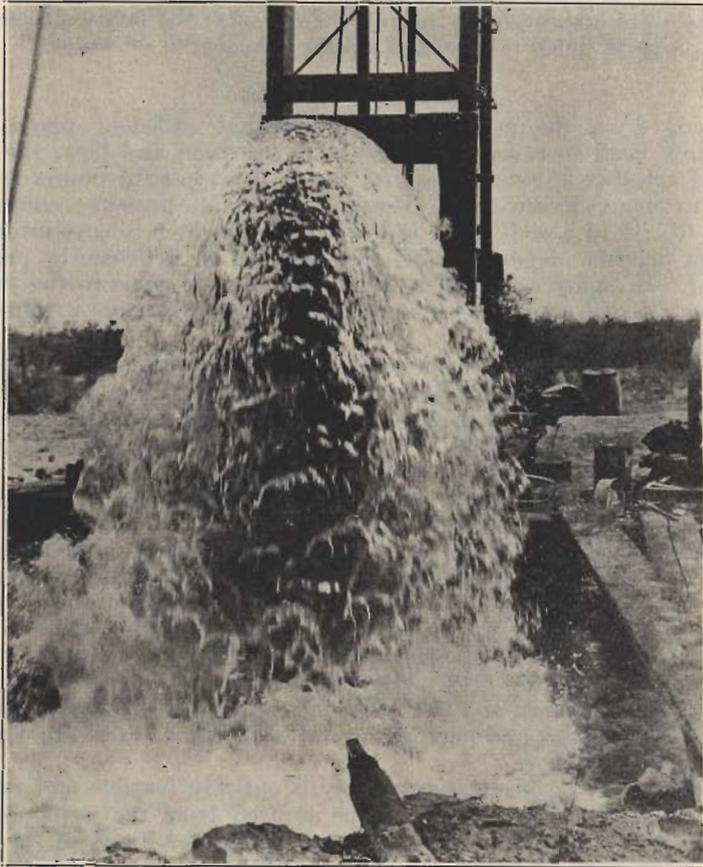
"There are several other conditions that operate to check the flow of water in the underground channels and to cause an artesian pressure to be built up. The water-bearing strata may pass under the valley floor and rise on the opposite side, intrusive dykes may cut the water streams, a bend or twist in the gravel beds may act as an obstruction, and occasionally a slip or fault may elevate the water-bearing beds until they come opposite impervious strata so that the flow is checked. Usually the obstructions do not form perfect dams to the underground streams, and the flows, instead of being entirely checked, are merely impeded and part of the water continues to escape through the deep channels.

"Pumping from an artesian supply is entirely feasible and serves a double purpose. More water can be secured from the wells, and the head or pressure on the artesian water within the limits of the influence of the wells is lowered by the depth to which the pumps drop the water in the wells. This lessened pressure means reduced losses of water through the natural outlets and a consequent greater available supply in the district."

Drilling

"Generally it will prove more satisfactory and economical to use a drilling outfit in putting down wells. If the territory is new and there are no wells to serve as guides, a spudding or percussion rig with solid tools is the safest to start with. A jet rig in which water is pumped through iron pipes forming the drill stem to outlets just back of the cutting edge of the bit is an excellent outfit for putting down small holes in exploratory work. The water returning to the

surface outside the drill stem carries the material loosened by the bit, so but little bailing is necessary. Also, the mud from the hole itself is forced into the material forming the sides of the hole, making a rather effective plaster. This rig will readily handle stiff clays, cemented sands and gravels and soft rock such as the cemented materials and limestones found in lake beds; but it is not so good for hard rock or loose gravel. It is not difficult to convert any standard percussion rig into a jet rig and the attachment is extremely valuable.



The Union Pacific Well Near Las Vegas, Nevada.
(Courtesy of University of Nevada, Agricultural Experiment Station)

A mud scow, which is a heavy bailer with a cutting edge, is probably the best tool for sinking large holes in the average sedimentary material found in alluvial plains and lake beds. It is not so efficient in sinking wells of the smaller sizes. The rotary type of drill has been used successfully where deep beds of clays must be penetrated and the water-bearing beds are widely separated, but does not lend itself so readily to pioneering as the other types of drills. It is

most successfully used with the very large holes such as the oil wells.

"The cost of drilling will naturally vary with the distance from railroads and highways; but at the present time it ranges from \$1 to \$2 per foot for the first 200 feet of hole, with slight increases for each 100 feet below this depth. The larger the hole the higher the drilling cost. Casing costs from around fifty cents a foot for 4-inch standard screw casing to about \$1 a foot for standard 8-inch screw casing.

Perforating or Screening

"After the casing has been set in place without regard to the water beds, it should be perforated at each water-bearing stratum shown in the log. The perforations should be numerous enough and large enough to admit all the water into the casing that is carried by each water-bearing bed. In this respect the stovepipe casing is possibly slightly superior to the screw casing, perforating a little more readily. Under some circumstances where sufficient wells have been sunk to give fairly exact information concerning the depth of the different water-bearing strata, it is sometimes practical to use factory perforated screen casing."

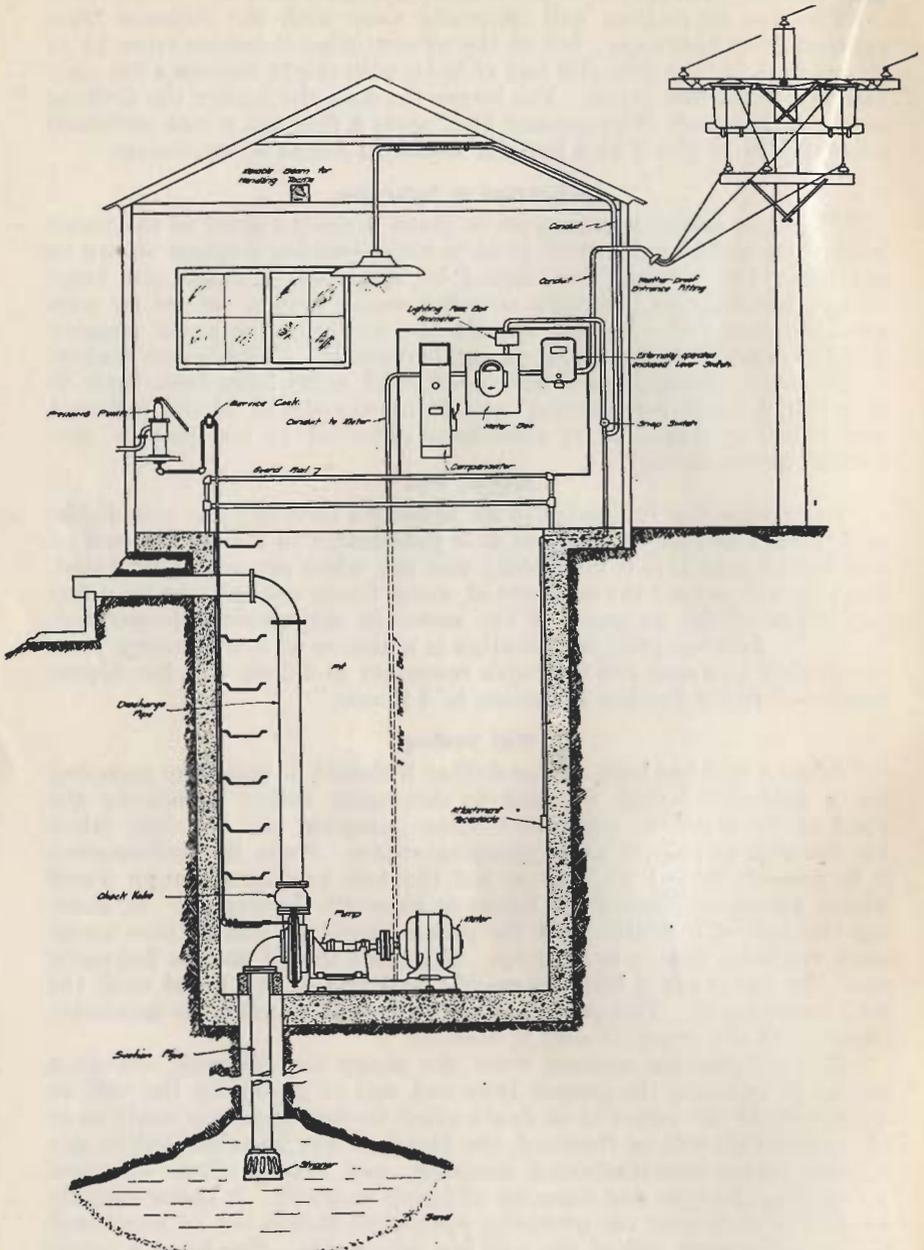
Size of Well

"In prospecting for water in an unknown territory the size of the well should be kept as small as it is practicable to sink. The cost of sinking a 4-inch hole is not great; and yet, when properly perforated, this size will permit the entrance of water freely enough to give a fair indication of the quantity of the water in the material penetrated. * * * Another good combination is a section of 8-inch casing from the surface to about 100 feet with reduction to 6-inch, and for depths below 500 feet a further reduction to 4 inches."

Well Testing

"After a well has been dug or drilled it should be tested by pumping for a sufficient length of time to determine rather accurately the yield of the well, the drawdown when pumping, and the time taken for the well to recover after pumping ceases. From this information it is possible to tell whether or not the well produces enough water within reasonable drawdown limits to be worth developing. In starting the test of a drilled well the pump should be run at slow speed until the water begins to clear up. The speed should then be increased until the water again becomes muddy, and run at this speed until the well clears again. This process should be repeated until the maximum capacity of the pump or well is reached.

"The information secured from the pump test likewise affords a means of selecting the proper type and size of pump for the well in question. If the owner is in doubt after the test has been made as to the pump that will be required, the test data can be submitted to any reliable pump manufacturing company, and expert advice obtained concerning the type and capacity of pump required. It seems scarcely needful to state that the pumping equipment should not be purchased before a thorough test of the well has been made. Too large a pump for the supply of water means uneconomical operation, while too small an outfit does not permit using the source of the water supply to its full capacity."



Vertical Section of Pumphouse and Pit Showing Electric Control and Direct-Connected Horizontal Centrifugal Pump.
 (Courtesy University of Nevada, Agricultural Experiment Station)

Pump Capacities

"The following table shows the average capacity of various sizes of centrifugal pumps, together with their efficiencies and the horsepower per foot of lift required to operate each pump :

No. of centrifugal pump	Discharge per minute U. S. Gals.	Theoretical horsepower per foot of lift	Efficiency Per cent	Actual horsepower per foot of lift*
2	100	.025	40 to 45	0.06
2½	150	.038	45 to 50	.08
3	225	.056	50 to 55	.11
3½	300	.075	55 to 60	.14
4	400	.100	60 to 62	.17
5	700	.175	62 to 66	.28
6	900	.225	66 to 68	.34
7	1,200	.300	68 to 70	.44
8	1,600	.400	70 to 74	.57

Above efficiencies are for pumps properly designed and installed for heads of 40 to 60 feet. Plant efficiencies can be estimated by subtracting 10 per cent for direct-connected electric motors and 17 to 22 per cent for belt-connected power.

*Efficiencies taken as the lower in preceding column.

"This table is from United States Department of Agriculture Farmers Bulletin No. 1404, 'Pumping from Wells for Irrigation.'

"The horse power required to lift any quantity of water any specified distance may be obtained from the following formula:

$$\text{Horsepower} = \frac{\text{g. p. m.} \times h}{4,000 \times E}$$

Where g. p. m. = gallons pumped per minute.

h = total head in feet against which pump must work.

This includes the total vertical lift plus frictional and other losses.

E = the efficiency of the pump.

"An efficiency of 50% is usually assumed for any type or size of centrifugal pump, though the actual efficiency varies with the size of pump, and to some extent with the head against which the pump is operating."

Cost of Pumping

"Under any system of farming where water must be lifted, the cost of pumping becomes a vital factor in the economic production of crops. The upper limit of this cost can scarcely be expressed in definite figures because the cost of pumping is only one of the factors affecting farming profits in any locality. Pumping costs should rather be considered in connection with the net returns per acre. The soil, its fertility and adaptability to particular crops, the climate which governs the class of crops that can be grown, the distance from market and the means of transportation which govern the costs of marketing, are all factors influencing the returns per acre. In general it may be stated that the higher the net returns per acre the higher will be the various items of expense in growing the crop, and the higher will be the permissible cost of pumping. In other words, with a crop that gives a very high return per acre the cost of pumping may be quite high without greatly affecting the net return; whereas, with a crop that gives a very low return per acre, the margin between the return and the cost of production does not permit of a very large expenditure for pumping. To illustrate further: Consider the condition of some of the interior valleys in Nevada. The climate is such

that only the rather hardy, short season crops can be grown, and the distance from market is so great that only those crops that can be consumed on the farm are profitable. Under such conditions the returns per acre from farming are necessarily small and if pumping is practiced the cost per acre for lifting the water must be very low. This means that the first cost of the wells must be moderate and that the distance through which the water is lifted must be small.

"On the other hand, the extreme southern end of Nevada has a mild climate with a very long growing season. The distance from markets is considerable, but means of transportation are available. These conditions permit the growing of a rather wide range of crops and the selection of those crops that give large returns per acre, and this in turn permits a higher water cost.

"The quantity of water that must be applied to a crop to bring it to maturity is likewise a variable factor, depending on the crops grown, the soil, and the climate.

"Until all the factors that enter into the cost of production and the possible returns per acre are known it is impossible to state a figure expressing the highest cost of pumping or the maximum lift that will allow a profitable return per acre on the crop grown.

"However, the items of cost vary considerably. The price of fuel fluctuates rather widely, and the cost of transporting the fuel from the railroad to the farm increases rapidly with the distance hauled. If electric power is available the first cost of an extension from the power line to the pumping plant must be considered and the interest and depreciation added to the power costs. The first costs of wells and pumping equipment range over wide limits. It costs more per acre-inch to lift water with pumps of small capacities than it does with pumps of larger capacities. Also, the rate of cost of pumping increases appreciably as the total lift increases. That is, if the rate is 5 cents per acre foot per foot lift with a total head of 40 feet the rate may be as much as 7½ cents when the head is increased to 100 feet.

Pumping lift feet	Rate (Cost of lifting one acre foot one foot)	Cost of lifting one acre foot maximum lift for rate
10- 20	\$0.06	\$1.20
20- 40	.08	3.20
40-100	.10	10.00

"With so many variable factors entering into the cost of lifting water, it is impossible to establish a general basic rate for pumping costs. Hence it is difficult to forecast the pumping cost or to determine the maximum pumping limit for any locality without exact data on the cost of all the various factors entering into the problem. In the absence of more exact information the above rates may be used in making rough estimates of pumping costs and allowable lifts for average conditions in Nevada."

During the past biennium the State Engineer's office has received many inquiries from ranch owners requesting information on the cost of pumping water from wells. Early in December, 1930, questionnaires were mailed to a score or more of ranchers who have had one or more years' experience in the operation of small pumping plants requesting information as to their experiences and detailed cost data. The replies from these questionnaires have been disappointing, probably due to the fact that too many pertinent questions were asked.

Replies from four well owners are given for the purpose of showing the wide variation that exists in the cost per acre foot of water pumped:

Well No. 1

Depth drilled—320 feet.
 Depth to water table—Surface.
 Power—50 horsepower motor.
 Make of pump—Byron-Jackson.
 Draw down—52 feet.
 Lift—52 feet.
 Discharge—4.5 acre feet per 24 hours, maximum.
 Irrigated acreage—100 acres.
 Crops irrigated—Hay and grain.
 Investment—Well, pump and motor, \$6,060.
 Power cost—\$285.82, seasonal.
 Interest and depreciation annually on investment—\$969.60.

Well No. 2

Depth drilled—470 feet.
 Depth to water table—40 feet.
 Casing—16 and 14 inches.
 Power—60 horsepower motor.
 Make of pump—Western Well.
 Draw down—19 feet.
 Lift—59 feet.
 Discharge—1,600 gallons per minute, maximum.
 Period of operation—One month, half time.
 Irrigated acreage—125 acres.
 Crops irrigated—Hay, grain and potatoes.
 Cost of drilling—\$3,850.
 Cost of casing—\$1,664.84.
 Cost of well—\$5,514.84.
 Investment—Well, pump and motor, \$9,524.
 Interest and depreciation annually on investment—\$1,523.44.
 Net cost per acre foot of water pumped, excluding interest and depreciation—\$2.90.

Well No. 3

Depth drilled—265 feet.
 Depth to water table—12 feet.
 Casing—14 and 12 inches.
 Power—25 horsepower motor.
 Make of pump—4-stage turbine.
 Draw down—60 feet.
 Lift—72 feet.
 Discharge—350 gallons per minute, maximum.
 Period of operation—20 days per month for four months.
 Irrigated acreage—35 acres.
 Crops irrigated—Hay and grain.
 Cost of well—\$3,000.
 Investment—Well, pump and motor, \$5,200.
 Interest and depreciation annually on investment—\$830.
 Net cost per acre foot of water pumped, excluding interest and depreciation, \$4.06.

Well No. 4

Depth drilled—80 feet.
 Depth to water table—27 feet.
 Casing—14 inch.
 Power—25 horsepower fuel-oil engine.
 Make of pump—Byron-Jackson turbine.
 Draw down—10 feet.
 Lift—25 to 30 feet.
 Discharge—1,500 gallons per minute, maximum.
 Period of operation—100 to 130 days.
 Irrigated acreage—Wells No. 4 and No. 4A, 250 acres.
 Crop irrigated—Alfalfa.
 Yield from 250 acres—1,200 to 1,500 tons.
 Cost of drilling—\$2.50 per foot.
 Cost of casing—\$1.60 per foot.
 Investment—Wells, pumps and engines (wells No. 4 and No. 4A)—
 \$15,000.
 Seasonal power cost—\$10 per day.
 Interest and depreciation on investment (wells No. 4 and No. 4A)—
 \$2,400.
 Net cost per acre foot of water pumped, excluding interest and
 depreciation—\$0.75.

Well No. 4A

Depth drilled—80 feet.
 Depth to water table—18 feet.
 Casing—18-inch.
 Power—25 horsepower fuel-oil engine.
 Make of pump—10-inch centrifugal.
 Draw down—10 feet.
 Lift—25 to 30 feet.
 Discharge—1,500 gallons per minute, maximum.
 Period of operation—100 to 135 days.
 Cost of drilling—\$2.50 per foot.
 Cost of casing—\$1.60 per foot.

SUMMARY

	Well No. 1	Well No. 2	Well No. 3	Wells Nos. 4 and 4A
Estimated cost per acre foot.....		\$17.14	\$10.56	\$2.34
Estimated annual cost per acre, irrigated	\$12.55*	14.64*	38.63*	14.20†

*Supplemental water. †Total supply, fuel oil.

In addition to the cost per acre foot the interest on the investment and depreciation charges on the equipment must also be taken into consideration.

The State of Nevada has just completed a well at the Prison Farm, near Carson City, and on December 22, 1930, an engineer from this office conducted a test on this well. Due to the fact that the well has not been fully developed and that the engine and pump had been installed but a short time the results obtained are not conclusive as to the cost per acre foot for pumping water from this well. After a seasonal run by this plant, during which period accurate data will be secured of all the operating features, accurate and authentic cost data will be available.

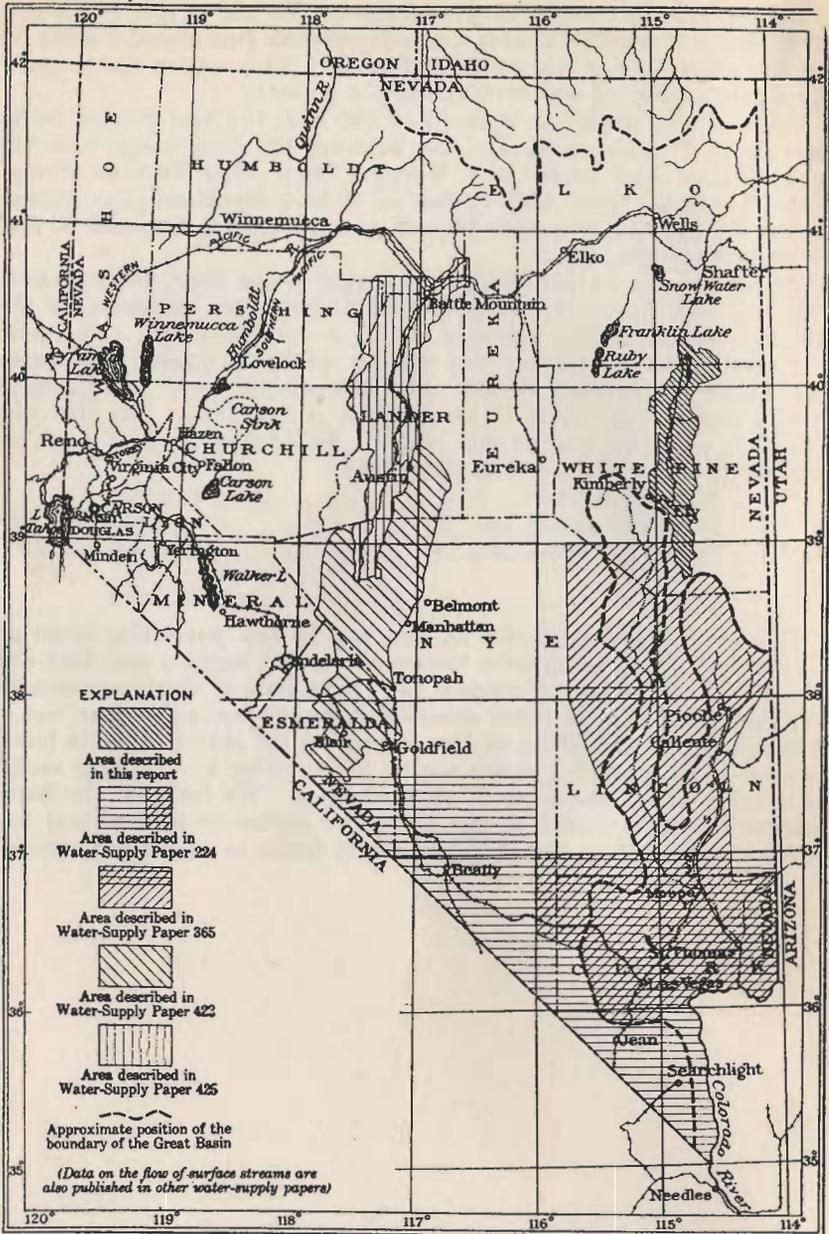
An interesting feature of the equipment in use at this plant is a 40 horsepower Fabco-Tuxham low compression, full Diesel 2-cycle oil engine, which uses a low grade of fuel oil. This engine has a maximum rated speed of 450 revolutions per minute.

The well was drilled to a depth of 230 feet, the first 80 feet being cased with 18-inch casing and the balance, 150 feet, cased with 12-inch casing. The pump is a Western Deep Well Turbine Pump, belted discharge head, with 70 feet of 10-inch discharge pipe, tubing and shafting. One two-stage 14-inch pump, length 4 feet, and 30 feet of 10-inch suction pipe.

A test was run on this plant for a period of one hour, during which time one and three-quarters gallons of fuel oil was consumed by the engine. As the engine was speeded up it developed that a speed of 380 revolutions per minute pumped the maximum quantity of water that could be supplied by the well, or a discharge of 1.965 second feet, which is equivalent to 880 gallons per minute. The lift was estimated to be 80 feet at this period. The following cost items on this well may be of interest to the reader:

Well and test bore.....	\$1,998.00
Pump and installation.....	1,341.70
Engine and installation.....	2,815.00
Total.....	<u>\$6,154.70</u>

This office is not interested in any way in any particular make of well casing, pump equipment, motors or fuel-oil engines and does not desire to enter into any discussion as to the merits of the advantages to be gained by the use of either electrical power or fuel-oil engines, but it is interested in protecting as far as possible the interests of its land-owners who are adding to the wealth of the State by bringing under cultivation additional areas of our arid lands. We feel that the State Engineer's office should be the source of authentic information for problems of this kind, and it is our earnest desire to render this service.



MAP OF NEVADA SHOWING AREAS COVERED BY THE PRESENT AND OTHER WATER-SUPPLY PAPERS OF THE UNITED STATES GEOLOGICAL SURVEY

25 0 25 50 75 100 MILES

1920

Map Reproduced from Water Supply Paper No. 476 U. S. Geological Survey, Showing Areas in Nevada Described in Various Water Supply Papers. (See following list of references.)

REFERENCES

Farmers Bulletin No. 813—Construction and Use of Farm Weirs.

Farmers Bulletin No. 1904—Pumping from Wells for Irrigation.

The following Water Supply Papers of the United States Geological Survey:

Water Supply Paper No. 224—Some Desert Watering Places in Southeastern California and Southwestern Nevada, by Walter C. Men-denhall.

Water Supply Paper No. 365—Ground Water in Southeastern Nevada, by Everett Carpenter.

Water Supply Paper No. 423—Geology and Water Resources of Big Smoky, Clayton, and Alkali Spring Valleys, Nevada, by Oscar E. Meinzer.

Water Supply Paper No. 425d—Ground Water in Reese River Basin and Adjacent Parts of the Humboldt River Basin, Nevada, by Gerald A. Waring.

Water Supply Paper No. 540c—Ground Water in Pahrump, Mesquite, and Ivanpah Valleys, Nevada and California, by C. A. Waring.

Water Supply Paper No. 467—Exploratory Drilling for Water and Use of Ground Water for Irrigation in Steptoe Valley, Nevada, by W. O. Clark and C. W. Riddell, with an Introduction by O. E. Meinzer.

United States Department of Agriculture, Bureau of Soils—Soil Survey of the Las Vegas Area, Nevada, by E. J. Carpenter and F. O. Youngs.

For information concerning duty of water for various crops refer to Bulletin 96 of the Nevada Agricultural Experiment Station, "Irrigation of Field Crops in Nevada," by C. S. Knight and George Hardman. Also various bulletins of the Department of Agriculture and of the State Experiment Stations.

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CHAPTER XVII

Status of Applications Filed During 1929-1930

STATUS OF APPLICATIONS FILED DURING THE BIENNIUM 1929-1930

Following is a condensed statement giving the salient data in connection with applications filed during the calendar years 1929-1930, in the order of:

1. Application Serial Number.
2. Date of Filing.
3. Name of Applicant.
4. Source of Water Supply.
5. Purpose of Appropriation.
6. Action on Application.
7. Status of Permits as of December 31, 1930.

1929

8802....	1- 2-29....	W. C. Pitt Co.; West Fork Say Canyon Springs and Creek; Stockwatering and domestic; Approved March 5, 1930. G. S.
8803....	1- 2-29....	C. J. Carpenter and Tula M. Carpenter, Surprise Shaft of Western Nevada Mines Co.; Mining, milling and domestic; Approved March 19, 1930. G. S.
8804....	1- 2-29....	Robison Brothers; Willard Creek; Stockwatering; Approved March 19, 1930. G. S.
8805....	1- 2-29....	Heidenrich Brothers; Underground waters from well; Irrigation and domestic; Approved June 10, 1930. G. S.
8806....	1- 2-29....	Parker Liddel; Mountain Spring; Domestic, mining and milling*; Withdrawn January 9, 1930.
8807....	1- 3-29....	State of Nevada, Board of Capitol Commissioners; Lower Rose Spring; Irrigation and domestic; No action.
8808....	1- 3-29....	State of Nevada, Board of Capitol Commissioners; Upper Rose Spring; Irrigation and domestic*; No action.
8809....	1- 7-29....	Frank Charlebois; Lower Reese River Canyon Spring and Creek; Stockwatering and domestic; Approved January 23, 1930. G. S.
8810....	1-10-29....	Victor E. Matteucci; Willow Spring; Mining and domestic; Approved March 29, 1929. G. S.
8811....	1-14-29....	W. M. Kearney; Armagosa River; Irrigation and domestic; No action.
8812....	1-14-29....	W. C. Bradley; Armagosa; Irrigation; No action.
8813....	1-17-29....	Handley Brothers; Cottonwood Canyon Springs and Creek (No. 2 or South Branch); Stockwatering and domestic; Approved April 30, 1930. G. S.
8814....	1-17-29....	Handley Brothers; Saw Mill Spring and Creek; Stockwatering and domestic; Approved April 30, 1930. G. S.
8815....	1-17-29....	Handley Brothers; Cottonwood Springs and Creek (No. 1 or main branch); Stockwatering and domestic; Approved April 30, 1930. G. S.
8816....	1-21-29....	Alex Ranson; Granite Spring; Mining, milling and domestic; Approved October 16, 1929. Certificate.
8817....	1-22-29....	George E. Turpin; McCoy Spring No. 3; Mining and domestic*; No action.
8818....	1-23-29....	Clarence A. Lewis; Muddy River and tributaries; Irrigation and domestic; No action.
8819....	1-23-29....	Los Angeles & Salt Lake Railroad Company; Upper Cottonwood Spring; Railroad and domestic; Approved November 18, 1929. G. S.
8820....	1-25-29....	Silver Banner Mining Company; Maraposa Springs; Domestic and milling; Approved October 28, 1929. G. S.
8821....	1-25-29....	Silver Banner Mining Company; Lindsey Springs; Domestic and milling; Approved October 28, 1929. G. S.
8822....	1-25-29....	Silver Banner Mining Company; East Fork of Owyhee River; Milling; Approved October 28, 1929. G. S.
8823....	1-27-29....	Geo. T. Toombs, Jr.; Underground waters; Irrigation and domestic; Approved October 14, 1929. G. S.
8824....	1-29-29....	Irene Watt; Watt Spring No. 3; Stockwatering*; Denied January 24, 1930.
8825....	2- 1-29....	Seven Troughs Gold Mines Company; Deep Tunnel; Mining, milling and domestic; No action.
8826....	2- 1-29....	L. A. Friedman; Deep Tunnel of the Seven Troughs Gold Mines Company; Stockwatering*; No action.
8827....	2- 1-29....	John Canson; Underground water; Bathing and domestic; Approved July 31, 1929. G. S.
8828....	2- 6-29....	H. M. Brennen; Rattlesnake Creek; Irrigation; No action.

*Protested application. G. S. Good standing.

- 8829.... 2- 8-29....Jackson B. Staley; Fair Banks Spring; Irrigation and domestic; Canceled March 28, 1930.
- 8830.... 2-15-29....Earl L. Moser; Water well; Irrigation and domestic; Approved September 14, 1929. G. S.
- 8831.... 2-15-29....W. D. Spencer; Artesian Well; Irrigation; Canceled August 11, 1930.
- 8832.... 2-17-29....Gaston Uhalde and Wm. Hendrix; Nugget Spring; Stockwatering and domestic*; No action.
- 8833.... 2-18-29....Kent Land & Livestock Company; Willow Spring; Stockwatering and domestic; Approved January 9, 1930. G. S.
- 8834.... 2-18-29....Kent Land & Livestock Company; Freeman Creek and Canyon; Stockwatering and domestic; Approved January 9, 1930. G. S.
- 8835.... 2-20-29....Henry Anderson; Jenny Creek; Stockwatering; Approved March 29, 1930. G. S.
- 8836.... 2-20-29....A. Sciarani; W. R. I. D. Drain Ditches; Irrigation; Canceled June 20, 1930.
- 8837.... 2-20-29....C. W. Hyatt; W. R. I. D. Drain Ditches; Irrigation; Canceled June 20, 1930.
- 8838.... 2-22-29....City of Wells; Underground waters; Municipal water supply; Approved February 25, 1930. G. S.
- 8839.... 2-26-29....Chas. Allen; Willow Creek; Stockwatering*; No action.
- 8840.... 2-27 29....N. P. Morrison; Deep Well; Irrigation and domestic; No action.
- 8841.... 2-28-29....S. O. Cressler Estate; Unnamed Canyon, otherwise known as Rye Patch Creek and tributaries; Stockwatering and domestic; Approved May 23, 1930. G. S.
- 8842.... 3- 4-29....William H. Smith; Newark Mining Canyon; Mining and milling; Withdrawn July 9, 1929.
- 8843.... 3- 7-29....Julia Lorenzi; Artesian wells and springs; Irrigation and domestic; Canceled September 5, 1929.
- 8844.... 3- 8-29....Alex Dufferena; Shyster Creek and tributaries; Irrigation and domestic; Withdrawn November 5, 1929.
- 8845.... 3- 8-29....Earl L. Moser; Moser Well No. 2; Domestic and irrigation; Approved September 14, 1929.
- 8846.... 3-13-29....J. E. Marble; Carlson Springs and Creek; Irrigation and domestic*; No action.
- 8847.... 3-17-29....Lewis Ferruse; Abandoned drill well; Domestic and Irrigation; Canceled March 28, 1930.
- 8848.... 3-20-29....C. E. Haviland and Thos. H. Shone; Barret Springs; Domestic and medical; Approved April 9, 1930. G. S.
- 8849.... 3-25-29....T. T. Fairchild; Packer Creek; Stockwatering; Approved October 7, 1929. G. S.
- 8850.... 3-26-29....Walker River Irrigation District; West Walker River; Irrigation and stockwatering; No action.
- 8851.... 3-27-29....Q. D. Boyd; Lamoille Creek; Irrigation; No action.
- 8852.... 3-28-29....Pete Chango and Gene Aldax; Underground water; Irrigation and domestic; Approved July 31, 1929.
- 8853.... 4- 3-29....Seven Troughs Ext. Mng. Co.; Summit Springs; Mining and domestic*; No action.
- 8854.... 4- 4-29....Edward Austin, Jr.; Mustang Spring; Stockwatering and domestic; Approved March 29, 1930. G. S.
- 8855.... 4- 4-29....Edw. H. Berryman Jr.; Undeveloped Spring; Stockwatering; Canceled February 21, 1930.
- 8856.... 4- 5-29....Frank and Henry Childress and Wm. Meeke; Big Canyon Spring; Mining, milling and domestic; Approved October 9, 1929. G. S.
- 8857.... 4- 5-29....Chas. Caldwell; Whytock; Mining, milling and domestic; Approved October 9, 1929. G. S.
- 8858.... 4- 5-29....Gicinio Smiraldo; McKnight Springs Nos. 1, 2 and 3; Stockwatering and domestic; Approved October 9, 1929. G. S.
- 8859.... 4- 6-29....Arthur H. Brown; Meadow or Black Springs and tributaries; Stockwatering and domestic; No action.
- 8860.... 4-10-29....Walter B. Cole; McKenna Tunnel; Mining and milling; Approved October 7, 1929. G. S.
- 8861.... 4-10-29....Walter B. Cole; Bonanza Spring No. 2; Mining and milling; Approved October 7, 1929. G. S.
- 8862.... 4-10-29....Walter B. Cole; Bonanza Spring No. 1; Mining and milling; Approved October 7, 1929. G. S.
- 8863.... 4-12-29....J. M. Jensen; Kaford Spring; Irrigation and domestic; Withdrawn May 15, 1929.
- 8864.... 4-12-29....J. M. Jensen; Galoon Spring; Irrigation and domestic; Withdrawn May 15, 1929.
- 8865.... 4-12-29....J. M. Jensen; Underground waters of Dunlap Canyon; Irrigation and domestic; No action.
- 8866.... 4-16-29....Charles R. Brownlow; Virgin River; Irrigation and domestic; No action.
- 8867.... 4-18-29....George G. Hussman; East Carson River; Irrigation and domestic* ; No action.
- 8868.... 4-19-29....James B. Gibson; Snow and flood waters tributary to Gibson Reservoir and waters of South Canyon; Domestic and stockwatering; Approved February 6, 1930. G. S.
- 8869.... 4-19-29....James B. Gibson; Gibson Well; Domestic and stockwatering; Approved February 6, 1930. G. S.
- 8870.... 4-19-29....James B. Gibson; Battle Spring No. 3; Domestic and stockwatering; Approved February 6, 1930. G. S.

*Protested application. G. S. Good standing.

- 8871.... 4-19-29....James B. Gibson; Battle Spring No. 2; Domestic and stockwatering; Approved February 6, 1930. G. S.
- 8872.... 4-19-29....James B. Gibson; Battle Spring No. 1; Domestic and stockwatering; Approved February 6, 1930. G. S.
- 8873.... 4-19-29....Kent Land & Livestock Company; Jobs Basin Spring; Stock and domestic; Approved January 9, 1930. G. S.
- 8874.... 4-20-29....H. R. Jepsen, Clerk of the Board of County Commissioners, acting as a town board for the unincorporated town of Gardnerville; Underground; Municipal; No action.
- 8875.... 4-20-29....F. R. Bowers; Mayflower Spring; Mining and domestic*; No action.
- 8876.... 4-20-29....F. R. Bowers; Rock House Spring; Mining and domestic*; No action.
- 8877.... 4-21-29....Luther E. Woods; Horse Spring; Domestic and stockwatering; Approved December 16, 1929. G. S.
- 8878.... 4-23-29....George G. Hussman; East Carson River; Irrigation*; No action.
- 8879.... 4-24-29....Serena and Duccini; Unnamed Spring; Stockwatering*; Approved September 19, 1930. G. S.
- 8880.... 4-24-29....Serena and Duccini; Unnamed Spring; Stockwatering*; Approved September 19, 1930. G. S.
- 8881.... 4-25-29....Pio Esain and Daniel Esparza; Chimney Creek; Irrigation*; No action.
- 8882.... 4-26-29....Arthur H. Brown; Herman Sadler Homestead Springs and Creek and tributaries; Stockwatering and domestic; No action.
- 8883.... 4-27-29....Arthur E. Ellis; Unnamed Seepage; Irrigation and domestic; Withdrawn October 6, 1930.
- 8884.... 4-27-29....Hans Johnson; Well; Irrigation and domestic; Approved November 3, 1930. G. S.
- 8885.... 4-27-29....Hans Johnson; Artesian Well; Irrigation and domestic; Approved November 3, 1930. G. S.
- 8886.... 5- 1-29....Robert E. Griffith; Big Falls Spring; Domestic and irrigation; Approved May 26, 1930. G. S.
- 8887.... 5- 1-29....Robert E. Griffith; Mary Jane Spring; Domestic and irrigation; Approved May 26, 1930. G. S.
- 8888.... 5- 1-29....Robert E. Griffith; Rainbow Falls Spring; Domestic and irrigation; Approved May 24, 1930. G. S.
- 8889.... 5- 1-29....Robert E. Griffith; Twin Falls Spring; Domestic and irrigation; Approved May 24, 1930. G. S.
- 8890.... 5- 1-29....Fred Etchegary; Cottonwood Spring No. 1; Stockwatering; Approved January 7, 1930. G. S.
- 8891.... 5- 1-29....Fred Etchegary; Cottonwood Spring No. 2; Stockwatering; Approved January 7, 1930. G. S.
- 8892.... 5- 1-29....Fred Etchegary; Fagin Spring; Stockwatering; Approved January 7, 1930. G. S.
- 8893.... 5- 1-29....Fred Etchegary; Potato Canyon Spring; Stockwatering; Approved January 7, 1930. G. S.
- 8894.... 5- 1-29....Fred Etchegary; Snow Water Canyon Springs; Stockwatering; Approved January 7, 1930. G. S.
- 8895.... 5- 3-29....Kent Land & Livestock Company; Sheep Canyon; Domestic and stockwatering; Withdrawn July 9, 1929.
- 8896.... 5- 3-29....Kent Land & Livestock Company; Box Canyon Spring; Domestic and stockwatering; Approved January 9, 1930. G. S.
- 8897.... 5- 3-29....Kent Land & Livestock Company; Buck Brush Springs; Domestic and stockwatering; Approved January 9, 1930. G. S.
- 8898.... 5- 3-29....Pete Abadie; Stump Spring; Domestic and stockwatering*; No action.
- 8899.... 5- 3-29....A. J. Olds; Hard Scrabble Creek; Irrigation and domestic; Approved February 25, 1930. G. S.
- 8900.... 5- 4-29....E. R. Dodge; Surface and underground; Power and domestic; Canceled June 20, 1930.
- 8901.... 5-11-29....Pete Abadie; Stump Basin Creeks; Domestic and stockwatering*; No action.
- 8902.... 5-13-29....Frank Childress; Childress Spring; Mining, milling and domestic*; No action.
- 8903.... 5-13-29....Frank Allen; Pine Spring; Stockwatering and domestic; Approved April 9, 1930. G. S.
- 8904.... 5-13-29....Raymond Van Ness Mining Company; Unnamed Spring; Mining and domestic; Approved March 10, 1930. G. S.
- 8905.... 5-17-29....S. E. Tweedy, Trustee; Underground water of Rabbit Hole Channel; Mining and domestic; Approved May 2, 1930. G. S.
- 8906.... 5-18-29....Parman, Valerdi Co., Incorporated; Artesian Well; Irrigation; Approved March 21, 1930. G. S.
- 8907.... 5-19-29....John W. Hewey; Hiko Spring; Stockwatering and domestic; Approved October 9, 1929. G. S.
- 8908.... 5-21-29....Alex Ranson; Silver Dike Spring; Mining, milling and domestic; No action.
- 8909.... 5-22-29....E. F. McCurdy; Boyel Tunnel; Mining, milling and domestic; Approved May 5, 1930. G. S.
- 8910.... 5-22-29....S. R. Whitehead; Artesian Well; Irrigation and domestic; Approved May 5, 1930. G. S.
- 8911.... 5-22-29....Benton V. Smith; Deer Creek; Domestic; Approved May 9, 1930. G. S.
- 8912.... 5-22-29....A. L. Dressler; Big Alder Creek and Springs and Tributaries; Stockwatering and domestic*; Approved August 12, 1930. G. S.

*Protested application. G. S. Good standing.

- 8913.... 5-22-29....A. L. Dressler; Onion Creek and Springs and Tributaries*; Stockwatering; Approved August 12, 1930. G. S.
- 8914.... 5-22-29....A. L. Dressler; West Fork Little Alder Creek and Springs and Tributaries; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 8915.... 5-22-29....A. L. Dressler; East Fork Little Alder Creek and Springs and Tributaries; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 8916.... 5-22-29....A. L. Dressler; Wood Canyon Creek and Springs and Tributaries; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 8917.... 5-22-29....A. L. Dressler; Unnamed Creek and Springs; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 8918.... 5-22-29....A. L. Dressler; Drilled Well; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 8919.... 5-23-29....W. T. Jenkins Co.; Red Rock Springs; Stockwatering and domestic*; No action.
- 8920.... 5-23-29....Grey Eagle Mining Company; Lee Canyon Spring; Mining, milling and domestic; Approved February 20, 1930. G. S.
- 8921.... 5-24-29....James Ryan and John Conaway; Abandoned Spring; Stockwatering and domestic; Approved August 2, 1930. G. S.
- 8922.... 5-25-29....J. L. Pennington; Underground flow; Mining, milling and domestic*; No action.
- 8923.... 5-28-29....A. J. McMillan; Unnamed Spring; Stockwatering; No action.
- 8924.... 5-28-29....Hattie I. Helsey; Canyon Creek; Stockwatering; No action.
- 8925.... 5-28-29....Robert F. Gulley; Cottonwood Creek; Stockwatering*; No action.
- 8926.... 5-29-29....W. H. Scott; Spring or Tunnel; Mining, milling and domestic; Approved May 7, 1930. G. S.
- 8927.... 5-29-29....W. H. Scott; Willow Tunnel; Mining, milling and domestic; Approved May 7, 1930. G. S.
- 8928.... 5-31-29....Harvey L. Titus; Warm Spring; Irrigation and domestic*; No action.
- 8929.... 6- 3-29....Skull Creek Livestock Co.; Unnamed Spring, or Liberty Spring No. 1; Stockwatering and domestic*; No action.
- 8930.... 6- 3-29....Skull Creek Livestock Co.; Unnamed Spring, or Liberty Spring No. 2; Stockwatering and domestic*; No action.
- 8931.... 6- 4-29....Griswold-Henderson Live Stock Company; Side Hill Spring; Domestic and stockwatering; Canceled February 11, 1930.
- 8932.... 6- 4-29....Griswold-Henderson Live Stock Company; Chicken Creek; Domestic and stockwatering*; No action.
- 8933.... 6- 4-29....Mrs. Caroline Walther; Artesian Well; Irrigation; Approved May 7, 1930. G. S.
- 8934.... 6- 5-29....Central Pacific Railway Company; Parson Springs; General railroad and domestic; Approved December 15, 1930.
- 8935.... 6- 5-29....Central Pacific Railway Company; Killian Springs; General railroad and domestic*; Approved December 15, 1930.
- 8936.... 6- 6-29....Griswold Henderson Livestock Company; Griswold Well; Domestic and stockwatering*; No action.
- 8937.... 6- 6-29....Philip Brady; North Creek; Stockwatering; Approved May 29, 1930. G. S.
- 8938.... 6- 6-29....Philip Brady; Crow Spring; Stockwatering; Approved May 29, 1930. G. S.
- 8939.... 6- 6-29....Philip Brady; Water Tunnel; Stockwatering; Approved May 29, 1930. G. S.
- 8940.... 6- 6-29....Philip Brady; Summit Springs; Stockwatering; Approved May 29, 1930. G. S.
- 8941.... 6- 6-29....Philip Brady; Deer Spring; Stockwatering; Approved May 29, 1930. G. S.
- 8942.... 6-11-29....Martin and Fernando Segura; John Blair Springs and Tributaries; Irrigation and domestic; Approved December 3, 1930. G. S.
- 8943.... 6-11-29....Martin and Fernando Segura; Segura No. 1 Spring and Creek; Stockwatering and domestic; Approved December 3, 1930. G. S.
- 8944.... 6-11-29....Martin and Fernando Segura; Segura No. 2 Spring and Creek; Stockwatering and domestic; Approved December 3, 1930. G. S.
- 8945.... 6-11-29....Martin and Fernando Segura; Segura No. 3 Creek and Springs; Stockwatering and domestic; Approved December 3, 1930. G. S.
- 8946.... 6-11-29....Martin and Fernando Segura; Segura No. 4 Springs and Creek; Stockwatering and domestic; Approved December 3, 1930. G. S.
- 8947.... 6-11-29....Martin and Fernando Segura; Segura No. 5 Spring and Creek and Lake; Stockwatering and domestic; Approved December 3, 1930. G. S.
- 8948.... 6-11-29....Martin and Fernando Segura; Segura No. 6 Springs and Creek; Stockwatering and domestic; Approved December 3, 1930.
- 8949.... 6-11-29....Martin and Fernando Segura; Segura No. 7 Springs and Creek; Stockwatering and domestic; Approved December 3, 1930. G. S.
- 8950.... 6-11-29....Martin and Fernando Segura; Segura No. 8 Spring and Creek; Stockwatering and domestic; Approved December 3, 1930. G. S.
- 8951.... 6-11-29....Martin and Fernando Segura; Segura No. 9 Spring and Creek; Stockwatering and domestic; No action.
- 8952.... 6-11-29....Martin and Fernando Segura; Segura No. 10 Springs and Creek; Stockwatering and domestic; No action.
- 8953.... 6-11-29....Martin and Fernando Segura; Nine Mile Canyon Creek and Tributaries; Stockwatering and domestic*; No action.

*Protested application. G. S. Good standing.

- 8954.... 6-11-29....Martin and Fernando Segura; Charles Allison Spring; Stockwatering and domestic; Approved December 3, 1930. G. S.
- 8955.... 6-11-29....Eastern Nevada Exploration Co.; Upper Town Spring; Mining and domestic; Approved August 20, 1930. G. S.
- 8956.... 6-11-29....Eastern Nevada Exploration Co.; Lower Town Spring; Mining and domestic use; Approved August 20, 1930. G. S.
- 8957.... 6-12-29....W. T. Jenkins Company; Harry Canyon Spring No. 1; Stockwatering*; No action.
- 8958.... 6-12-29....W. T. Jenkins Company; Harry Canyon Spring No. 2; Stockwatering*; No action.
- 8959.... 6-15-29....Manuel Aguirre; Unnamed Spring; Stockwatering; No action.
- 8960.... 6-18-29....F. Heise Land & Livestock Co.; Drilled Well; Irrigation and domestic; Approved May 7, 1930. G. S.
- 8961.... 6-19-29....N. M. Fothergill; Underground Water; Irrigation; No action.
- 8962.... 6-20-29....Arthur H. Brown; Franklin Spring; Stockwatering and domestic; No action.
- 8963.... 6-20-29....Arthur H. Brown; Browne Spring; Stockwatering and domestic; No action.
- 8964.... 6-20-29....Arthur H. Brown; DuFour Springs; Stockwatering and domestic; No action.
- 8965.... 6-20-29....Arthur H. Brown; Salty Williams Springs; Stockwatering and domestic; No action.
- 8966.... 6-23-29....Wm. Jacoby; Jacoby Spring; Stockwatering and domestic*; No action.
- 8967.... 6-24-29....Isabelle G. Mathieson; Cow Creek Springs; Mining, milling and domestic*; Approved January 27, 1930. G. S.
- 8968.... 6-25-29....Julius N. Van Meter; Pine Spring; Irrigation and domestic; No action.
- 8969.... 6-26-29....Arthur H. Brown; Grassy Springs; Stockwatering and domestic; No action.
- 8970.... 6-26-29....Arthur H. Brown; Peggy B. Springs; Stockwatering and domestic; No action.
- 8971.... 6-26-29....Arthur H. Brown; Alba Springs; Stockwatering and domestic; No action.
- 8972.... 6-26-29....Finley Bros. & Stevens; Finley Spring No. 1; Stockwatering*; Withdrawn November 11, 1929.
- 8973.... 6-26-29....Finley Bros. & Stevens; Birch Spring (Finley No. 2); Stockwatering and domestic; Withdrawn July 23, 1929.
- 8974.... 6-26-29....Finley Bros. & Stevens; Unnamed Spring (Finley No. 3); Stockwatering and domestic*; Withdrawn November 11, 1929.
- 8975.... 6-26-29....Finley Bros. & Stevens; Unnamed Spring (Finley No. 4); Stockwatering and domestic*; Withdrawn November 11, 1929.
- 8976.... 6-30-29....W. H. Gilmer & Sons; Unnamed Spring; Stockwatering; No action.
- 8977.... 6-30-29....Kawich Cattle Comany; Tiger Water; Stockwatering; Approved April 18, 1930. G. S.
- 8978.... 7- 1-29....Louis Bartlett; Unnamed Spring; Domestic and fire; Canceled July 10, 1930.
- 8979.... 7- 4-29....Richard A. Yelland; Nigger Creek Lower Spring; Stockwatering*; No action.
- 8980.... 7- 5-29....L. A. Friedman; Underground; Irrigation and domestic; Canceled October 14, 1930.
- 8981.... 7- 5-29....Lee E. Pitts; Underground seepage on Dry Creek; Mining and domestic; Approved May 23, 1930. G. S.
- 8982.... 7- 6-29....Martin Elorga; Road Side Springs; Stockwatering*; No action.
- 8983.... 7- 6-29....Martin Elorga; Horse Canyon Spring; Stockwatering*; No action.
- 8984.... 7- 8-29....Kent Land & Livestock Company; Deep Canyon Spring; Domestic and Stockwatering; Approved January 9, 1930. G. S.
- 8985.... 7-11-29....Griswold-Henderson Livestock Company; Unnamed Spring; Stockwatering*; No action.
- 8986.... 7-11-29....E. E. Woodruff; Developed water or spring on private land; Stockwatering and domestic; Withdrawn March 21, 1930.
- 8987.... 7-11-29....E. E. Woodruff; Little High Rock Creek; Irrigation, stock and domestic; Approved October 9, 1930. G. S.
- 8988.... 7-11-29....E. E. Woodruff; Little High Rock Creek; Irrigation and domestic; Approved October 9, 1930. G. S.
- 8989.... 7-12-29....W. T. Jenkins Company; Coon Creek Spring No. 1; Stockwatering and domestic*; No action.
- 8990.... 7-14-29....J. A. Ralph; Pequop Well; Stockwatering and domestic; Approved July 7, 1930. G. S.
- 8991.... 7-15-29....E. C. Johnson; Old Thomas Spring; Stockwatering; Approved October 15, 1930. G. S.
- 8992.... 7-15-29....E. C. Johnson; Thatcher Spring and Creek; Stockwatering; Canceled August 29, 1930.
- 8993.... 7-17-29....W. T. Holcomb, acting in behalf of the State of Nevada, Department of Highways; Canyon Well; Highway maintenance and domestic; Approved April 1, 1930. G. S.
- 8994.... 7-19-29....W. J. West and E. V. Smith; South Fork of Deer Creek; Domestic; Approved May 9, 1930. G. S.
- 8995.... 7-20-29....Handley Brothers; Dipping Corral Spring; Stockwatering and domestic; Approved April 30, 1930. G. S.
- 8996.... 7-21-29....Frank E. Smith; Glider Spring; Stockwatering and domestic*; No action.

*Protested application. G. S. Good standing.

- 8997.... 7-21-29....F. C. Vanover; Little Ike Springs (Upper); Stockwatering; Approved April 15, 1930. G. S.
- 8998.... 7-26-29....Frank J. Winzell and Kate Cockrill; Deer Creek; Stockwatering and domestic; Withdrawn September 12, 1929.
- 8999.... 7-26-29....Frank J. Winzell and Kate Cockrill; Lamb Creek; Stockwatering and domestic; Withdrawn September 12, 1929.
- 9000.... 7-26-29....Frank J. Winzell and Kate Cockrill; Pete Hanson Creek; Stockwatering and domestic; Withdrawn September 12, 1929.
- 9001.... 7-26-29....The Great Western Mining & Development Co.; The Cave Spring; Mining, milling and domestic; No action.
- 9002.... 7-26-29....The Great Western Mining & Development Co.; Hagerty Spring; Power*; No action.
- 9003.... 7-26-29....The Great Western Mining & Development Co.; Hagerty Spring; Mining, milling and domestic; No action.
- 9004.... 7-29-29....W. T. Holcomb, acting for the State of Nevada, Department of Highways; Stone House; Highway maintenance and domestic; Approved July 9, 1930. G. S.
- 9005.... 8- 3-29....John A. Fuller and Theo R. Morrill; Bell Creek; Propagation of fish; Canceled October 14, 1930.
- 9006.... 8- 7-29....H. Moffat Company; McConnel Spring; Stockwatering and domestic; Approved June 30, 1930. G. S.
- 9007.... 8- 8-29....Ramona Muguerza; Ramona Hot Springs; Domestic, scalding hogs, chickens, etc.; Approved December 27, 1929. G. S.
- 9008.... 8-10-29....Central Pacific Railway Company; Star Canyon Creek; General railroad and domestic*; Approved December 15, 1930.
- 9009.... 8-12-29....Wm Mathews, Jr.; Fort Creek; Stockwatering; Approved May 22, 1930. G. S.
- 9010.... 8-12-29....S. E. Tweedy, Trustee; Rabbit Hole Spring; Mining and domestic*; No action.
- 9011.... 8-12-29....S. E. Tweedy, Trustee; Simmon Springs; Mining and domestic*; No action.
- 9012.... 8-12-29....S. E. Tweedy, Trustee; Therien Spring; Mining and domestic*; No action.
- 9013.... 8-12-29....S. E. Tweedy, Trustee; De La Vega Spring; Mining and domestic*; No action.
- 9014.... 8-13-29....Elizabeth L. Kellum; McFaul Creek and tributaries; Irrigation and domestic; No action.
- 9015.... 8-13-29....Wm. McKnight and Jesse E. Smith; Drilled wells; Irrigation and domestic; No action.
- 9016.... 8-14-29....Julius N. Van Meter; Willow Spring; Irrigation and domestic; No action.
- 9017.... 8-15-29....Winnemucca State Bank & Trust Company; Underground waters adjacent to Clerk Creek; Irrigation and domestic; Canceled October 14, 1930.
- 9018.... 8-15-29....John Crosby, Jr.; Rock Spring; Stockwatering*; No action.
- 9019.... 8-15-29....John Crosby, Jr.; Brush Spring; Stockwatering*; No action.
- 9020.... 8-15-29....John Crosby, Jr.; Summit Spring; Stockwatering*; No action.
- 9021.... 8-15-29....John Crosby, Jr.; Butts Spring; Stockwatering*; No action.
- 9022.... 8-15-29....John Crosby, Jr.; Basin Spring; Stockwatering*; No action.
- 9023.... 8-15-29....John Crosby, Jr.; Osage Spring; Stockwatering*; No action.
- 9024.... 8-15-29....John Crosby, Jr.; Allen Springs; Stockwatering*; No action.
- 9025.... 8-15-29....John Crosby, Jr.; Sage Spring; Stockwatering*; No action.
- 9026.... 8-15-29....John Crosby, Jr.; Peacock Springs; Stockwatering*; No action.
- 9027.... 8-15-29....John Crosby, Jr.; Truett Spring; Stockwatering*; No action.
- 9028.... 8-15-29....John Crosby, Jr.; Willow Spring; Stockwatering*; No action.
- 9029.... 8-15-29....John Crosby, Jr.; Stauffer Spring; Stockwatering*; No action.
- 9030.... 8-15-29....John Crosby, Jr.; Mud Springs; Stockwatering*; No action.
- 9031.... 8-15-29....John Crosby, Jr.; Grant Springs; Stockwatering*; No action.
- 9032.... 8-15-29....John Crosby, Jr.; Munroe Spring; Stockwatering*; No action.
- 9033.... 8-15-29....John Crosby, Jr.; Frost Spring; Stockwatering*; No action.
- 9034.... 8-16-29....Irwin E. Smith; Gracey Spring; Irrigation and power; Canceled October 14, 1930.
- 9035.... 8-16-29....Mort Hulery; Champion Creek; Irrigation; No action.
- 9036.... 8-19-29....A. E. Fraser; Fraser Creek; Mining and domestic; Withdrawn September 24, 1929.
- 9037.... 8-20-29....George G. Hussman; Underground waters; Irrigation and domestic; Canceled October 14, 1930.
- 9038.... 8-22-29....Willard H. George; Sandstone Springs Nos. 1 and 2; Irrigation; Approved March 18, 1930. G. S.
- 9039.... 8-28-29....George H. Sharp; Blue Eagle Well; Stockwatering; Approved January 6, 1930. G. S.
- 9040.... 8-31-29....Martin and Fernando Segura; Meadow Canyon Creek and Springs and Tributaries; Irrigation and domestic; Approved December 3, 1930. G. S.
- 9041.... 8-31-29....Martin and Fernando Segura; Antelope Valley Springs and Drainage and Tributaries; Stockwatering and domestic; Approved December 3, 1930. G. S.
- 9042.... 8-31-29....Martin and Fernando Segura; Coal Burner Springs and Tributaries; Stockwatering and domestic; Approved December 2, 1930. G. S.
- 9043.... 9- 3-29....Willard H. George; Lone Grape Vine Spring; Stockwatering; Approved April 17, 1930. G. S.
- 9044.... 9- 3-29....Willard H. George; Mud Spring No. 1; Stockwatering; Approved April 17, 1930. G. S.

*Protested application. G. S. Good standing.

- 9045.... 9- 3-29....Willard H. George; Mud Spring No. 2; Stockwatering; Approved April 17, 1930. G. S.
- 9046.... 9- 3-29....Willard H. George; Fig Spring; Stockwatering and domestic; Approved March 18, 1930. G. S.
- 9047.... 9- 5-29....G. S. Clack; Clack Spring; Mining; Approved April 9, 1930. G. S.
- 9048.... 9- 7-29....James C. Jensen; Spring Valley Creek; Irrigation*; Withdrawn October 11, 1930.
- 9049.... 9- 7-29....William J. England; Willard Creek; Mining and domestic*; No action.
- 9050.... 9- 7-29....William J. England; Shingle Creek; Mining and domestic*; No action.
- 9051.... 9-12-29....Edward Austin, Jr.; Austin Well; Stockwatering; No action.
- 9052.... 9-14-29....Bert Jarvis; Horse Basin Creek; Irrigation; Approved August 18, 1930. G. S.
- 9053.... 9-14-29....Chas. E. J. H. and L. S. Day; Sulphur Springs Creek and Tributaries; Stockwatering and domestic; Approved November 3, 1930. G. S.
- 9054.... 9-16-29....Orville C. Finley; Ant Spring; Stockwatering; Withdrawn November 11, 1929.
- 9055.... 9-16-29....Frank E. Meder and Cole L. Harwood and L. H. Taylor; Beatty Springs; Domestic*; No action.
- 9056.... 9-18-29....Abel & Curtner Livestock Company; Mahogany Spring; Stockwatering*; No action.
- 9057.... 9-18-29....Abel & Curtner Livestock Company; Rock Spring; Stockwatering; No action.
- 9058.... 9-19-29....John Hickison; Wood Canyon Spring; Stockwatering; Approved March 18, 1930. G. S.
- 9059.... 9-20-29....L. A. Maxfield; Maxfield Well No. 2; Stockwatering and domestic; Approved June 30, 1930. G. S.
- 9060.... 9-25-29....John C. Jordan; Spring Claim; Mining and milling*; Approved July 1, 1930. G. S.
- 9061.... 9-20-29....Central Pacific Railway Company; Star Canyon Creek; General railroad and domestic; Approved May 28, 1930. G. S.
- 9062....10- 1-29....Bertrand Paris; Rye Grass Well; Stockwatering and domestic*; No action.
- 9063....10- 1-29....F. J. Powers & Son; Yellow Hills Creek; Stockwater; No action.
- 9064....10- 1-29....F. J. Powers & Son; Yellowrock Spring; Stockwater; Withdrawn October 9, 1929.
- 9065....10- 1-29....F. J. Powers & Son; Yellow Rock Creek; Stockwater*; No action.
- 9066....10- 2-29....H. Heidenrich; Franktown Creek and Tributaries; Irrigation and domestic*; No action.
- 9067....10- 3-29....H. C. Purdy and A. J. Nelson; Underground water from Johnson Tunnel; Stockwatering*; No action.
- 9068....10- 4-29....Fred Wallace and James O'Brien; Unnamed Spring; Mining and domestic*; Approved April 17, 1930. G. S.
- 9069....10- 4-29....Frank Yrazoqui; Underground waters; Stockwatering*; No action.
- 9070....10- 4-29....Frank Yrazoqui; Underground waters; Stockwatering*; No action.
- 9071....10- 4-29....Frank Yrazoqui; Underground waters; Stockwatering*; No action.
- 9072....10- 4-29....Frank Yrazoqui; Underground waters; Stockwatering*; No action.
- 9073....10- 7-29....Central Pacific Railway Company; Garden Spring; General railroad and domestic; No action.
- 9074....10- 7-29....Central Pacific Railway Company; Killian Springs; General railroad and domestic*; Approved December 15, 1930.
- 9075....10- 7-29....J. P. Saffores; Indian Spring; Stockwater; Approved April 16, 1930. G. S.
- 9076....10- 7-29....J. P. Saffores; Mud Spring; Stockwater; Approved April 16, 1930. G. S.
- 9077....10- 7-29....J. P. Saffores; Willow Springs; Stockwater; Approved April 16, 1930. G. S.
- 9078....10- 7-29....J. P. Saffores; Little Willow Spring; Stockwater; Approved April 16, 1930. G. S.
- 9079....10- 7-29....J. P. Saffores; Little Cottonwood Spring; Stockwater; Approved April 16, 1930. G. S.
- 9080....10- 7-29....J. P. Saffores; Montview Creek; Stockwater; Approved April 16, 1930. G. S.
- 9081....10-7-29....J. P. Saffores; Big Rock Spring; Stockwater; Approved April 16, 1930. G. S.
- 9082....10-7-29....J. P. Saffores; Hayes Spring; Stockwatering; Approved April 16, 1930. G. S.
- 9083....10- 8-29....City of Lovelock; Well; Municipal domestic; Approved March 20, 1930. G. S.
- 9084....10- 9-29....Frank M. Owens; Circle Creek; Irrigation and domestic; No action.
- 9085....10-11-29....Emery Garrett; Monitor Spring; Stockwatering; Approved April 17, 1930. G. S.
- 9086....10-11-29....R. B. Griffith; Mazey Spring; Irrigation and domestic. No action.
- 9087....10-13-29....F. J. Powers & Son; Chicken Spring; Stockwater; No action.
- 9088....10-14-29....W. J. England; Ridge Well; Mining and domestic*; No action.
- 9089....10-16-29....Frank B. Smith; Smith Well; Stockwatering and domestic*; No action.
- 9090....10-16-29....Frank Yrazoqui; Yrazoqui Well No. 5; Stockwatering*; No action.
- 9091....10-20-29....C. D. Baker; Cold Creek Spring; Irrigation and domestic*; No action.

*Protested application. G. S. Good standing.

- 9092....10-23-29....Mammoth Quicksilver Mining Company; Unnamed Spring; Mining, milling and domestic; Approved June 26, 1930. G. S.
- 9093....10-24-29....Elizabeth L. Kellum; McFaul Creek and Tributaries; Irrigation and domestic; Approved September 11, 1930. G. S.
- 9094....10-24-29....Elizabeth L. Kellum; South Fork of McFaul Creek; Irrigation and domestic; Approved September 11, 1930. G. S.
- 9095....10-26-29....Palma Bros.; Maybe Well; Stockwatering*; No action.
- 9096....10-26-29....Palma Bros.; Big Pump Well; Stockwatering*; No action.
- 9097....10-26-29....Oren F. Boies; Buckhorn Spring; Stockwatering; No action.
- 9098....10-26-29....Oren F. Boies; Disappointment Spring; Stockwatering; No action.
- 9099....10-26-29....Oren F. Boies; Elk Spring; Stockwatering; No action.
- 9100....10-26-29....Oren F. Boies; Happen So Spring; Stockwatering; No action.
- 9101....10-26-29....Oren F. Boies; Box Canyon Spring; Stockwatering; No action.
- 9102....10-26-29....Oren F. Boies; Stag Spring; Stockwatering; No action.
- 9103....10-28-29....S. O. Cressler Estate; Catnip Creek and Tributaries; Stockwatering and domestic; No action.
- 9104....10-28-29....S. O. Cressler Estate; Fish Creek and Tributaries; Stockwatering and domestic*; No action.
- 9105....10-28-29....Clark's Valley Land & Sheep Co. and J. P. Duque; Smith Canyon and Springs; Stockwatering and domestic; Canceled October 13, 1930.
- 9106....10-28-29....Clark's Valley Land & Sheep Co. and J. P. Duque; Unnamed Spring; Stockwatering and domestic; Canceled October 13, 1930.
- 9107....10-30-29....W. H. Hood; Spring; Irrigation and domestic; Approved March 29, 1930. G. S.
- 9108....11- 1-29....Carson and Tahoe Lumber and Fluming Company; Douglas Fir Spring; Domestic, fire and irrigation; No action.
- 9109....11- 1-29....Carson and Tahoe Lumber and Fluming Company; Cedar Spring; Domestic, fire and irrigation; No action.
- 9110....11- 1-29....Gerlach & Waltz; Stockade Spring; Stockwatering*; No action.
- 9111....11- 1-29....Gerlach & Waltz; Three Troughs Spring; Stockwatering*; No action.
- 9112....11- 1-29....Gerlach & Waltz; Cherry Spring; Stockwatering*; No action.
- 9113....11- 1-29....Gerlach & Waltz; Black Mountain Spring; Stockwatering*; No action.
- 9114....11- 1-29....Gerlach & Waltz; Willow Spring; Stockwatering*; No action.
- 9115....11- 1-29....Gerlach & Waltz; Company Spring; Stockwatering*; No action.
- 9116....11- 1-29....Gerlach & Waltz; Tin Spring; Stockwatering*; No action.
- 9117....11- 1-29....Gerlach & Waltz; Bolder Dam; Stockwatering*; No action.
- 9118....11- 1-29....Gerlach & Waltz; Twin Spring; Stockwatering*; No action.
- 9119....11- 1-29....Gerlach & Waltz; Hillside Spring; Stockwatering*; No action.
- 9120....11- 1-29....L. Devita; Well; Irrigation; Canceled October 14, 1930.
- 9121....11- 2-29....Garat & Company; Garat Spring No. 1; Stockwatering*; No action.
- 9122....11- 2-29....Garat & Company; Garat Spring No. 2; Stockwatering*; No action.
- 9123....11- 2-29....Garat & Company; Garat No. 3, Water Hole in Owyhee River; Stockwatering*; No action.
- 9124....11- 2-29....Garat & Company; Garat No. 4, Water Hole on Owyhee River; Stockwatering*; No action.
- 9125....11- 2-29....Garat & Company; Garat Reservoir No. 5; Stockwatering*; No action.
- 9126....11- 2-29....Garat & Company; Garat Water Hole No. 6, on the Owyhee River; Stockwatering*; No action.
- 9127....11- 2-29....Garat & Company; Garat Water Hole No. 7, on the Owyhee River; Stockwatering*; No action.
- 9128....11- 2-29....Garat & Company; Garat Reservoir No. 8; Stockwatering*; No action.
- 9129....11- 2-29....Garat & Company; Garat Reservoir No. 9; Stockwatering*; No action.
- 9130....11- 2-29....Garat & Company; Garat Reservoir No. 10; Stockwatering*; No action.
- 9131....11- 2-29....Garat & Company; Garat Reservoir No. 11; Stockwatering*; No action.
- 9132....11- 2-29....Garat & Company; Garat Reservoir No. 12; Stockwatering*; No action.
- 9133....11- 2-29....Garat & Company; Garat Reservoir No. 13; Stockwatering*; No action.
- 9134....11- 2-29....Garat & Company; Garat No. 14, Watering Hole on Four Mile Creek; Stockwatering*; No action.
- 9135....11- 2-29....Garat & Company; Garat Spring No. 15; Stockwatering*; No action.
- 9136....11- 2-29....Garat & Company; Garat No. 16 Reservoir, in Wilson Creek Wash; Stockwatering*; No action.
- 9137....11- 2-29....Garat & Company; Garat Watering Hole No. 17; Stockwatering*; No action.
- 9138....11- 2-29....Garat & Company; Garat No. 18 Watering Hole, Rye Grass Creek; Stockwatering*; No action.
- 9139....11- 6-29....Alex Dufferrena; Shyster Creek; Irrigation; Approved May 7, 1930. G. S.
- 9140....11- 7-29....Riverview-Cumberland Mining Corporation; Dug Well on Mill Site; Mining and milling; Approved August 20, 1930. G. S.

*Protested application. G. S. Good standing.

- 9141.....11- 8-29.....John G. Kirchen; Coyote Spring; Placer mining; Approved June 21, 1930. G. S.
- 9142.....11- 8-29.....A. L. Dressler; South Fork of Pole Creek and Springs and Tributaries; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 9143.....11- 8-29.....A. L. Dressler; North Fork of Pole Creek and Springs and Tributaries; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 9144.....11- 8-29.....A. L. Dressler; Willow Springs and Creek and Tributaries; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 9145.....11- 8-29.....A. L. Dressler; Quaking Asp Springs and Creek; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 9146.....11- 9-29.....Martin Elorga; Shale Spring; Stockwatering*; No action.
- 9147.....11-13-29.....Henry C. Esplin; Esplin Well No. 1; Stockwatering*; No action.
- 9148.....11-14-29.....A. L. Dressler; Alder Creek and Tributaries; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 9149.....11-14-29.....A. L. Dressler; Unnamed Creek and Springs; Stockwatering and domestic*; Approved August 12, 1930. G. S.
- 9150.....11-15-29.....Garat & Company; Coyote Springs; Stockwatering; Canceled October 15, 1930.
- 9151.....11-15-29.....The Western Pacific Railroad Company; Garden Springs; Locomotive and domestic; Approved July 8, 1930. G. S.
- 9152.....11-17-29.....Martin Elorga; Bens Spring; Stockwatering*; No action.
- 9153.....11-19-29.....F. E. Bush and F. H. Murphey; Cottonwood Creek and Springs and Tributaries; Stockwatering and domestic*; No action.
- 9154.....11-19-29.....F. E. Bush and F. H. Murphey; White Rock Spring and Creek; Stockwatering and domestic; No action.
- 9155.....11-19-29.....F. E. Bush and F. H. Murphey; Cove Creek and Springs; Stockwatering and domestic; No action.
- 9156.....11-19-29.....F. E. Bush and F. H. Murphey; Knott Creek and Springs; Stockwatering and domestic; No action.
- 9157.....11-19-29.....F. E. Bush and F. H. Murphey; Corral Creek and Springs and Tributaries; Stockwatering and domestic*; No action.
- 9158.....11-19-29.....F. E. Bush and F. H. Murphey; Pass Spring and Creek and Tributaries; Stockwatering and domestic*; No action.
- 9159.....11-19-29.....F. E. Bush and F. H. Murphey; Willow Springs and Creek and Tributaries; Stockwatering and domestic*; No action.
- 9160.....11-19-29.....F. E. Bush and F. H. Murphey; Pole Creek and Springs; Stockwatering and domestic*; No action.
- 9161.....11-19-29.....F. E. Bush and F. H. Murphey; Sheep Spring and Creek; Stockwatering and domestic*; No action.
- 9162.....11-19-29.....F. E. Bush and F. H. Murphey; Crane Creek and Springs; Stockwatering and domestic*; No action.
- 9163.....11-19-29.....F. E. Bush and F. H. Murphey; Canyon Spring and Creek and Tributaries; Stockwatering and domestic*; No action.
- 9164.....11-19-29.....F. E. Bush and F. H. Murphey; Idaho Canyon Springs and Creek and Tributaries; Stockwatering and domestic*; No action.
- 9165.....11-19-29.....F. E. Bush and F. H. Murphey; Summit Spring and Creek; Stockwatering and domestic; No action.
- 9166.....11-19-29.....F. E. Bush and F. H. Murphey; Alkali Spring and Creek; Stockwatering and domestic*; No action.
- 9167.....11-19-29.....F. E. Bush and F. H. Murphey; Indian Spring; Stockwatering and domestic*; No action.
- 9168.....11-19-29.....F. E. Bush and F. H. Murphey; West Spring and Creek; Stockwatering and domestic*; No action.
- 9169.....11-23-29.....F. E. Bush and F. H. Murphey; Gravel Springs and Creek; Stockwatering and domestic*; No action.
- 9170.....11-23-29.....F. E. Bush and F. H. Murphey; Little Rock Spring; Stockwatering and domestic*; No action.
- 9171.....11-23-29.....F. E. Bush and F. H. Murphey; Idaho Canyon Spring No. 1; Stockwatering and domestic*; No action.
- 9172.....11-27-29.....J. P. Saffores; Ant Spring; Stockwatering; Approved April 16, 1930. G. S.
- 9173.....11-27-29.....J. P. Saffores; Finley Spring No. 4; Stockwatering; Approved April 16, 1930. G. S.
- 9174.....11-27-29.....J. P. Saffores; Finley Spring No. 3; Stockwatering; Approved April 16, 1930. G. S.
- 9175.....11-27-29.....Guy Tidball; North Well; Stockwatering; Canceled October 15, 1930.
- 9176.....11-29-29.....S. E. Tweedy; Torrey Spring; Mining and domestic; Canceled October 14, 1930.
- 9177.....11-29-29.....S. E. Tweedy; Maxine Spring; Mining and domestic; Canceled October 14, 1930.
- 9178.....12- 1-29.....William E. Barbeau; Horse Creek; Irrigation and domestic*; No action.
- 9179.....12- 3-29.....Mammoth Quicksilver Mining Co.; Red Hill Spring; Mining, milling and domestic; Withdrawn May 12, 1930.
- 9180.....12- 6-29.....J. E. Marble; Union Spring No. 6; Stockwatering; No action.
- 9181.....12- 6-29.....Arthur H. Brown; Unnamed Spring; Stockwatering and domestic*; No action.
- 9182.....12-12-29.....Lee F. Streeter and George M. Streeter; Unnamed Springs and seepage waters; Fish ponds*; No action.
- 9183.....12-16-29.....Frank Walker; Bradshaw Spring; Stockwatering*; No action.

*Protested application. G. S. Good standing.

- 9184....12-20-29....Laborde Bros. & Co.; Laborde Well No. 1; Stockwatering*; No action.
- 9185....12-20-29....J. L. Hylton; Red Rock Spring No. 1; Stockwatering and domestic; Approved June 21, 1930. G. S.
- 9186....12-20-29....J. L. Hylton; Red Rock No. 2; Stockwatering and domestic; Approved June 21, 1930. G. S.
- 9187....12-20-29....J. L. Hylton; Red Rock Spring No. 3; Stockwatering and domestic; Approved June 21, 1930. G. S.
- 9188....12-20-29....J. L. Hylton; Red Rock Spring No. 4; Stockwatering and domestic; Approved June 21, 1930. G. S.
- 9189....12-28-29....Tom and Andey Pastorino; Pastorino Springs; Stockwatering and domestic*; No action.
- 9190....12-28-29....J. B. Sorhouet; Unnamed Well; Stockwatering and domestic; No action.
- 9191....12-28-29....J. B. Sorhouet; Underground water; Stockwatering and domestic; No action.
- 9192....12-31-29....Annie B. Philatro and David S. Jones; Corey Spring; Stockwatering*; No action.

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- 9193.... 1- 2-30....Manuel Urresti and Leandro Yriarte; Tom Kane Creek; Irrigation and domestic; Canceled October 15, 1930.
- 9194.... 1- 4-30....New Original Bullfrog Mines Company; Indian Springs Nos. 1, 2, 3, 4, 5, 6, 7 and 8; Mining, milling and domestic; Canceled November 7, 1930.
- 9195.... 1- 4-30....Gerlach & Waltz; Harry Spring; Stockwatering*; No action.
- 9196.... 1- 4-30....Mathew Rees; Meadow Valley Wash; Irrigation and domestic; No action.
- 9197.... 1- 7-30....Laborde Bros. & Co.; Laborde Well No. 2; Stockwatering*; No action.
- 9198.... 1- 9-30....R. L. Goss and Chas. F. Goss; Trail Canyon; Mining placer; Canceled June 17, 1930.
- 9199.... 1-10-30....Handley Brothers; Valley Well; Stockwatering and domestic; No action.
- 9200.... 1-11-30....Steve Allen; Mustang Spring; Stockwatering*; No action.
- 9201.... 1-14-30....Gilbert H. Beesmyer; Pepper Springs; Mining, milling and domestic*; No action.
- 9202.... 1-14-30....E. D. Farnham; Pass Creek and Springs; Stockwatering and domestic; Canceled December 6, 1930.
- 9203.... 1-14-30....E. D. Farnham; Hot Springs; Stockwatering and domestic; No action.
- 9204.... 1-14-30....E. D. Farnham; Spring Creek (South Branch); Stockwatering and domestic; No action.
- 9205.... 1-14-30....E. D. Farnham; Big Creek and Springs (North Fork); Stockwatering and domestic; No action.
- 9206.... 1-14-30....E. D. Farnham; Big Creek and Springs (Middle Fork); Stockwatering and domestic; No action.
- 9207.... 1-15-30....Emil Bauman; Cottonwood Spring; Stockwatering; Approved August 30, 1930. G. S.
- 9208.... 1-15-30....Emil Bauman; Isaac or Willow Spring; Stockwatering; Approved August 30, 1930. G. S.
- 9209.... 1-20-30....California Mother Lode Mining Company; Tiger Creek; Mining and domestic; Canceled December 6, 1930.
- 9210.... 1-22-30....Steve Allen; Crow Springs; Stockwatering*; No action.
- 9211.... 1-23-30....McGonigle and Gentry; Redrock Spring No. 2; Stockwatering and domestic; Approved June 23, 1930. G. S.
- 9212.... 1-23-30....McGonigle and Gentry; Mud Spring; Stockwatering and domestic; Approved June 23, 1930. G. S.
- 9213.... 1-23-30....McGonigle and Gentry; Summit Spring; Stockwatering and domestic; Approved June 23, 1930. G. S.
- 9214.... 1-23-30....McGonigle and Gentry; Connelly Spring; Stockwatering and domestic; Approved June 23, 1930. G. S.
- 9215.... 1-23-30....McGonigle and Gentry; Walker Spring; Stockwatering and domestic; Approved June 23, 1930. G. S.
- 9216.... 1-23-30....McGonigle and Gentry; Twin Spring; Stockwatering and domestic; Approved June 23, 1930. G. S.
- 9217.... 1-23-30....McGonigle and Gentry; Garden Spring; Stockwatering and domestic; Approved June 23, 1930. G. S.
- 9218.... 1-23-30....McGonigle and Gentry; Storm water flowing in gulch to Greasewood Basin Reservoir Site; Stockwatering and domestic; Approved June 23, 1930. G. S.
- 9219.... 1-24-30....J. L. Hylton; Red Rock Well No. 6; Stockwatering; No action.
- 9220.... 1-24-30....J. L. Hylton; Red Rock Spring No. 5; Stockwatering and domestic; No action.
- 9221.... 2- 4-30....Nevada Consolidated Copper Company; Underground waters; Concentrating ores; general metallurgical and domestic; Approved October 21, 1930. G. S.
- 9222.... 2- 7-30....John I. Guthrie; Little Mud Springs; Irrigation and domestic; No action.
- 9223.... 2-14-30....Gus Sellas; Antelope Springs; Stockwatering; Approved July 2, 1930. G. S.
- 9224.... 2-14-30....Laborde Bros. & Co.; Laborde Well No. 3; Stockwatering and domestic*; No action.

*Protested application. G. S. Good standing.

- 9225.... 2-14-30....Laborde Bros. & Co.; Laborde Well No. 4; Stockwatering*; No action.
- 9226.... 2-14-30....L. O. Farr and Geo. M. Southward, copartners of firm known as Diamond Mineral Springs Water Company; Diamond Springs Well; Domestic and commercial; Approved September 12, 1930. G. S.
- 9227.... 2-18-30....J. P. Saffores; Cottonwood Spring; Stockwatering and domestic; Approved August 14, 1930. G. S.
- 9228.... 3- 1-30....Mrs. O. C. Stewart; Seepage waters; Stockwatering*; No action.
- 9229.... 3- 9-30....R. R. Gamble; Patna Hot Springs; Irrigation and domestic*; No action.
- 9230.... 3-21-30....A. L. Dressler; Hillside Springs; Stockwatering and domestic; No action.
- 9231.... 3-23-30....R. A. Yelland; Nigger Creek; Stockwatering*; No action.
- 9232.... 4- 2-30....Frank L. Reber; Unnamed Springs; Mining, milling and domestic; Canceled December 6, 1930.
- 9233.... 4- 3-30....Hubert Raycraft; Bog Hole; Irrigation and domestic; No action.
- 9234.... 4- 9-30....C. H. Baker and B. J. Sears; Unnamed Spring; Mining and domestic*; No action.
- 9235.... 4-11-30....M. P. Geraghty; Underground water; Irrigation; No action.
- 9236.... 4-12-30....Laborde Bros. & Co.; Laborde Well No. 5; Stockwatering*; No action.
- 9237.... 4-12-30....Laborde Bros. & Co.; Laborde Well No. 6; Stockwatering*; No action.
- 9238.... 4-12-30....Laborde Bros. & Co.; Laborde Well No. 7; Stockwatering*; No action.
- 9239.... 4-14-30....Mrs. Helen Sutherland Wengert; Artesian Wells; Irrigation and domestic; No action.
- 9240.... 4-15-30....Willard H. George; Sandstone Springs Nos. 1 and 2; Irrigation and domestic; No action.
- 9241.... 4-16-30....John W. Cole and Philip J. Dolan; Wilson Creek and its Tributaries, including Hidden Treasure Spring; Irrigation and domestic*; No action.
- 9242.... 4-18-30....Mammoth Quicksilver Mining Company; Easter Spring; Mining, milling and domestic; No action.
- 9243.... 4-20-30....Bell Telephone Company of Nevada; Artesian Well; Irrigation and domestic; No action.
- 9244.... 4-22-30....Fritz Schacht; Underground water; Irrigation and domestic; No action.
- 9245.... 4-23-30....Lyle J. Beeney; Dry Spring; Stockwatering and domestic; Withdrawn July 14, 1930.
- 9246.... 4-23-30....E. T. Smith; Jack Springs; Irrigation and domestic; No action.
- 9247.... 4-24-30....Angelo Florio; Springs in Secret Canyon; Stockwatering and domestic; No action.
- 9248.... 4-25-30....Clel E. Georgetta; Spring Creek; Domestic and stockwatering; Withdrawn December 20, 1930.
- 9249.... 4-25-30....Clel E. Georgetta; Spring Creek; Domestic and stockwatering; No action.
- 9250.... 4-28-30....W. D. and M. E. Caton; Duffy Trough Springs; Stockwatering*; No action.
- 9251.... 4-28-30....W. D. and M. E. Caton; Joe Jeal Spring; Stockwatering*; No action.
- 9252.... 4-28-30....W. D. and M. E. Caton; Willow Creek Spring; Stockwatering*; No action.
- 9253.... 5- 2-30....E. G. Schmiedell; Poett Spring; Domestic and fire protection; Approved September 16, 1930. G. S.
- 9254.... 5- 3-30....D. H. Tandy and Floyd K. Grimes; Birch Creek; Mining, milling and domestic; Canceled December 6, 1930.
- 9255.... 5-11-30....Rhyolite Consolidated Mines Company; Upper Indian Springs Nos. 1, 2 and 3; Mining, milling and domestic; No action.
- 9256.... 5-12-30....Mono Land and Livestock Co.; Unnamed Spring; Stockwatering and domestic; No action.
- 9257.... 5-16-30....F. J. Powers & Son; Powers Spring; Stockwatering and domestic; No action.
- 9258.... 5-16-30....F. M. Williams and C. A. Russell, Jr.; Spring Valley Canyon; Mining and domestic*; No action.
- 9259.... 5-19-30....Charles F. Lee; Wilson Creek; Irrigation and domestic; No action.
- 9260.... 5-22-30....Pueblo Mountain Mining Company; Yellow Stone Spring; Mining*; No action.
- 9261.... 5-22-30....W. H. Scott; Tunnel Spring; Mining, milling and domestic; Canceled December 6, 1930.
- 9262.... 5-23-30....Merle S. Hornbeck; McIntosh Spring; Irrigation; No action.
- 9263.... 5-23-30....T. Gordon Smith; Coyote Creek; Stockwatering; Withdrawn June 2, 1930.
- 9264.... 5-24-30....Nevada Consolidated Copper Company; Underground source; Concentrating ores; General metallurgical and domestic; No action.
- 9265.... 5-24-30....Nevada Consolidated Copper Company; Underground source; Irrigation; No action.
- 9266.... 5-31-30....Letitia Violet Spencer; Meadow Valley Wash; Irrigation and domestic; Canceled December 6, 1930.
- 9267.... 6- 3-30....H. Heidenreich; Underground waters from Pasture Well; Irrigation and domestic; No action.

*Protested application. G. S. Good standing.

- 9268.... 6- 3-30....H. Heidenreich; Underground waters through Heidenreich Wells Nos. 1, 2, 3 and 4; Irrigation and domestic; No action.
- 9269.... 6- 5-30....Mrs. Genevieve Delmue; Head of Dry Valley Creek leading into Conder's Canyon*; Stockwatering and domestic; No action.
- 9270.... 6- 9-30....R. H. Rowland; Unnamed Spring; Mining, milling and domestic*; Approved August 27, 1930. G. S.
- 9271.... 6- 9-30....H. E. Springer; Granite Spring; Mining and domestic; No action.
- 9272.... 6-11-30....George Freidhoff; Walker River; Irrigation and domestic*; No action.
- 9273.... 6-17-30....M. H. Wallace and Elmer Seevers; Berlin Canyon; Mining; Canceled December 6, 1930.
- 9274.... 6-20-30....Nelson E. Noon; La Madre Spring; Irrigation and domestic; No action.
- 9275.... 6-21-30....M. H. Wallace and Elmer Seevers; Davenport Canyon; Mining; No action.
- 9276.... 6-25-30....Herman Hildebrandt; South American Canyon Spring; Mining, milling and domestic; Canceled December 6, 1930.
- 9277.... 6-26-30....Leon Acorda; Acorda Well No. 1; Stockwatering; No action.
- 9278.... 6-26-30....Basque Mining and Milling Co.; Cherry Springs; Mining and domestic; No action.
- 9279.... 6-26-30....Basque Mining and Milling Co.; Basque Spring; Mining and domestic; No action.
- 9280.... 6-27-30....John Fasano; Fasano Springs; Stockwatering; No action.
- 9281.... 6-27-30....A. V. Heller; Juniper Spring; Stockwatering*; No action.
- 9282.... 6-27-30....A. V. Heller; Rosebush Spring; Stockwatering*; No action.
- 9283.... 6-27-30....W. D. Parker; Indian Rock Spring; Stockwatering*; No action.
- 9284.... 6-27-30....W. D. Parker; Rocky Spring; Stockwatering*; No action.
- 9285.... 6-28-30....C. R. Jones; Squaw Spring; Mining and milling*; No action.
- 9286.... 6-28-30....C. R. Jones; Bullock Spring; Mining and milling*; No action.
- 9287.... 6-28-30....C. R. Jones; Nesbitt and Tunnel No. 3 Springs; Mining and milling*; No action.
- 9288.... 6-28-30....C. R. Jones; Mona Springs; Mining and milling*; No action.
- 9289.... 6-28-30....C. R. Jones; Underground flow of Cedar Wash; Mining and milling*; No action.
- 9290.... 6-28-30....E. Edwards and Harry Parker; Lee Canyon; Mining and domestic*; No action.
- 9291.... 7- 7-30....Golden Eagle Mining and Milling Co.; LeBeau Creek; Mining, milling and domestic*; No action.
- 9292.... 7-10-30....Albert G. Burns and W. S. Thomson; Unnamed Spring; Domestic and manufacturing; No action.
- 9293.... 7-10-30....Consolidated Copper Mines Corporation; Steptoe Creek and Tributaries; Mining, milling and domestic; No action.
- 9294.... 7-11-30....Peter Etchart; Cane Springs; Stockwatering; No action.
- 9295.... 7-11-30....Peter Etchart; Etchart Springs; Stockwatering; No action.
- 9296.... 7-13-30....James Doutre; Nigger Abe Creek; Irrigation; No action.
- 9297.... 7-15-30....H. E. Springer; Barrel Spring; Mining, milling and domestic; No action.
- 9298.... 7-17-30....Paul M. Yarraguirre; Unnamed Spring; Stockwatering and domestic*; No action.
- 9299.... 7-19-30....Pete Itcaina; South Well; Stockwatering; No action.
- 9300.... 7-19-30....Pete Itcaina; White Horse Well; Stockwatering; No action.
- 9301.... 7-19-30....Pete Itcaina; Spruce Well; Stockwatering; No action.
- 9302.... 7-19-30....Pete Itcaina; Mizpah Well; Stockwatering; No action.
- 9303.... 7-19-30....Pete Itcaina; North Well; Stockwatering; No action.
- 9304.... 7-21-30....E. C. Johnson; Rock Spring; Stockwatering; No action.
- 9305.... 7-21-30....E. C. Johnson; Aspen Spring; Stockwatering; No action.
- 9306.... 7-23-30....Thos. Wilson; Surface and sub-flow of timber hill wash and tributaries; Mining and domestic; No action.
- 9307.... 7-25-30....Joe Ulrich; Underground water; Irrigation and domestic; No action.
- 9308.... 7-26-30....J. B. Sorhouet; Six Mile Canyon Springs and Creek and Tributaries; Stockwatering and domestic; No action.
- 9309.... 7-26-30....J. B. Sorhouet; Well; Stockwatering and domestic; No action.
- 9310.... 8- 5-30....Garat & Company; Peaks Creek; Domestic, irrigation and stockwatering; No action.
- 9311.... 8- 7-30....Arthur H. Brown; Spring; Stockwatering and domestic; No action.
- 9312.... 8- 7-30....Arthur H. Brown; Spring; Stockwatering and domestic; No action.
- 9313.... 8- 8-30....Charles Lunceford and Lyle Benney; Unnamed Spring; Stockwatering; No action.
- 9314.... 8-16-30....Mrs. O. C. Stewart; Unnamed Spring; Stockwatering; No action.
- 9315.... 8-18-30....D. A. Whitaker; Belleville Spring; Mining, milling and domestic; No action.
- 9316.... 8-18-30....Willard H. George; Surface run-off from rainfall collected into reservoir formed by White Rock Dam, in Unnamed Wash; Stockwatering; No action.
- 9317.... 8-18-30....Willard H. George; Surface run-off from rainfall collected into reservoir formed by Red Rock Dam in Unnamed Wash; Stockwatering; No action.
- 9318.... 8-18-30....Walter F. McLallen; Oak Creek; Irrigation and domestic; No action.
- 9319.... 8-20-30....W. D. Spencer; Artesian Well; Irrigation and domestic; No action.

*Protested application. G. S. Good standing.

- 9320.... 8-21-30....Skyland Camp, Inc.; Zephyr Cove Creek (North Fork); Camp, fire protection and domestic; No action.
- 9321.... 8-23-30....Halley D. Buzick; South Fork Spring; Irrigation and domestic; No action.
- 9322.... 8-23-30....Truckee-Carson Irrigation District; Carson River and Tributaries; Irrigation and domestic; No action.
- 9323.... 8-25-30....Boulder Dam Townsite Company; Artesian Well; Irrigation and domestic; No action.
- 9324.... 8-27-30....Carson and Tahoe Lumber and Fluming Company; South Fork of Zephyr Cove Creek; Irrigation and domestic; No action.
- 9325.... 8-27-30....Carson and Tahoe Lumber and Fluming Company; Zephyr Cove Creek; Irrigation and domestic; fire; No action.
- 9326.... 9- 2-30....Smiley Bros.; Smiley Well; Stockwatering and domestic; No action.
- 9327.... 9- 2-30....Benton V. Smith; Surprise Spring; Domestic and camp; No action.
- 9328.... 9- 5-30....Longstreet Gold Mining & Milling Company, Ltd.; Unknown Spring in Longstreet Canyon; Mining, milling and domestic; No action.
- 9329.... 9- 8-30....Mose Butti; Butti Well; Irrigation; No action.
- 9330.... 9- 9-30....Truckee-Carson Irrigation District; Truckee River and Tributaries; Irrigation and domestic; No action.
- 9331.... 9-10-30....Kearns Corporation; Kearns Spring; Stockwatering*; No action.
- 9332.... 9-11-30....Leon Acorda; Acorda Well No. 2; Stockwatering; No action.
- 9333.... 9-12-30....Bart J. Smithson; Unnamed Spring; Domestic and irrigation; No action.
- 9334.... 9-12-30....Bart J. Smithson; Unnamed Spring; Domestic and irrigation; No action.
- 9335.... 9-15-30....Frank A. Thorley; Dry Wash, Swiss Bob Well; Stockwatering*; No action.
- 9336.... 9-16-30....Snow Creek Livestock Company; Highway Well; Stockwatering; No action.
- 9337.... 9-18-30....Fred A. Farnsworth; Willow Creek; Irrigation; No action.
- 9338.... 9-19-30....Charles F. Lee; Hidden Treasure Spring; Irrigation and domestic; No action.
- 9339.... 9-19-30....United Securities Corporation; Lehman Creek and Tributaries; Irrigation, stock and domestic; No action.
- 9340.... 9-19-30....United Securities Corporation; Baker Creek and Tributaries; Irrigation, stock and domestic; No action.
- 9341.... 9-23-30....Clarence T. Rhodes; Cave Springs; Irrigation and domestic; No action.
- 9342.... 9-25-30....J. C. Wakeling and Jos. Oxborrow; Summit Spring; Stockwatering and domestic; No action.
- 9343.... 9-29-30....Mrs. Zoe Birnie; Meadow Valley Wash; Irrigation and domestic; No action.
- 9344.... 9-30-30....F. A. Pecetti and Casazza Estate; Thomas Creek and Tributaries; Power; No action.
- 9345....10- 2-30....J. H. Carter Estate Company; Carter Well; Stockwatering and domestic; No action.
- 9346....10- 4-30....F. H. Bush and F. H. Murphey; Bell Spring and Creek; Stockwatering and domestic*; No action.
- 9347....10-12-30....Rhyolite Consolidated Mines Company; Indian Springs Nos. 7 and 8; Mining, milling and domestic; No action.
- 9348....10-12-30....Rhyolite Consolidated Mines Co.; Upper Indian Springs Nos. 4, 5 and 6; Mining, milling and domestic; No action.
- 9349....10-12-30....F. W. Noble and Smith Sheep Company; Ruby Valley Well No. 2; Stockwatering; No action.
- 9350....10-12-30....F. W. Noble and Smith Sheep Company; Long Valley Well No. 1; Stockwatering; No action.
- 9351....10-12-30....F. W. Noble and Smith Sheep Company; Ruby Valley Well No. 1; Stockwatering; No action.
- 9352....10-17-30....W. T. Holcomb, acting in behalf of the State of Nevada, Department of Highways; Surplus waters from Wood Spring; Highway maintenance and domestic; No action.
- 9353....10-18-30....Clarence Glaser and Dan Glaser; Unnamed Spring; Stockwatering; No action.
- 9354....10-18-30....Clarence Glaser and Dan Glaser; Unnamed Spring; Stockwatering; No action.
- 9355....10-18-30....Steve Belli, Jr.; Underground Water; Irrigation and domestic; No action.
- 9356....10-23-30....Rubert R. Spencer; Horse Creek; Irrigation and domestic; No action.
- 9357....10-25-30....The Western Pacific Railroad Company; Well at Jungo; Locomotive and domestic; No action.
- 9358....10-26-30....George Weilmunster; Cold Spring Slide Creek; Irrigation and domestic; No action.
- 9359....10-27-30....C. G. Sevier; Holy Lake Creek and Tributaries; Irrigation and domestic; No action.
- 9360....10-28-30....G. R. Holcomb Estate Company; Thomas Creek; Mining, milling and domestic; No action.
- 9361....10-29-30....E. D. Farnham; North Fork Spring Creek and Springs and Tributaries; Stockwatering and domestic; No action.
- 9362....10-29-30....E. D. Farnham; Horse Springs; Stockwatering and domestic; No action.

*Protested application. G. S. Good standing.

- 9363.....10-29-30.....Don Maestretti; LeBeau Creek; Irrigation and domestic; No action.
- 9364.....11- 3-30.....John Rodrigues and Antonio Rodrigues; Ragsdale Spring; Irrigation and domestic; No action.
- 9365.....11- 3-30.....Lyle J. Beoney and Chas. Lunceford; Horse Creek Spring; Stockwatering and domestic; No action.
- 9366.....11- 4-30.....Ohio Mines Corporation; Unnamed Underground Seepage; Mining, milling and domestic; No action.
- 9367.....11- 5-30.....F. W. Noble and Smith Sheep Company; Ruby Valley Well No. 3; Stockwatering; No action.
- 9368.....11- 5-30.....F. W. Noble and Smith Sheep Company; Long Valley Well No. 2; Stockwatering; No action.
- 9369.....11- 6-30.....Moore Sheep Company; Moore Well No. 1; Stockwatering; No action.
- 9370.....11- 8-30.....Griswold-Henderson Livestock Co.; Underground waters from Spruce Well; Stockwatering; No action.
- 9371.....11- 8-30.....Griswold-Henderson Livestock Co.; Jasper Well; Stockwatering; No action.
- 9372.....11-11-30.....F. J. Powers & Son; Powers Spring; Stockwatering; No action.
- 9373.....11-11-30.....Smith Creek Live Stock Company; Well; Stockwatering; No action.
- 9374.....11-16-30.....Powell Bros., Everett Gallop and Ernest J. Fee; Snow Creek; Irrigation; No action.
- 9375.....11-20-30.....Clyde E. Franklin; Summit Spring; Stockwatering; No action.
- 9376.....11-20-30.....Clyde E. Franklin; Little Sage Hen Springs; Stockwatering; No action.
- 9377.....11-20-30.....John Zaharis; Unnamed Spring; Stockwatering; No action.
- 9378.....11-21-30.....Hazel Green; Sheep Creek; Irrigation; No action.
- 9379.....11-22-30.....J. B. Sorhouet; Moore's Station Creek; Irrigation and domestic; No action.
- 9380.....11-22-30.....J. B. Sorhouet; Moore's Station Creek and Tributaries; Stockwatering and domestic; No action.
- 9381.....11-22-30.....J. B. Sorhouet; Needle Spring No. 1; Stockwatering and domestic; No action.
- 9382.....11-22-30.....J. B. Sorhouet; South Canyon Spring and Tributaries; Stockwatering and domestic; No action.
- 9383.....11-22-30.....J. B. Sorhouet; Hobble Canyon Spring and Tributaries; Stockwatering and domestic; No action.
- 9384.....11-22-30.....Philip Egoscue; Pritchard Canyon and Tributaries; Irrigation and domestic; No action.
- 9385.....11-22-30.....Fred Bartine; Bartine Spring; Irrigation and domestic; No action.
- 9386.....11-25-30.....Moore Sheep Co.; Moore Well No. 2; Stockwatering; No action.
- 9387.....11-29-30.....United States Brucite Corp.; Underground Water; Mining and domestic; No action.
- 9388.....12- 4-30.....Carlo and Luigi Arobio; Humboldt River; Irrigation and domestic; No action.
- 9389.....12- 6-30.....R. J. Oppedyk; Artesian Wells; Irrigation and domestic; No action.
- 9390.....12-12-30.....H. M. Payne; Spring; Stockwatering and domestic; No action.
- 9391.....12-14-30.....G. B. Butcher; Delfs' Spring; Mining and domestic; No action.
- 9392.....12-14-30.....Theodore Belzarena & Company; Gravel Springs and Creek; Stockwatering; No action.
- 9393.....12-20-30.....Angelo Florio; Springs in Secret Canyon; Stockwatering and domestic; No action.
- 9394.....12-23-30.....Theodore Belzarena & Company; Idaho Canyon Spring No. 1; Stockwatering; No action.

*Protested application. G. S. Good standing.

CHAPTER XVIII

Status of Applications Filed Prior to 1929

STATUS OF APPLICATIONS FILED PRIOR TO JANUARY 1, 1929, UPON WHICH ACTION HAS BEEN TAKEN DURING THE YEARS 1929-1930

Following is a condensed statement giving the salient data in connection with applications filed prior to January 1, 1929, upon which action has been taken during the years 1929 and 1930, in the order of:

1. Application Serial Number.
2. Date of Filing.
3. Name of Applicant.
4. Source of Water Supply.
5. Purpose of Appropriation.
6. Action on Application.
7. Status of Permits as of December 31, 1930.

4763....12- 8-17....	Pete Arena;	Unnamed Spring; Stockwater*;	Denied December 19, 1929.
4764....12- 8-17....	Pete Arena;	Unnamed Spring; Stockwater*;	Denied December 19, 1929.
4765....12- 8-17....	Pete Arena;	Hackamore Springs; Stockwater*;	Denied December 19, 1929.
4766....12- 8-17....	Pete Arena;	Unnamed Springs; Stockwater*;	Denied December 19, 1929.
4767....12- 8-17....	Pete Arena;	Unnamed Springs; Stockwater*;	Denied December 19, 1929.
4781....12-17-17....	William T. Boyd;	Virgin Creek; Irrigation and domestic;	Denied September 15, 1930.
4874.... 1-29-18....	Union Land & Cattle Co.;	Four Mile Creek; Irrigation*;	Approved December 16, 1929. G. S.
4875.... 1-29-18....	Union Land & Cattle Co.;	Winters Creek; Irrigation*;	Approved December 16, 1929. G. S.
4886.... 2- 2-18....	Edward C. Leak;	The Old Duck Creek Channel; Irrigation and domestic*;	Denied November 28, 1930.
5208.... 8-20-18....	R. L. Primeaux;	Morgan Spring; Stockwater;	Withdrawn November 18, 1930.
5215.... 8-20-18....	R. L. Primeaux;	Choke Cherry Spring; Stockwater;	Withdrawn November 18, 1930.
5602.... 7-10-19....	Pete Mariluch;	Jones Spring; Stockwater and; domestic*;	Denied December 1, 1930.
5625.... 7-21-19....	Harry Albert Holmberg;	Peterson's Springs; Irrigation and domestic*;	Denied December 19, 1929.
5665.... 8-11-19....	Frank M. Schmidt;	Jones Spring; Irrigation and domestic*;	Denied December 1, 1930.
5719.... 9- 8-19....	Emery E. Garrett;	Pine Creek; Irrigation and domestic;	Approved April 17, 1930. G. S.
6010.... 3- 6-20....	Edward Brown;	Spring Canyon Creek; Irrigation*;	Approved April 4, 1929. G. S.
6177.... 6-17-20....	Nevada Valleys Power Company;	Underground Waters; Manufacturing and domestic;	Approved January 21, 1930. G. S.
6265.... 9-17-20....	Angelo Cartago;	Rock Springs; Irrigation and domestic;	Denied March 31, 1930.
6331....11-22-20....	Kent E. Keller;	Shermantown Springs and Tributaries; Mining, milling and domestic;	Denied October 21, 1930.
6333....11-22-20....	Clarence C. Higgins;	Unappropriated and flood waters of Dave Creek; Irrigation and domestic;	Denied June 1, 1929.
6358....12-10-20....	Arthur K. Carter;	Mason Creek; Irrigation and domestic;	Approved April 16, 1929. G. S.
6453.... 5- 4-21....	M. L. Miller;	Jones Springs; Irrigation and domestic;	Withdrawn October 6, 1930.
6509.... 7-15-21....	Pedro Corta;	Underwood Spring; Stockwater*;	Denied December 19, 1929.
6510.... 7-15-21....	Pedro Corta;	Middle Spring; Stockwater*;	Denied December 19, 1929.
6511.... 7-15-21....	Pedro Corta;	Pine Mountain Spring; Stockwater;	Denied December 19, 1929.
6512.... 7-15-21....	Pedro Corta;	Fagin Spring; Stockwater*;	Denied December 19, 1929.
6513.... 7-15-21....	Pedro Corta;	Willow Spring; Stockwater;	Denied December 19, 1929.
6514.... 7-15-21....	Pedro Corta;	Granite Spring; Stockwater*;	Denied December 19, 1929.

*Protested application. G. S. Good standing.

- 6531.... 8- 6-21....Ed. Malley, Trustee for Ed. Malley, Parvin P. Jones, Robert A. Allen and L. B. Hawkins; Beatty Springs; Power and domestic; Approved October 14, 1929. G. S.
- 6573....10- 8-21....Tom Etulain; Yragui Springs; Stockwater; Irrigation and domestic; Denied March 31, 1930.
- 6607....12-29-21....E. C. Murphy, Eliza Dolan and Mark Dolan; Telegraph Creek and Springs; Irrigation and domestic*; Withdrawn November 6, 1930.
- 6614.... 1-17-22....Tom Etulain; Buck Spring; Stockwater and domestic; Denied March 31, 1930.
- 6615.... 1-17-22....Tom Etulain; Etulain Spring; Stockwater; Denied March 31, 1930.
- 6644.... 3- 6-22....B. H. Robison; Pine Spring; Stockwater and domestic; Approved May 9, 1929. G. S.
- 6771.... 9-23-22....D. D. Sabala; Unnamed Well; Stockwater and domestic; Denied October 22, 1930.
- 6845.... 1- 1-23....Alfred Hocking; Faulkner Creek; Irrigation and domestic*; Denied October 9, 1930.
- 6891.... 4-30-23....James Bicill; Unnamed Spring; Irrigation, stockwater and domestic*; Withdrawn September 18, 1930.
- 7068.... 3-28-24....Kearns Corporation; Penrod Creek; Irrigation and domestic; Approved September 4, 1930. G. S.
- 7069.... 3-28-24....Kearns Corporation; Owyhee River; Irrigation and domestic; Approved September 4, 1930. G. S.
- 7071.... 3-28-24....Kearns Corporation; Warm Creek; Irrigation and domestic; Approved September 4, 1930. G. S.
- 7084.... 4-14-24....Jno. B. Pescio; Lone Tree Trail Spring; Stockwater; Withdrawn September 24, 1930.
- 7136.... 6-16-24....Jerry Yragui; Unnamed Spring; Stockwater*; Denied October 22, 1930.
- 7252....11-21-24....Albert Welch; Carpenter Spring; Stockwater; Approved June 3, 1929. G. S.
- 7280.... 1-12-25....G. A. Lathrop; Big Spring; Irrigation and domestic; Withdrawn May 21, 1929.
- 7349.... 5- 1-25....Jose Iragui; No Name; Stockwater*; Approved September 9, 1930. G. S.
- 7350.... 5- 1-25....Jose Iragui; Summit Spring; Stockwater*; Approved September 9, 1930. G. S.
- 7351.... 5- 1-25....Jose Iragui; Head of Rock Creek; Stockwater*; Approved September 9, 1930. G. S.
- 7429.... 7- 5-25....Chas. R. Allen, Jr.; Pony Spring; Stockwater*; Withdrawn October 4, 1929.
- 7449.... 7-22-25....J. H. Millard; Corral Creek; Irrigation*; Denied January 14, 1930.
- 7461.... 8- 1-25....J. C. Wholey; Wholey's Well No. 3; Stockwater and domestic; Approved December 26, 1929. G. S.
- 7476.... 8-10-25....Arnaud Paris; Roadside Spring; Irrigation and domestic*; Withdrawn September 16, 1930.
- 7493.... 9- 5-25....J. C. Wholey; Lake Spring; Stockwater*; Denied December 19, 1929.
- 7494.... 9- 6-25....Ed. Filippini; Lake Springs No. 2; Irrigation; Approved January 4, 1930. G. S.
- 7520.... 9-27-25....Fritz Walti; Potato Spring No. 1; Stockwater*; Approved May 9, 1930. G. S.
- 7522.... 9-27-25....Fritz Walti; Potato Spring No. 3; Stockwater*; Approved May 8, 1930. G. S.
- 7523.... 9-27-25....Fritz Walti; Flat Spring; Stockwater*; Approved August 28, 1929. G. S.
- 7524.... 9-27-25....Fritz Walti; Potato Spring No. 2; Stockwater*; Approved May 8, 1930. G. S.
- 7525.... 9-27-25....Fritz Walti; Red Mountain Spring; Stockwater*; Approved August 28, 1929. G. S.
- 7526.... 9-27-25....Fritz Walti; Sheep Corral Spring; Stockwater*; Approved August 28, 1929. G. S.
- 7541....10- 7-25....Grass Valley Tom (Indian); Corral Canyon Creek; Irrigation and domestic*; Denied December 19, 1929.
- 7545....10- 7-25....Clement Maggini; Potato Spring; Stockwater*; Withdrawn August 19, 1929.
- 7591....12- 2-25....Pete Lambert; Mud Spring; Stockwater*; Withdrawn September 16, 1930.
- 7605....12-18-25....Handley Brothers; Black Point Spring; Stockwater; Approved September 20, 1929. Certificate.
- 7606....12-18-25....Handley Brothers; Pedrol Creek through Ditch No. 1; Stockwater*; Approved December 5, 1930. G. S.
- 7607....12-18-25....Handley Brothers; Pedrol Creek through Ditch No. 2; Stockwater*; Approved December 5, 1930. G. S.
- 7614.... 1- 5-26....Marvin Ballenger; Big Spring; Irrigation and domestic; Approved June 28, 1929. G. S.
- 7637.... 2- 9-26....J. C. Wholey; Underground Water; Irrigation, stockwatering and domestic; Approved for irrigation and domestic, December 26, 1929. G. S.
- 7646.... 2-25-26....James C. Riordan; Reef Spring; Mining, milling, domestic and stockwater; Approved October 9, 1929. G. S.

*Protested application. G. S. Good standing.

- 7648.... 2-25-26....C. L. Johnson; Onyx Springs; Stockwater*; Withdrawn October 6, 1930.
- 7650.... 2-26-26....Ely Water Co.; Murry Creek; Irrigation and domestic; Approved February 19, 1930. G. S.
- 7657.... 3- 5-26....H. E. Lewis; Unnamed Spring; Irrigation and domestic; Approved April 16, 1929. G. S.
- 7672.... 3-25-26....Grover Millard; Millard Creek; Irrigation and domestic; Denied December 19, 1929.
- 7724.... 4-23-26....Henry C. Nicholson and Henry Marriott; Osceola Creek; Milling and domestic; Approved November 3, 1930. G. S.
- 7725.... 4-23-26....Henry C. Nicholson and Henry Marriott; New Moon Creek; Milling and domestic; Approved November 3, 1930. G. S.
- 7736.... 4- 1-26....John A. Ryan; Coyote Creek; Irrigation and domestic; Denied December 17, 1930.
- 7739.... 5-10-26....Harry E. Springer; Cottonwood or Granite Springs; Power, mining and domestic; Denied June 1, 1929.
- 7748.... 5-11-26....Grover Millard; Bush Creek and its Tributaries; Irrigation and domestic; Denied December 19, 1929.
- 7761.... 5-20-26....Ely Water Company; Toner Spring; Irrigation and stockwater; Approved February 18, 1930. G. S.
- 7766.... 6- 1-26....Alma Woods; Alma Woods Spring No. 1; Stockwater*; Approved October 7, 1930. G. S.
- 7768.... 6- 1-26....Alma Woods; Alma Woods Spring No. 3; Stockwater*; Approved October 7, 1930. G. S.
- 7774.... 6- 6-26....Henry Anderson; Anderson Springs; Irrigation, stockwatering and domestic; Approved for stockwater and domestic January 10, 1929. G. S.
- 7792.... 6-28-26....Pete Mariluch; Pete's Spring; Stockwater*; Denied December 1, 1930.
- 7801.... 6-30-26....E. P. Carville; Snowball Spring No. 10; Stockwater and domestic; Denied December 15, 1930.
- 7802.... 6-30-26....E. P. Carville; Snowball Spring No. 11; Stockwater and domestic; Denied December 15, 1930.
- 7803.... 6-30-26....E. P. Carville; Snowball Spring No. 12; Stockwater and domestic; Denied December 15, 1930.
- 7824.... 7-16-26....Alma Woods; Warm Spring; Irrigation and domestic; Approved November 3, 1930. G. S.
- 7825.... 7-16-26....Wm. H. Brennen; Buckhorn Spring No. 1; Stockwater and irrigation; Withdrawn September 9, 1930.
- 7826.... 7-17-26....Wm. H. Brennen; Buckhorn Spring No. 2; Stockwater and irrigation; Withdrawn September 9, 1930.
- 7827.... 7-17-26....Wm. H. Brennen; Tub Spring; Stockwater*; Withdrawn September 9, 1930.
- 7828.... 7-17-26....Wm. H. Brennen; Seguria Spring; Stockwater*; Withdrawn September 9, 1930.
- 7829.... 7-17-26....Wm. H. Brennen; Cherry Tree Spring; Stockwater*; Withdrawn September 9, 1930.
- 7832.... 7-27-26....Hank Toytoy (Indian); North Cowboy Rest Creek and Tributaries; Irrigation; domestic and stockwater*; Denied December 28, 1929.
- 7835.... 8- 2-26....Wm. H. Brennen; Blue Spring; Stockwater*; Withdrawn September 9, 1930.
- 7841.... 8- 7-26....Henry Anderson; Tank-house Springs; Irrigation, stock and domestic; Approved January 10, 1929. G. S.
- 7843.... 8- 7-26....Henry Anderson; Sheep Trough Spring; Irrigation, stock and domestic; Approved for stockwater and domestic, January 10, 1929. G. S.
- 7844.... 8- 7-26....Henry Anderson; Twenty Small Springs; Irrigation, stock and domestic; Approved January 10, 1929. G. S.
- 7845.... 8- 7-26....Henry Anderson; Thirty Small Springs; Irrigation, stock and domestic; Approved January 10, 1929. G. S.
- 7847.... 8-12-26....Ely Calumet Mining Co.; Piermont Creek; Power, mining, milling and domestic; Approved January 21, 1930. G. S.
- 7862.... 8-24-26....N. P. Morrison; Underground; Irrigation and domestic; Approved May 9, 1929. G. S.
- 7866.... 8-25-26....Rufus Edgar Hurst; Willow Spring; Irrigation; Approved December 3, 1929.
- 7868.... 8-26-26....Marcos Legarra; Potato Spring No. 2; Stockwater*; Approved March 28, 1930. G. S.
- 7888.... 9-13-26....Mrs. Emma Schaefer; Willow Spring; Stockwater; Approved June 27, 1929. G. S.
- 7889.... 9-16-26....Henry Anderson; Unnamed Spring; Irrigation, stock and domestic; Approved for stock and domestic, January 10 1929. G. S.
- 7890.... 9-16-26....Henry Anderson; Tunnel Spring; Irrigation and stockwater; Approved for stockwater and domestic, January 10, 1929. G. S.
- 7902....10-14-26....Long Valley Land and Development Co.; Denio Creek and Middle, Western, and Massacre Lake; Storage, irrigation, power, domestic and livestock; Approved for storage purposes, July 9, 1929. G. S.
- 7927....11-10-26....Vincente Juaristi; Dry Lake Well No. 1; Stockwater and domestic; Approved March 14, 1929. G. S.

*Protested application. G. S. Good standing.

- 7928.....11-10-26....Vincente Juaristi; Dry Lake Well No. 2; Stockwater and domestic; Approved March 14, 1929. G. S.
- 7939.....11-20-26....William Sellas; Chin Creek and Tributaries; Irrigation and domestic*; Approved October 14, 1929. G. S.
- 7949.....12-11-26....Raymond L. Holland; Lost Creek; Mining, milling and domestic; Denied December 1, 1930.
- 7979.....1-15-27....The Adams-McGill Co.; Moorman Spring Slough; Stock; Approved October 25, 1930. G. S.
- 7986.....1-22-27....George H. Eldridge; San Pedro Well; Stockwater; Approved November 25, 1930. G. S.
- 7987.....1-22-27....W. C. Morgan; Ben Spring; Irrigation, stock and domestic; Approved for irrigation and domestic, May 22, 1930. G. S.
- 7992.....1-29-27....H. L. Stiff; Hot Springs; Domestic; Approved August 12, 1929. G. S.
- 7999.....2-4-27....Edward Ryan; Lake Creek; Irrigation*; Approved April 24, 1929; Canceled August 30, 1930.
- 8022.....3-6-27....J. C. Wholey; Carrico Creek and Tributaries; Irrigation, stockwater and domestic; Denied December 19, 1929.
- 8028.....2-11-27....F. C. Vanover; Black Rock Springs; Stockwater; Approved October 29, 1930. G. S.
- 8029.....3-11-27....F. C. Vanover; Vanover Spring; Stockwater; Approved October 29, 1930. G. S.
- 8050.....3-25-27....Donald D. Eldridge; North Millick Spring Creek; Irrigation and domestic; Denied July 18, 1929.
- 8051.....3-25-27....David S. Eldridge; Eldridge Spring; Irrigation and domestic; Denied July 18, 1929.
- 8053.....3-25-27....John Manzonie; North Well; Stockwater; Denied December 15, 1930.
- 8054.....3-25-27....John Manzonie; Secret Spring; Stockwater; Denied December 15, 1930.
- 8063.....3-29-27....Grass Valley Land & L. S. Co.; Cottonwood Creek; Stockwater*; Denied December 30, 1929.
- 8071.....3-30-27....Grass Valley Land & Livestock Co.; Unnamed Spring; Stockwater*; Denied December 30, 1929.
- 8100.....4-19-27....B. H. Robison; Water Cress Spring; Stockwater and domestic; Approved May 9, 1929. G. S.
- 8102.....4-19-27....B. H. Robison; Basin Spring; Stockwater and domestic*; Approved May 9, 1929. G. S.
- 8104.....4-19-27....B. H. Robison; Munsey Creek; Stockwater and domestic*; Approved May 9, 1929. G. S.
- 8121.....5-3-27....F. J. Powers & Son; Hanging Rock Creek; Stockwater; Approved October 17, 1929. G. S.
- 8134.....5-19-27....M. L. McClure; Rabbit Brush Spring; Stockwater; Approved April 15, 1930. G. S.
- 8136.....5-19-27....Edwin Van Riper; Passa Spring; Stockwater; Approved October 16, 1929. Certificate.
- 8154.....6-7-27....W. B. Oliphint; Spring; Mining and domestic*; Canceled December 17, 1929.
- 8162.....6-10-27....Herbert A. Miller; Big Meadow Slough; Irrigation and domestic; Denied March 19, 1930.
- 8172.....6-15-27....Donald Eldridge; South Millick Spring; Irrigation and domestic; Approved October 30, 1929. G. S.
- 8175.....6-17-27....M. L. McClure; Pony Spring; Stockwater and domestic; Approved August 9, 1929. G. S.
- 8176.....6-17-27....M. L. McClure; Dutch John Well; Stockwater and domestic; Approved August 9, 1929. G. S.
- 8178.....6-17-27....Texas A. McCall; Big Spring; Irrigation and domestic; Approved August 23, 1929. G. S.
- 8179.....6-17-27....Texas A. McCall; Fairbanks Spring; Irrigation and domestic; Approved August 23, 1929. G. S.
- 8181.....6-20-27....Bert Lyman; Meadow Valley Wash; Irrigation and domestic; Approved June 8, 1929. G. S.
- 8188.....6-21-27....Herman Deitlaff; Deitlaff Springs Nos. 1, 2, 3 and 4; Irrigation and domestic; Approved April 8, 1930. G. S.
- 8189.....6-21-27....Meeker & Heward; South Willow Creek Spring; Stockwater; Approved April 16, 1930. G. S.
- 8202.....6-26-27....Garat and Company; Unnamed Spring; Stockwater; Approved June 8, 1929. G. S.
- 8206.....6-30-27....Lyle J. Craner; Private Well; Irrigation and domestic; Approved February 25, 1929. G. S.
- 8207.....6-30-27....Harry E. Webb; Unnamed Spring; Stockwater; Approved January 13, 1930. G. S.
- 8239.....7-18-27....W. E. Barnard; Burk Creek Spring and Tributaries; Irrigation and domestic; Denied June 10, 1930.
- 8256.....8-1-27....James S. Morrison; Highway Spring; Stockwater; Approved January 10, 1929. G. S.
- 8266.....8-8-27....Albert Knight; Unnamed Spring; Irrigation and domestic; Approved July 31, 1929. G. S.
- 8287.....8-12-27....W. E. Barnard; Burk Creek; Power; Denied June 10, 1930.
- 8300.....8-22-27....Handley Brothers; White Hill Spring; Stockwater; Approved April 30, 1930. G. S.
- 8308.....8-29-27....Humboldt Sulphur Co.; Humboldt Sulphur Wells Nos. 1, 2, 3, 4 and 5; Milling and domestic; Approved May 24, 1929. G. S.

*Protested application. G. S. Good standing.

- 8309.... 8-29-27....Humboldt Sulphur Co.; Cold Sulphur Spring; Milling and domestic; Approved May 24, 1929. G. S.
- 8322.... 9-16-27....Snow Creek Livestock Co.; West Spring; Stockwatering*; Withdrawn September 16, 1930.
- 8329.... 9-30-27....Schaefer Sheep Company; Schaefer Well; Stockwater; Approved June 27, 1929. G. S.
- 8330....10- 1-27....Alma Woods; Clover Spring; Stockwater and domestic; Approved June 8, 1929. G. S.
- 8331....10- 1-27....Alma Woods; Shamrock Springs; Stockwater and domestic; Approved June 8, 1929. G. S.
- 8339....10- 5-27....Handley Bros.; Mahogany Springs; Stockwater; Approved September 20, 1929. G. S.
- 8341....10- 6-27....Moses Reinhart; Grand Trunk Spring; Stockwater; Approved March 29, 1930. G. S.
- 8344....10-13-27....Frank Yrazoqui; South Spring; Stockwater*; Withdrawn September 15, 1930.
- 8345....10-13-27....Frank Yrazoqui; Mud Springs; Stockwater*; Withdrawn September 15, 1930.
- 8346....10-13-27....Frank Yrazoqui; Flat Spring; Stockwater*; Withdrawn September 15, 1930.
- 8360....10-22-27....C. L. Fulstone; North Canyon Creek and Tributaries; Power and domestic*; Canceled January 15, 1929.
- 8370....10-26-27....Clark's Valley Land & Sheep Co.; Twin Mountain Spring; Stockwater; Approved October 26, 1929. G. S.
- 8373....10-26-27....J. P. Duque; Sage Hen Spring; Stockwater; Approved October 26, 1929. G. S.
- 8379....11- 9-27....Albert Welch; Cottonwood Creek; Stockwater; Approved June 3, 1929. G. S.
- 8380....11- 9-27....Grant Welch; Welch Well; Stock and domestic; Approved June 3, 1929. G. S.
- 8396....11-23-27....Ely Calumet Mining Corporation; Piermont Creek; Mining, milling and domestic; Approved December 27, 1929. G. S.
- 8406....12- 8-27....M. L. McClure; Wild Horse Spring; Stockwater and domestic; Withdrawn March 25, 1929.
- 8407....12- 8-27....M. L. McClure; Poor Cow Spring; Stockwater and domestic; Approved August 9, 1929. G. S.
- 8408....12- 8-27....M. L. McClure; Gouge Eye Spring; Stockwater and domestic; Approved August 9, 1929. G. S.
- 8411....12-26-27....The Adams-McGill Company, Inc.; Copper Flat Well; Stockwater; Approved May 21, 1929. G. S.
- 8430.... 1- 8-28....Muddy Valley Irrigation Company; Muddy River and Tributaries; Irrigation and domestic; Canceled January 11, 1929.
- 8438.... 1-25-28....Abraham Arigoni; Artesian Well; Stockwater; Approved September 5, 1929. G. S.
- 8441.... 2- 1-28....Gold Hill Mining Company; Spring on the R. T. Baily Ranch; Mining, milling and domestic; Approved March 25, 1929. G. S.
- 8444.... 2- 7-28....Mrs. Effie M. Jaime; Blue Point Spring; Stockwater and domestic*; Approved August 21, 1929. G. S.
- 8457.... 2-20-28....W. C. Pitt Company; Say Canyon and Springs (East Fork); Stockwater and domestic; Approved May 24, 1930. G. S.
- 8458.... 2-20-28....W. C. Pitt Company; French Boy Canyon and Springs; Stockwater and domestic; Approved May 24, 1930. G. S.
- 8459.... 2-21-28....Mrs. Effie M. Jaime; Whiskey Springs; Stockwater and domestic*; Approved August 21, 1929. G. S.
- 8460.... 2-24-28....S. N. Davis; Hayes Well; Stockwater and domestic; Approved May 15, 1929. G. S.
- 8461.... 2-29-28....Mike Sala; Egan Creek; Irrigation; Approved March 29, 1930. G. S.
- 8462.... 3- 1-28....E. W. Griffith; Kyle Spring; Domestic and irrigation; Approved February 13, 1930. G. S.
- 8470.... 3- 2-28....A. Charlebois; Reese River Canyon Spring and Creek; Stockwater and domestic; Approved January 23, 1930. G. S.
- 8471.... 3- 2-28....A. Charlebois; Buck Brush Spring; Stockwater and domestic*; Approved February 21, 1930. G. S.
- 8472.... 3- 2-28....Frank Charlebois; Deadman Canyon Spring and Creek; Stockwater and domestic; Canceled January 2, 1929.
- 8473.... 3- 2-28....Frank Charlebois; Penrod Canyon Spring and Creek; Stockwater and domestic; Canceled January 2, 1929.
- 8475.... 3- 3-28....Handley Brothers; Saw Mill Springs and Creek; Stockwater and domestic; Canceled January 15, 1929.
- 8476.... 3- 3-28....Handley Brothers; Cottonwood Canyon Spring and Creek (No. 1 Branch); Stockwater and domestic; Canceled January 15, 1929.
- 8477.... 3- 3-28....Handley Brothers; Cottonwood Canyon Springs and Creek (No. 2 Branch); Stockwater; Canceled January 15, 1929.
- 8478.... 3- 7-28....Mark Lattin; Well; Stockwater; Approved April 9, 1930. G. S.
- 8483.... 3-16-28....John A. Magnuson; Third Creek; Stockwater; Approved September 16, 1929. G. S.
- 8484.... 3-16-28....John A. Magnuson; Fitzhugh Creek; Stockwater; Approved September 17, 1929. G. S.
- 8485.... 3-16-28....John A. Magnuson; Second Creek; Stockwater; Approved September 17, 1929. G. S.
- 8486.... 3-16-28....John A. Magnuson; First Creek; Stockwater; Approved September 17, 1929. G. S.

*Protested application. G. S. Good standing.

- 8487.... 3-22-28....John M. Allen; Lone Willow Spring; Mining and domestic; Canceled January 15, 1929.
- 8489.... 3-24-28....John Manzonie; Giroux Wash; Stockwater; Canceled January 2, 1929.
- 8494.... 3-28-28....C. W. Godecke; Artesian Well; Irrigation and domestic; Approved June 26, 1929. G. S.
- 8497.... 4- 5-28....Edward J. Sharp; Forty-nine Creek (Flood Waters) and Tributary; Irrigation and stockwater; Canceled January 15, 1929.
- 8501.... 4-11-28....Frank Yrazoqui; Unnamed Well; Stockwater; Canceled March 6, 1929.
- 8505.... 4-19-28....Keywest Mining Company; Spring; Mining and domestic; Canceled March 21, 1929.
- 8507.... 4-19-28....E. R. Dodge; Surface and underground waters; Power and domestic; Canceled March 1, 1929.
- 8511.... 4-28-28....Clarence and Dan Glaser and Jiconie Smiraldo; Glaser Well; Stockwater; Withdrawn January 2, 1929.
- 8514.... 4-23-28....A. C. Florio; Rock Spring; Stockwater and domestic*; Approved March 17, 1929. Certificate.
- 8515.... 4-23-28....A. C. Florio; Cash Spring; Stockwater and domestic; Approved March 24, 1930. G. S.
- 8516.... 4-23-28....A. C. Florio; Evans Springs; Stockwater and domestic; Approved July 3, 1930. G. S.
- 8517.... 4-23-28....A. C. Florio; Soda Springs; Stockwater and domestic; Approved October 21, 1930. G. S.
- 8524.... 4-24-28....Lewis R. Persson; McConnell Creek; Irrigation and domestic; Approved August 26, 1929. G. S.
- 8525.... 4-26-28....R. T. Swallow; Pipe Spring; Stockwater; Approved August 9, 1929. G. S.
- 8531.... 5-11-28....State of Nevada, Department of Highways; Becky Springs; Construction and maintenance camp and domestic; Approved July 20, 1929. G. S.
- 8534.... 5-12-28....L. E. McCulley; Sage Hen Spring; Stockwater and domestic; Approved January 6, 1930. G. S.
- 8535.... 5-12-28....L. E. McCulley; Beebe Spring; Stockwater and domestic; Approved January 6, 1930. G. S.
- 8537.... 5-14-28....B. & B. Quick Company; Trail Creek, West Slope of Fish Lake Valley; Mining and domestic; Approved May 29, 1929. G. S.
- 8538.... 5-14-28....Pete Carletti; Pony Creek in Copper Mine Basin; Stockwater; Approved May 23, 1929. G. S.
- 8539.... 5-15-28....J. H. McCoy and B. P. Howell; McCoy Springs; Mining, milling and domestic; Approved August 23, 1929. G. S.
- 8540.... 5-15-28....J. H. McCoy and B. P. Howell; Gillman Springs; Mining, milling and domestic; Approved August 23, 1929. G. S.
- 8542.... 5-22-28....R. A. Yelland; Yelland Well; Stockwater; Approved May 9, 1929. G. S.
- 8543.... 5-22-28....John Rosenlund; Upper and Lower Trough Springs; Stockwater; Approved May 21, 1929. G. S.
- 8544.... 5-22-28....John Rosenlund; Upper and Lower Gravel Springs; Stockwater; Approved May 21, 1929. G. S.
- 8545.... 5-23-28....Patmos Mines Company; Patmos Springs; Mining, milling and domestic; Approved May 8, 1929. G. S.
- 8546.... 5-23-28....Chas. E., J. H. and L. S. Day; Sulphur Spring Creek and Springs; Stockwater and domestic; Canceled September 12, 1929.
- 8547.... 5-28-28....Andrew Boundy; Mud Spring Group; Stockwater; Approved May 17, 1929. G. S.
- 8548.... 5-28-28....Q. D. Boyd; Unnamed Spring; Stockwater; Approved May 24, 1929. G. S.
- 8553.... 6- 3-28....J. Claud Frei; Cottonwood Creek; Stockwater and domestic; Approved May 9, 1929. G. S.
- 8556.... 6- 4-28....John Janney; Underground Water of Nevada Des Moines Shaft; Mining; Approved January 30, 1929. G. S.
- 8562.... 6- 9-28....Castle Peak Quicksilver Company; Lousetown Creek; Mining and domestic; Approved June 8, 1929. G. S.
- 8563.... 6- 9-28....G. W. Warmoth; Spring in Burnt Canyon; Mining, milling and domestic; Denied August 23, 1929.
- 8564.... 6-11-28....Leo E. Frey and Catherine Frey; Artesian Wells; Greenhouse and domestic; Approved June 8, 1929. G. S.
- 8566.... 6-13-28....H. M. Gilbert; Combination Springs; Mining, milling and domestic; Approved December 23, 1929. G. S.
- 8567.... 6-13-28....H. M. Gilbert; Lovey Springs; Mining, milling and domestic*; Approved September 16, 1930. G. S.
- 8571.... 6-14-28....Handley Bros.; Stone House Springs and Creek; Stockwater and domestic; Approved April 30, 1930. G. S.
- 8573.... 6-17-28....W. T. Jenkins Company; Clark's Springs; Stockwater and domestic; Approved September 9, 1930. G. S.
- 8575.... 6-19-28....W. E. Hill; Little Slough; Stockwater; Approved May 8, 1929. G. S.
- 8576.... 6-19-28....W. E. Hill; Little Basin Creek; Stockwater; Approved May 8, 1929. G. S.
- 8577.... 6-19-28....J. F. Poore; Post Canyon Creek; Stockwater; Approved May 15, 1929. G. S.
- 8579.... 6-20-28....Gaston Uhalde and Wm. Hendrix; Nugget Spring; Stockwater and domestic; Canceled January 15, 1929.
- 8583.... 6-20-28....Lyle Cook; Burnt Lake Canyon Spring; Stockwater; Approved November 6, 1929. Certificate.

*Protested application. G. S. Good standing.

- 8584.... 6-21-28....Bertrand Paris; Paris Spring No. 3; Stockwater; Approved October 20, 1929. G. S.
- 8585.... 6-21-28....Bertrand Paris; Paris Spring No. 2; Stockwater; Approved October 20, 1929. G. S.
- 8586.... 6-21-28....Bertrand Paris; Paris Spring No. 4; Stockwater; Approved October 20, 1929. G. S.
- 8587.... 6-21-28....Bertrand Paris; Paris Spring No. 5; Stockwater; Approved October 20, 1929. G. S.
- 8588.... 6-21-28....Bertrand Paris; Paris Spring No. 1; Stockwater; Approved October 20, 1929. G. S.
- 8589.... 6-21-28....Everett F. Hill; Mud Springs; Stockwater; Approved May 22, 1929. Certificate.
- 8592.... 6-22-28....Bertrand Paris; Pine Spring; Stockwater; Approved October 20, 1929. G. S.
- 8593.... 6-22-28....Bertrand Paris; High Rock Spring; Stockwater; Approved October 20, 1929. G. S.
- 8594.... 6-22-28....Bertrand Paris; Willow Spring; Stockwater; Approved October 20, 1929. G. S.
- 8596.... 6-23-28....Donnelly Land and Livestock Co.; Broncho Spring and Artesian Well; Irrigation and domestic; Approved May 29, 1930. G. S.
- 8597.... 6-23-28....Donnelly Land and Livestock Company; Cedar Spring; Stockwater and domestic; Approved May 29, 1930. G. S.
- 8598.... 6-23-28....Donnelly Land and Livestock Company; Buck Spring and Creek; Stockwater and domestic; Approved May 29, 1930. G. S.
- 8599.... 6-23-28....Donnelly Land and Livestock Company; Sheep Spring and Creek; Stockwater and domestic; Approved May 29, 1930. G. S.
- 8600.... 6-23-28....Donnelly Land and Livestock Company; Donnelly Springs; Stockwater and domestic; Approved May 29, 1930. G. S.
- 8601.... 6-25-28....Donnelly Land and Livestock Company; Box Spring; Stockwater and domestic; Approved May 29, 1930. G. S.
- 8602.... 6-25-28....John Uhalde; Gracien's Well; Stockwater and domestic*; Approved September 12, 1929. G. S.
- 8603.... 6-25-28....John Uhalde; White Sage Well; Stockwater and domestic*; Approved September 12, 1929. G. S.
- 8606.... 6-27-28....Bertrand Paris; Paris Spring No. 6; Stockwater; Approved October 20, 1929. G. S.
- 8607.... 6-27-28....W. E. Rinehart, Round Lake; Stockwater and domestic; Approved October 3, 1929. G. S.
- 8608.... 6-27-28....W. E. Rinehart; Bald Mountain Spring and Creek; Stockwater and domestic; Approved October 3, 1929. G. S.
- 8609.... 6-27-28....W. E. Rinehart; Cottonwood Spring and Creek; Stockwater and domestic; Approved October 3, 1929. G. S.
- 8610.... 6-27-28....W. E. Rinehart; Half Moon Lake; Stockwater and domestic; Approved October 3, 1929. G. S.
- 8611.... 6-27-28....W. E. Rinehart; Unnamed Canyon or Creek; Stockwater and domestic; Approved October 3, 1929. G. S.
- 8616.... 7-13-28....H. F. Dangberg Land & Livestock Company; Well; Irrigation and domestic; Approved May 9, 1929. G. S.
- 8617.... 7-13-28....H. F. Dangberg Land & Livestock Company; Well; Irrigation and domestic; Approved May 9, 1929. G. S.
- 8618.... 7-13-28....Levi W. Sypheus; Rogers Spring; Irrigation and domestic; Canceled September 5, 1929.
- 8619.... 7-13-28....Wm. Hendrix; Rock Spring; Stockwater and domestic; Withdrawn July 9, 1929.
- 8620.... 7-14-28....Frances Rauer; High Meadow Spring; Irrigation and domestic; Canceled September 5, 1929.
- 8622.... 7-17-28....George H. and Inez M. Gilbert; Spring; Irrigation and domestic; Approved March 28, 1930. G. S.
- 8629.... 7-19-28....Alex Dufferrena; Maggie Spring; Stockwater; Approved October 2, 1929. G. S.
- 8630.... 7-19-28....Alex Dufferrena; Wilder Creek (Little); Stockwater; Approved October 2, 1929. G. S.
- 8631.... 7-19-28....Alex Dufferrena; Crow Creek Spring; Stockwater; Approved October 2, 1929. G. S.
- 8637.... 7-23-28....Louis W. Whiting; Telegraph Canyon, also known as Fleming Canyon; Mining, milling and domestic; Approved June 8, 1929. G. S.
- 8641.... 7-28-28....Ely Water Company; Underground waters; Domestic and municipal; Approved February 19, 1930. G. S.
- 8643.... 7-31-28....Ormsby County, Nevada; Sugar Loaf Spring; Airplane Landing Field and domestic; Withdrawn April 26, 1929.
- 8650.... 8- 1-28....John Manzonie; Lane Spring; Stockwater; Withdrawn May 2, 1929.
- 8652.... 8- 7-28....V. E. Wells, W. W. Bown, F. D. Coder and H. R. Rieck; Unnamed Spring; Mining and domestic; Approved September 11, 1929. G. S.
- 8653.... 8- 8-28....W. G. Adamson; Unnamed Spring; Mining and domestic; Approved September 11, 1929. G. S.
- 8656.... 8-12-28....John E. Nay; Seven Mile Spring; Stockwater and domestic; Approved August 5, 1929. G. S.
- 8657.... 8-12-28....Alladdin Mines Company; Spring; Domestic and mining; Canceled September 23, 1929.
- 8658.... 8-13-28....Josie Pearl; Pearl Spring; Mining and domestic*; Approved July 26, 1929. G. S.

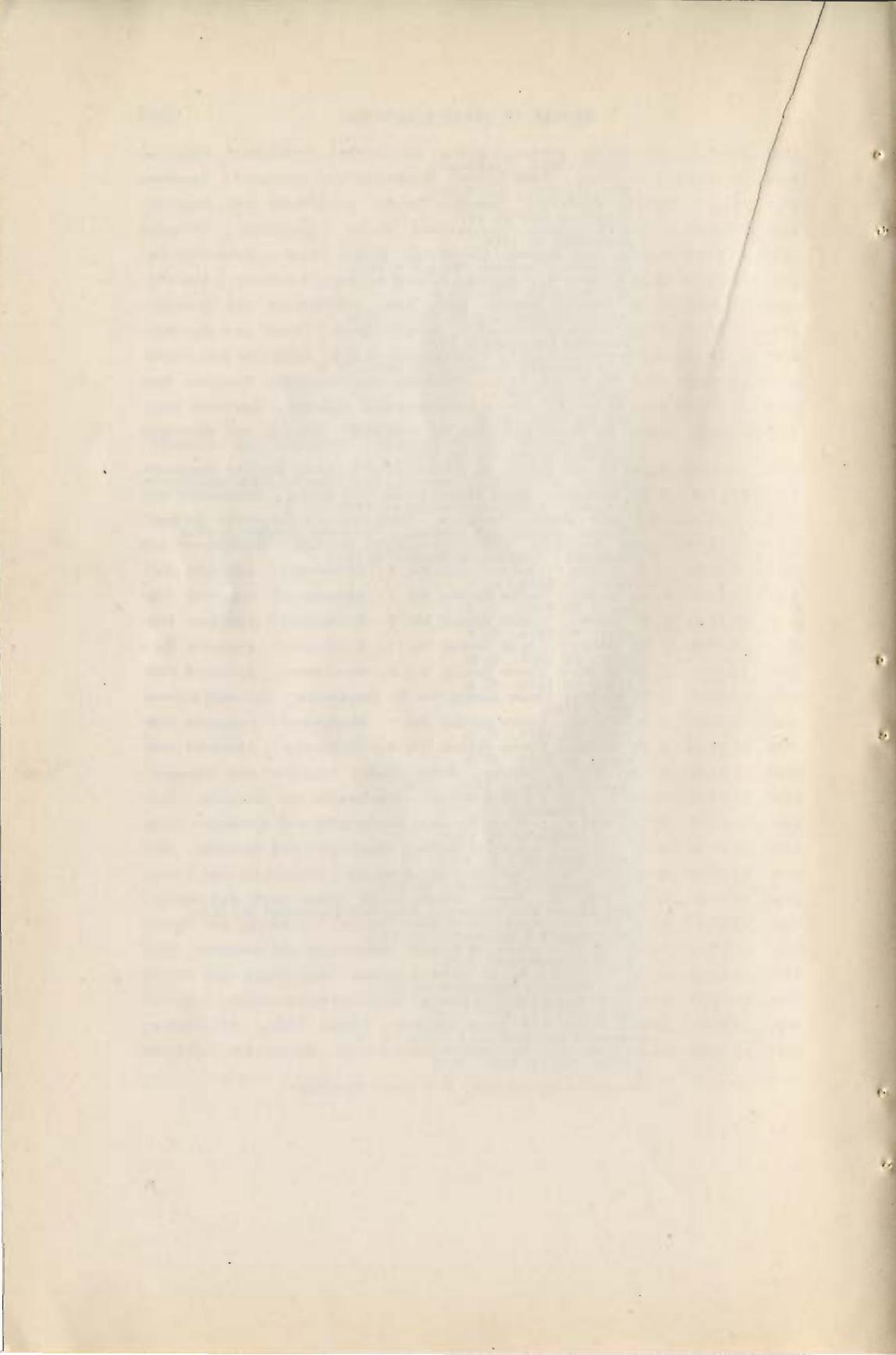
*Protested application. G. S. Good standing.

- 8660.... 8-13-28....Louis Bartlett; Edgewood Creek; Domestic and fire protection*; Denied August 17, 1929.
- 8662.... 8-13-28....Martin Elorga; Willow Spring; Stockwater; Canceled September 23, 1929.
- 8664.... 8-14-28....C. W. Godecke; Artesian Well; Domestic and irrigation*; Approved June 26, 1929. G. S.
- 8665.... 8-17-29....Will M. Bliss; Secret Harbor Creek; Irrigation and domestic; Canceled September 5, 1929.
- 8667.... 8-18-28....Chas. Eek; Sampson Creek; Irrigation and domestic; Canceled September 5, 1929.
- 8668.... 8-19-28....Richard T. Swallow; Fortification Spring; Stockwater; Approved September 9, 1929. G. S.
- 8669.... 8-28-28....Richard T. Swallow; Jasper Spring; Stockwater; Withdrawn July 26, 1929.
- 8672.... 8-24-28....Frank Allen; Wire Grass Spring; Stockwater and domestic; Approved April 9, 1930. G. S.
- 8673.... 8-24-28....W. D. Spencer; Mississippi Springs; Domestic; Stockwater; Approved February 25, 1930. G. S.
- 8674.... 8-24-28....W. D. Spencer; Eagle Springs; Domestic Range Stock; Approved February 25, 1930. G. S.
- 8679.... 8-27-28....F. E. Sands, I. E. Seigneous, E. Scheurman and A. B. Jones; Mill Creek; Power and domestic; Denied December 15, 1930.
- 8680.... 8-29-28....Fred L. Fulstone; Unnamed Spring; Stockwater and domestic; Approved February 19, 1930. G. S.
- 8685.... 9- 5-28....F. E. Bush and F. H. Murphy; Wright's Creek; Stockwater and domestic; Canceled September 5, 1929.
- 8686.... 9- 5-28....F. E. Bush and F. H. Murphy; Corral Spring; Stockwater and domestic; Canceled September 5, 1929.
- 8689.... 9- 6-28....Will M. Bliss; Unnamed Creek; Domestic, fire and irrigation; Canceled September 5, 1929.
- 8691.... 9-14-28....Harry F. Powell; Underground water; Irrigation; Approved May 29, 1929. G. S.
- 8692.... 9-14-28....Weiss & Vogel; Artesian Wells; Irrigation; Approved August 21, 1929. G. S.
- 8693.... 9-14-28....Mrs. Minnie Weiss; Artesian Wells; Irrigation; Approved August 21, 1929. G. S.
- 8697.... 9-17-28....Rosemary DeLongchamps; Seepage and Underground (Rosemary Spring); Irrigation and domestic; Approved October 16, 1929. G. S.
- 8698.... 9-17-28....Robert A. Thorley; Thorley Reservoir; Stockwater; Approved September 30, 1929. G. S.
- 8699.... 9-17-28....Gerald A. Smith; Artesian Wells; Irrigation; Approved August 21, 1929. G. S.
- 8700.... 9-19-28....Emily A. Pence; Lower Monument Springs; Stockwatering; Approved June 3, 1929. G. S.
- 8701.... 9-20-28....George Eldridge; Eldridge Well; Stockwater; Approved October 28, 1929. G. S.
- 8704.... 9-25-28....Bertrand Paris; Underground Water; Stockwater; Approved October 20, 1929. G. S.
- 8705.... 9-27-28....Emery Garrett; Monitor Spring; Domestic; Canceled September 23, 1929.
- 8709.... 9-30-28....E. C. Murphy; Underground waters; Stockwater; Approved July 1, 1930. G. S.
- 8713....10- 6-28....R. T. Swallow; South Well; Stock Water; Approved August 9, 1929. G. S.
- 8714....10- 6-28....Leslie F. Phillips; Garden Spring; Irrigation; Approved April 16, 1929.
- 8718....10-13-28....Chas. F. Lee; Hidden Treasure Spring; Stockwater and domestic; Withdrawn August 31, 1929.
- 8719....10-13-28....Chas. F. Lee; Wilson Creek; Irrigation and domestic; Withdrawn August 31, 1929.
- 8720....10-13-28....J. C. Wholey; Snow and rain water; Stockwater and domestic; Withdrawn July 23, 1929.
- 8728....10-18-28....Irene Watt; Watt Creek Spring; Stockwater*; Denied January 24, 1930.
- 8729....10-18-28....Irene Watt; Cottonwood Springs; Stockwater*; Denied January 24, 1930.
- 8730....10-19-28....Joseph T. Atkin & Sons; Cedar Spring; Stockwater; Approved February 20, 1930. G. S.
- 8731....10-19-28....Joseph T. Atkin & Sons; Wire Grass Spring; Stockwater; Approved February 20, 1930. G. S.
- 8732....10-23-28....Nev.-Mont. Mining Co.; Underground Water; Mining and domestic; Approved June 25, 1929. G. S.
- 8738....10-27-28....West Side Cattle Company; Twenty-one Mile Well; Stockwater and domestic; Canceled September 23, 1929.
- 8739....11- 3-28....E. J. Fee; Baker Creek; Stockwater; Approved April 17, 1930. G. S.
- 8740....11- 7-28....F. & N. Land and Livestock Company; Robinson Lake and Creek; Irrigation and domestic; Canceled September 23, 1929.
- 8742....11- 7-28....John Jaureguito; Three-mile Well; Stockwater and domestic; Canceled September 23, 1929.
- 8753....11- 9-28....A. C. Florio; Hoover Spring and Creek; Stockwater and domestic*; Approved May 17, 1929. Certificate.
- 8754....11- 9-28....A. C. Florio; Clover Spring; Stockwater and domestic*; Approved May 17, 1929. Certificate.

*Protested application. G. S. Good standing.

- 8755.....11- 9-28....A. C. Florio; Josephine Spring; Stockwater and domestic*; Approved May 17, 1929. Certificate.
- 8756.....11- 9-28....A. C. Florio; View Spring; Stockwater and domestic*; Approved May 17, 1929. Certificate.
- 8757.....11- 9-28....W. E. Rinehart; Unnamed Creek; Stockwater and domestic; Approved May 23, 1930. G. S.
- 8758.....11-10-28....Frank Yrazoqui; Underground Water; Stockwater; Canceled September 23, 1929.
- 8761.....11-11-28....Gentile and Rosetta Georgetta; Spring Creek; Irrigation and domestic; Canceled October 9, 1929.
- 8762.....11-11-28....M. H. Hough; Rose Spring; Mining, milling and domestic; Approved September 12, 1929. G. S.
- 8763.....11-13-28....S. O. Cressler Estate; Swan Lake; Stockwater and domestic; Approved February 21, 1929. G. S.
- 8765.....11-19-28....Carlin Products Company; Maggie Creek; Power and domestic; Canceled December 9, 1929.
- 8769.....11-21-28....Ely Water Company; Underground Water; Irrigation and domestic; Approved February 18, 1930. G. S.
- 8770.....11-21-28....Fred W. Cook; Well; Irrigation and domestic; Canceled September 23, 1929.
- 8771.....11-21-28....Fred W. Cook; Well; Irrigation and domestic; Approved October 30, 1929. G. S.
- 8772.....11-26-28....Viola M. Sauer and Ella M. Campbell; Seepage and developed swamp water (Sauer Swamp); Irrigation and domestic; Canceled September 23, 1929.
- 8773.....12- 4-28....Annie M. and Cassie M. Johnstone and Jennie DeHill; Peninsula Spring; Stockwater; Approved February 24, 1930. Certificate.
- 8774.....12- 5-28....J. B. Sorhouet; Stone House Creek and Spring; Stockwater and domestic; Approved January 11, 1930. G. S.
- 8775.....12- 6-28....Gold Hill Mining Company; Unknown Stream from Springs; Mining, milling and domestic; Canceled October 9, 1929.
- 8776.....12- 6-28....Frank Charlebois; Unnamed Canyon Springs; Stockwater and domestic; Withdrawn October 9, 1929.
- 8781.....12-16-28....J. E. Marble; Union Spring No. 1; Stockwater; Approved February 26, 1930. G. S.
- 8782.....12-16-28....J. E. Marble; Union Spring No. 2; Stockwater; Approved February 26, 1930. G. S.
- 8783.....12-16-28....J. E. Marble; Union Spring No. 3; Stockwater; Approved February 26, 1930. G. S.
- 8784.....12-16-28....J. E. Marble; Union Spring No. 4; Stockwater; Approved February 26, 1930. G. S.
- 8785.....12-16-28....J. E. Marble; Union Spring No. 5; Stockwater; Approved February 26, 1930. G. S.
- 8786.....12-16-28....J. E. Marble; Union Spring No. 6; Stockwater; Canceled December 9, 1929.
- 8787.....12-16-28....J. E. Marble; Union Spring No. 7; Stockwater; Approved February 26, 1930. G. S.
- 8788.....12-16-28....J. E. Marble; Union Spring No. 8; Stockwater; Approved February 26, 1930. G. S.
- 8789.....12-16-28....W. W. Mining Company; Butte Creek; Irrigation and domestic; Approved June 8, 1929. G. S.
- 8790.....12-17-28....W. C. Pitt Co.; Kitten Spring; Stockwater and domestic; Canceled September 23, 1929.
- 8791.....12-17-28....W. C. Pitt Co.; High Spring; Stockwater and domestic; Canceled September 23, 1929.
- 8792.....12-17-28....W. C. Pitt Co.; Unnamed Spring; Stockwater and domestic; Canceled September 23, 1929.
- 8793.....12-17-28....W. C. Pitt Co.; Limerick Canyon Spring; Stockwater and domestic; Canceled September 23, 1929.
- 8794.....12-17-28....W. C. Pitt Co.; North Branch Buena Vista Creek and Spring; Stockwater and domestic; Canceled September 23, 1929.
- 8795.....12-17-28....W. C. Pitt Co.; Reed or Bob Reed Canyon; Stockwater and domestic; Canceled September 23, 1929.
- 8796.....12-17-28....W. C. Pitt Co.; Unnamed Spring; Stockwater and domestic; Canceled September 23, 1929.
- 8797.....12-17-28....W. C. Pitt Co.; Pilson Canyon Spring; Stockwater and domestic; Canceled September 23, 1929.
- 8798.....12-21-28....Alex Dufferrena; Antelope Spring; Irrigation and domestic; Approved November 12, 1930. G. S.
- 8800.....12-28-28....James Ryan and John Conway; Cedar Wash; Stockwater; Approved September 11, 1929. G. S.
- 8801.....12-28-28....James Ryan and John Conway; Cedar Wash; Stockwater; Approved September 11, 1929. G. S.

*Protested application. G. S. Good standing.



CHAPTER XIX

Certificates Issued Under Permits, 1929-1930

Following is a condensed statement giving the salient data in connection with Certificates Issued Under Permits during the biennium 1929-1930, in the order of:

1. Certificate Number.
2. Book Number.
3. Permit Number.
4. Name of Applicant.
5. Source of Water Supply.
6. Purpose of Appropriation.
7. Amount of water in cubic feet per second, unless otherwise noted.
8. Date Certificate Issued.

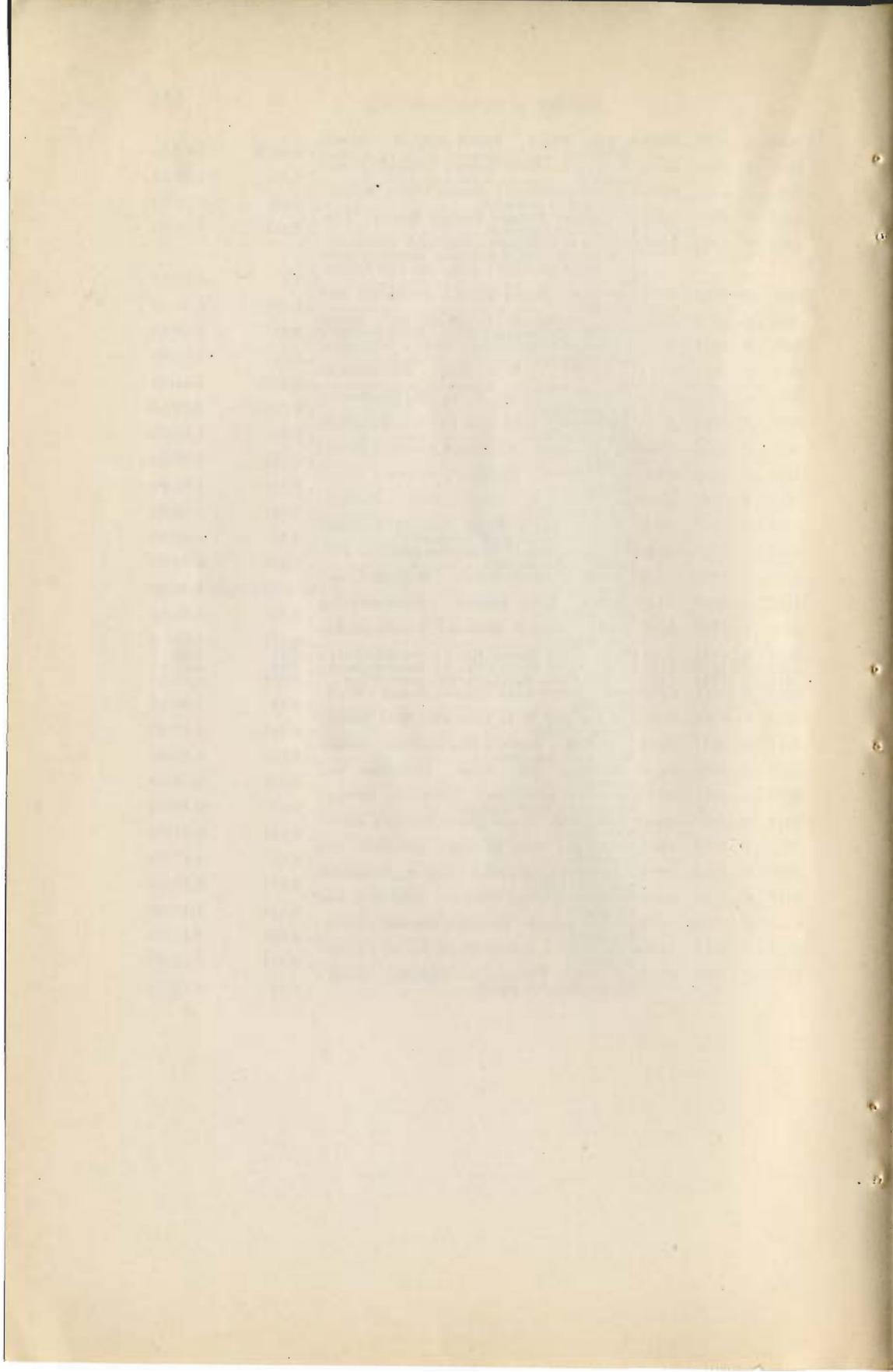
1475	6	3926	John Yelland; Smudge Spring; Stockwatering	0.025	1-17-29
1476	6	7110	Walter Maine; Cowboy Rest Creek; Irrigation and domestic	0.3399	1-17-29
1477	6	7746	Francis Cutting Co.; California Mill Spring No. 18; Mining, milling and domestic	0.0067	1-17-29
1478	6	7716	Francis Cutting Co.; California Mill Spring No. 2; Mining, milling and domestic	0.013	1-17-29
1479	6	7738	Francis Cutting Co.; California Mill Spring No. 11; Mining, milling and domestic	0.0067	1-17-29
1480	6	7715	Francis Cutting Co.; California Mill Spring No. 1; Mining, milling and domestic	0.033	1-17-29
1481	6	7700	Robison Brothers; Basin Springs; Stockwatering	0.0156	1-21-29
1482	6	7647	W. D. Parker; Parker Springs; Stockwatering	0.0047	1-21-29
1483	6	7988	State of Nevada, Department of Highways; Hot Springs; Highway maintenance and domestic	0.025	1-21-29
1484	6	4946	John Elissondoberry; Carson River; Irrigation	0.3005	1-26-29
1485	6	6469	R. H. Cowles; Last Chance Creek; Stockwatering	0.003	1-30-29
1486	6	6470	R. H. Cowles; Betty Creek; Stockwatering	0.003	1-30-29
1487	6	6471	R. H. Cowles; Little Meadow Creek; Stockwatering	0.003	1-30-29
1488	6	6480	R. H. Cowles; Missouri Creek; Stockwatering	0.003	1-30-29
1489	6	6489	Wade H. Parrish; Cliff Springs; Stockwatering	0.012	1-30-29
1490	6	6479	George W. Smith; Saviozzi Springs; Irrigation	0.570	1-30-29
1491	6	7289	Henry Palma, Sr., Henry Palma, Jr., Louis Palma and Areglio Palma; Cerruti Well No. 1; Stockwatering	0.0375	1-30-29
1492	6	7290	Henry Palma, Sr., Henry Palma, Jr., Louis Palma and Areglio Palma; Cerruti Well No. 2; Stockwatering	0.0375	1-30-29
1493	6	6244	Betty O'Neal Mines; Whiskey Springs; Mining and domestic	0.022	1-30-29
1494	6	8229	Alex Dufferrena; Diamond Spring; Stockwatering	0.0094	1-30-29
1495	6	8230	Alex Dufferrena; Texas Spring; Stockwatering	0.0094	1-30-29
1496	6	6004	A. L. DeLong; Leonard Creek; Irrigation and domestic	1.7649	1-30-29
1497	6	6942	Bertrand Paris; April Fool Spring; Stockwatering and domestic	0.012	1-30-29
1498	6	7645	Roy B. Crofts; Colorado River; Irrigation	0.755	2-19-29
1499	6	6493	John Hafen and E. R. Frei; Cottonwood Creek; Irrigation and domestic	0.04	2-19-29
1500	6	6576	James Ryan and J. H. and Emma Conway; Watershed of Pahroc and Boulder Ranges; Stockwatering	5.0 A. F.	2-19-29
1501	6	6808	Andrew Boudy; Lost Spring; Stockwatering	0.0075	2-19-29

1502	6	7020	Vicente Jaurista; Jaurista Well; Stockwatering	0.019	2-19-29
1503	6	7119	White Bear Syndicate; White Bear Syndicate Spring; Mining, milling and domestic	0.00089	2-19-29
1504	6	7120	White Bear Syndicate; White Bear Syndicate Spring; Mining, milling and domestic	0.0038	2-19-29
1505	6	6665	Gentile Georgetta; Evan Spring; Stockwatering	0.0193	2-19-29
1506	6	6620	Gentile Georgetta; Secret Canyon Springs; Stockwatering and domestic	0.004	2-19-29
1507	6	6660	Gentile Georgetta; Antelope Valley Wash and Tributaries; Stockwatering	0.025	2-19-29
1508	6	6518	Oscar E. Smith; Smith Creek; Irrigation	1.498	2-19-29
1509	6	7226	Corinda Robinson; Robinson Springs; Irrigation	0.285	2-19-29
1510	6	7167	Lena Sciuchetti Laborde; Spring Creek or South Fork Bernd Creek; Irrigation	0.548	2-21-29
1511	6	7620	Young and Woods; Reynolds Creek; Irrigation and domestic	0.612	2-21-29
1512	6	7623	Daniels Brothers; White Canyon Spring; Stockwatering	0.038	2-21-29
1513	6	7707	Glen A. Bellander; Pipe Springs No. 1; Stockwatering	0.0125	2-21-29
1514	6	7555	W. J. Potts; Potts Well; Stockwatering	0.0214	2-21-29
1515	6	7446	Robison Brothers; Robison Well; Stockwatering	0.019	2-21-29
1516	6	7467	C. R. Moorman and Albert Williams; Camel Seep No. 1; Stockwatering	0.003	2-21-29
1517	6	7406	Bertrand Paris; Anaud Spring; Stockwatering	0.0125	2-21-29
1518	6	6584	Pedro Corta; Corta Well No. 1; Stockwatering	0.025	2-21-29
1519	6	6585	Pedro Corta; Corta Well No. 2; Stockwatering	0.025	2-21-29
1520	6	7507	Shamrock Mines Company; Middle Creek (Summit Springs); Mining, milling and domestic	0.0833	2-21-29
1521	6	7668	Shamrock Mines Company; Ione Spring; Mining, milling and domestic	0.0833	2-21-29
1522	6	6621	Gentile Georgetta; Antique Spring; Stockwatering	0.0083	3- 1-29
1523	6	5553	Donnelly Land & Livestock Co.; Bateman's Spring; Irrigation and domestic	0.0794	3- 1-29
1524	6	5336	W. C. Goodman; Goodman Spring; Irrigation	0.02	3- 1-29
1525	6	5991	F. F. Franke and R. J. Lofthouse; Willow Creek; Irrigation and domestic	0.303	3- 1-29
1526	6	6953	John Jaureguito; Diamond Spring; Stockwatering	0.0125	3- 1-29
1527	6	7882	Myrtle and L. H. Danberg; Peterson Springs; Stockwatering	0.022	3-13-29
1528	6	5643	James Ryan; Boulder Spring; Stockwatering and domestic	0.01	3-13-29
1529	6	5083	Guy E. Buster; Buster Springs; Irrigation	0.4527	3-13-29
1530	6	5002	Pedro Etchevery; Marteletti Spring; Stockwatering	0.0219	3-13-29
1531	6	5064	O. C. Houghton; Shilo Spring; Stockwatering	0.00063	3-13-29
1532	6	5180	O. C. Houghton; Upper Shilo Spring; Stockwatering	0.00063	3-13-29
1533	6	5778	Samuel R. Clark, Harry L. Clark and Joe Saval; Unnamed Spring; Stockwatering	0.0156	3-13-29
1534	6	5779	Samuel R. Clark, Harry L. Clark and Joe Saval; Unnamed Spring; Stockwatering	0.0156	3-13-29
1535	6	5780	Samuel R. Clark, Harry L. Clark and Joe Saval; Unnamed Spring; Stockwatering	0.0156	3-13-29
1536	6	5282	Ambro Rosaschi; Twilight Springs; Stockwatering	0.035	3-13-29
1537	6	5283	Ambro Rosaschi; Butler's Springs; Stockwatering	0.012	3-13-29
1538	6	5287	Ambro Rosaschi; Tank Spring; Stockwatering	0.0375	3-13-29
1539	6	6972	A. C. Florio; Dry Lake Well; Stockwatering and domestic	0.05	3-13-29
1540	6	6925	Rudolph Merchun; Mahogany Spring; Stockwatering and domestic	0.0031	3-16-29
1541	6	5028	John Yelland; Four Mile Springs; Irrigation	0.066	3-16-29
1542	6	7730	G. E. McKenna; Tognoni Springs; Stockwatering	0.005	3-16-29
1543	6	7359	J. M. Ward and J. H. Smith; West Branch of Buffalo Creek; Stockwatering	0.0125	3-16-29

1544	6	6784	The Adams McGill Company; North Gleason Spring; Stockwatering	0.019	3-16-29
1545	6	6785	The Adams McGill Company; Gleason Spring No. 2; Stockwatering	0.019	3-16-29
1546	6	7268	Philip Brady; Black Rock Spring; Stockwatering	0.016	3-16-29
1547	6	6830	Mrs. Caroline T. Newhall; Skunk Harbor Creek; Domestic	0.105	3-16-29
1548	6	6902	Eureka Land & Stock Company; Deep Well No. 2; Stockwatering	0.0415	3-16-29
1549	6	6827	Antonio Popplano; Star Creek; Irrigation and domestic	0.0996	3-16-29
1550	6	6913	C. L. Henderson; Divala Spring; Stockwatering and domestic	0.0006	3-16-29
1551	6	6935	Louis A. Yelland; Rye Grass Spring; Stockwatering	0.0094	3-16-29
1552	6	7269	Philip Brady; Cottonwood Spring; Stockwatering	0.015	3-16-29
1553	6	6603	John Uhalde; Cedar Spring; Stockwatering	0.0125	3-21-29
1554	6	4650	Clay Springs Cattle Company; Quaking Asp Spring; Stockwatering and domestic	0.0023	3-21-29
1555	6	4651	Clay Springs Cattle Company; Glen Spring; Stockwatering and domestic	0.0016	3-21-29
1556	6	4652	Clay Springs Cattle Company; Trough Spring; Stockwatering and domestic	0.0008	3-21-29
1557	6	4653	Clay Springs Cattle Company; Dale Spring; Stockwatering and domestic	0.0016	3-21-29
1558	6	4654	Clay Springs Cattle Company; Johns Spring; Stockwatering and domestic	0.0008	3-21-29
1559	6	6749	Pacific Portland Cement Company; Baker Spring No. 2; Mining, milling and domestic	0.01	3-21-29
1560	6	6748	Pacific Portland Cement Company; Baker Spring No. 1; Mining, milling and domestic	0.01	3-21-29
1561	6	6750	Pacific Portland Cement Company; Baker Spring No. 3; Mining, milling and domestic	0.01	3-21-29
1562	6	6751	Pacific Portland Cement Company; Baker Spring No. 4; Mining, milling and domestic	0.01	3-21-29
1563	6	6805	Pacific Portland Cement Company; Baker Spring No. 7; Mining, milling and domestic	0.01	3-21-29
1564	6	7431	Pacific Portland Cement Company; Baker Springs Nos. 9 and 10; Mining, milling and domestic	0.01	3-21-29
1565	6	7447	Pacific Portland Cement Company; Baker Spring No. 11; Mining, milling and domestic	0.01	3-21-29
1566	6	4649	Henrie and Thiriot; Lamb Spring; Stockwatering	0.019	4- 8-29
1567	6	4635	Carl Ray; Little Cherry Creek; Irrigation and domestic	0.29	4- 8-29
1568	6	4337	A. J. Mackie; Clover Spring; Stockwatering	0.022	4-22-29
1569	6	4338	A. J. Mackie; Henrie Flat Reservoir No. 2; Stockwatering	0.015	4-22-29
1570	6	4339	A. J. Mackie; Jim Henrie Reservoir No. 1; Stockwatering	0.015	4-22-29
1571	6	4341	A. J. Mackie; Conger Spring; Stockwatering	0.0175	4-22-29
1572	6	4138	O. O. Tognini; Mountain Spring; Stockwatering	0.015	4-22-29
1573	6	4319	Frank E. Bell; Mitchell Spring; Stockwatering	0.025	4-22-29
1574	6	4217	Frank E. Bell; Wild Horse Corral Spring; Stockwatering	0.050	4-22-29
1575	6	4666	Bob Hamilton; Weepah Spring; Stockwatering	0.0008	5-17-29
1576	6	4665	John Castles, James Castles and John P. Wright; Oreana Spring; Stockwatering	0.0016	5-17-29
1577	6	4721	John Castles, John P. Wright and James Castles; Murphy Tunnel; Stockwatering	0.0008	5-17-29
1578	6	4718	John Castles and John P. Wright; Henry Spring; Stockwatering	0.0016	5-17-29
1579	6	4719	John Castles and John P. Wright; Little Cut Spring; Stockwatering	0.0008	5-17-29
1580	6	4597	Geo. H. Chester; Lyman Canyon Springs or Long Canyon; Irrigation and domestic	0.089	6-17-29
1581	6	3908	George E. McKenna; Wild Horse Spring; Stockwatering	0.0035	9-26-29

1582	6	3909	George E. McKenna; Cane Springs; Stockwatering	0.0035	9-26-29
1583	6	4705	Mrs. M. E. Spencer; Dutch Creek; Irrigation and domestic	0.126	10-17-29
1584	6	7389	Albert Williams; Mill Spring; Stockwatering	0.0012	10-18-29
1585	6	8376	F. A. Nolan; Big Springs Creek; Irrigation	0.626	10-18-29
1586	6	7270	Pete Lambert; White Rock Springs Nos. 1 and 2; Stockwatering	0.0125	10-22-29
1587	6	7271	Pete Lambert; Dead Willow Spring; Stockwatering	0.0125	10-22-29
1588	6	7272	Pete Lambert; Bush Spring; Stockwatering	0.0125	10-22-29
1589	6	7273	Pete Lambert; Slide Rock Spring; Stockwatering	0.0125	10-22-29
1590	6	7274	Pete Lambert; Lambert Spring; Stockwatering	0.0125	10-22-29
1591	6	7295	Frank S. Gillham; Hanlon's Well; Domestic	0.000774	10-24-29
1592	6	8589	Everett F. Hill; Mud Springs; Stockwatering	0.01	10-24-29
1593	6	8816	Alex Ranson; Granite Spring; Mining and domestic	0.02	12-12-29
1594	6	8753	A. C. Florio; Hoover Spring and Creek; Stockwatering	0.06	12-12-29
1595	6	8754	A. C. Florio; Clover Spring; Stockwatering	0.06	12-13-29
1596	6	8755	A. C. Florio; Josephine Spring; Stockwatering	0.06	12-13-29
1597	6	8756	A. C. Florio; View Spring; Stockwatering	0.06	12-13-29
1598	6	8514	A. C. Florio; Rock Spring; Stockwatering	0.06	12-17-29
1599	6	7067	W. D. Parker; Artesian Wells; Irrigation and domestic	0.3838	12-26-29
1600	6	6627	Leona Blundell Caraway; Piute Creek; Irrigation and domestic	0.2153	12-31-29
1601	6	6019	Eugene F. Marker; Cow Creek; Irrigation and domestic	0.42	1- 2-30
1602	6	7411	Myrtle and Louis H. Danberg; Sage Hen Spring and Creek; Stockwatering	0.0038	1- 3-30
1603	6	7412	Myrtle and Louis H. Danberg; Kaiser Springs; Stockwatering	0.0038	1- 3-30
1604	6	7106	Hattie Margaret Dickinson; Juniper Spring; Stockwatering	0.0022	1-15-30
1605	6	7687	Washoe County Title Guaranty Co.; Cottonwood Spring; Stockwatering	0.00125	1-15-30
1606	6	7689	Washoe County Title Guaranty Co.; Horse Spring; Stockwatering	0.0016	1-15-30
1607	6	7690	Washoe County Title Guaranty Co.; August Spring; Stockwatering	0.003	1-15-30
1608	6	7691	Washoe County Title Guaranty Co.; Lake Spring; Stockwatering	0.0024	1-15-30
1609	6	7692	Washoe County Title Guaranty Co.; Hillside Spring; Stockwatering	0.003	1-15-30
1610	6	7693	Washoe County Title Guaranty Co.; Mountain Spring; Stockwatering	0.016	1-15-30
1611	6	7694	Washoe County Title Guaranty Co.; Choke Cherry Spring; Stockwatering	0.003	1-16-30
1612	6	7695	Washoe County Title Guaranty Co.; Upper and Lower Willow Spring; Stockwatering	0.0019	1-16-30
1613	6	7696	Washoe County Title Guaranty Co.; Dick's Tunnel Spring; Stockwatering	0.0016	1-16-30
1614	6	7713	Washoe County Title Guaranty Co.; Fred's Spring; Stockwatering	0.003	1-16-30
1615-1	6	2783	R. A. Leberski; Lamoille Creek; Irrigation and domestic	1.48	1-28-30
1615-2	6	2783	Susie Strange; Lamoille Creek; Irrigation and domestic	0.1805	1-28-30
1615-3	6	2783	Frank C. Strange; Lamoille Creek; Irrigation and domestic	0.517	1-28-30
1616	6	7452	The Utah Construction Company; Milk House Spring; Stockwatering	0.017	1-28-30
1617	6	7462	The Utah Construction Company; Unnamed Spring; Stockwatering	0.017	1-28-30
1618	6	7497	A. C. Kirkeby; Middle Well; Stockwatering	0.0075	1-29-30
1619	6	7498	A. C. Kirkeby; Pine Spring; Stockwatering	0.0075	1-29-30
1620	6	7264	Gustave Henriod; Neese Spring; Stockwatering	0.0125	1-30-30
1621	6	4802	W. M. Pettit; Pettit Ditch; Irrigation and domestic	1.45	2- 7-30
1622	6	2986	J. L. Parker; Herder Creek; Irrigation and domestic	1.03	2- 8-30
1623	6	6754	James A. Cazier; Mud Springs; Irrigation and domestic	0.538	2-10-30
1624	6	7626	Roy L. Primeaux; Highway Spring; Domestic	0.025	2-13-30
1625	6	6733	W. H. Colvin; Cottonwood Canyon; Mining and domestic	0.13	2-13-30
1626	6	8403	Marcos Legarra; Stone Cabin Spring; Stockwatering	0.025	2-17-30

1627	6	8136	Edwin Van Riper; Passa Spring; Stockwatering	0.0016	2-17-30
1628	6	6145	Mary T. Clark; Cow Creek; Irrigation and domestic	0.135	2-28-30
1629	6	6718	Comet Mines Company; Comet Well; Mining, milling and domestic	0.025	3- 5-30
1630	6	6694	John S. Weeks; Ranger Station Spring; Irrigation and domestic	0.169	4-18-30
1631	6	7200	Los Angeles & Salt Lake Railroad Company; Las Vegas Valley Artesian Basin or Subterranean Channel; Railroad and domestic	2.5	4-18-30
1632	6	7025	S. G. Broyles; Reese River; Irrigation and domestic	0.897	4-18-30
1633	6	8773	Annie M. Cassie M. Johnstone and Jennie D. Hill; Peninsula Spring; Stockwatering	0.04	4-18-30
1634	6	4046	Cesare Regusci; Humboldt River; Irrigation and domestic	1.47	4-18-30
1635	6	3837	R. F. Raine; Red Springs; Stockwatering	0.016	4-21-30
1636	6	7911	Pete Ayarbe; Ayarbe Well; Stockwatering and domestic	0.014	4-21-30
1637	6	3945	A. D. McMillan; Pine Nut Creek; Irrigation and domestic	0.07	4-22-30
1638	6	5836	Handley Brothers; Unnamed Spring; Stockwatering	0.034	4-22-30
1639	6	8339	Handley Brothers; Mahogany Spring; Stockwatering	0.016	4-22-30
1640	6	7605	Handley Brothers; Black Point Springs; Stockwatering	0.016	4-22-30
1641	6	7542	C. E. Kent; Lee's West Canyon Springs; Stockwatering and domestic	0.05	4-23-30
1642	6	7227	Angelo DeBernardini; Robinson Spring; Irrigation and domestic	0.373	4-24-30
1643	6	6428	J. R. Schulz; Clear Creek; Irrigation and domestic	2.2%	entire flow 4-24-30
1644	6	7325	J. P. Raine; Rock Springs; Stockwatering and domestic	0.015	4-25-30
1645	6	7326	J. P. Raine; Cherry Springs; Stockwatering and domestic	0.015	4-25-30
1646	6	7697	Lyle Cook; Cook Spring No. 1; Stockwatering	0.01	4-25-30
1647	6	7698	Lyle Cook; Cook Spring No. 2; Stockwatering	0.01	4-25-30
1648	6	7784	Lyle Cook; Cook Springs; Stockwatering	0.003	4-25-30
1649	6	8583	Lyle Cook; Burnt Lake Canyon Spring; Stockwatering	0.02	4-25-30
1650	6	6763	Henry H. Lee and M. L. Lee; Five Mile Spring; Stockwatering	0.024	4-26-30
1651	6	7324	John I. Guthrie; Leach's Hot Springs; Irrigation and domestic	0.566	4-28-30
1652	6	4975	S. G. Broyles; Dry Creek; Irrigation and domestic	0.193	5- 6-30
1653	6	6983	Thomas Perry McKenna; Fairbanks Spring; Irrigation and domestic	0.33	6-11-30
1654	6	8341	Moses Reinhart; Grand Trunk Spring; Stockwatering	0.013	6-13-30
1655	6	7893	John Hickison; Twin Springs; Irrigation and domestic	0.02	6-17-30
1656	6	4613	John Hickison; Underwood Canyon; Irrigation and domestic	0.323	6-17-30
1657	6	4758	John Hickison; Wood Canyon; Irrigation and domestic	0.159	6-17-30
1658	6	3730	William J. Gardner; Maverick Springs; Stockwatering	0.023	7-11-30
1659	6	8425	James D. Pence; Poison Creek Spring; Stockwatering	0.019	7-11-30
1660	6	7883	F. A. Pecetti; Thomas or Huffaker Creek; Hydro-electric power	1.00	9-10-30



CHAPTER XX

Run-off Measurements of Nevada Streams

COLORADO RIVER DATA

Location of Gaging Station—300 feet above Kaibab Bridge, Grand Canyon National Park, a quarter of a mile above Bright Angel Creek.

Drainage Area—Not measured.

Records Available—October 1, 1922, to date.

Gage—Automatic recording.

Channel—Silt and gravel which silts and scours each year.

Records furnished by U. S. G. S.

COLORADO RIVER BASIN

Discharge of Colorado River at Bright Angel Creek, Near Grand Canyon, Arizona

	DISCHARGE IN SECOND FEET—			Run-off in acre feet
	1922-1923	Maximum	Minimum		Mean
October				320,000
November	7,660			424,000
December	8,480	5,520	7,120	437,000
January	7,130	5,840	6,520	401,000
February	8,330	5,770	6,650	369,000
March	9,040	7,360	8,120	499,000
April	32,000	8,640	22,000	1,310,000
May	97,300	20,900	58,000	3,570,000
June	95,100	60,200	78,000	4,640,000
July	61,200	23,600	37,800	2,320,000
August	33,400	15,200	23,400	1,440,000
September	98,500	9,380	22,000	1,310,000
The year	98,500		23,500	17,000,000
<i>1923-1924</i>				
October	14,400	10,400	12,200	750,000
November	35,100	8,680	12,900	768,000
December	39,500	5,200	9,650	593,000
January	12,600	4,040	6,010	370,000
February	11,800	6,450	9,200	529,000
March	11,200	7,540	8,650	532,000
April	45,800	8,600	28,000	1,670,000
May	65,100	24,100	48,700	2,990,000
June	73,200	32,900	53,000	3,150,000
July	30,500	8,760	17,100	1,050,000
August	8,840	3,100	5,440	334,000
September	11,000	2,790	4,630	276,000
The year	73,200	2,790	17,900	13,000,000
<i>1924-1925</i>				
October	7,550	4,090	6,150	378,000
November	7,130	6,560	6,840	407,000
December	6,730	990	4,880	300,000
January	5,820	1,400	4,390	270,000
February	9,040	6,210	7,670	426,000
March	18,100	7,760	10,800	664,000
April	33,800	16,700	22,000	1,310,000
May	49,800	19,800	34,200	2,100,000
June	51,900	31,100	40,300	2,400,000
July	36,000	13,700	24,200	1,490,000
August	25,900	9,500	13,100	806,000
September	35,000	12,600	20,100	1,200,000
The year	51,900	990	16,200	11,800,000
<i>1925-1926</i>				
October	29,000	11,300	17,000	1,050,000
November	12,500	8,310	10,400	619,000
December	8,770	5,720	7,490	461,000
January	7,030	5,120	6,040	371,000
February	7,320	5,250	6,530	363,000
March	16,100	6,320	10,600	652,000
April	50,800	12,100	27,700	1,650,000
May	84,000	32,600	54,900	3,380,000
June	78,500	28,600	58,500	3,480,000
July	36,900	11,800	23,200	1,430,000
August	12,800	5,450	9,430	580,000
September	21,600	3,870	6,510	387,000
The year	84,000	3,870	19,900	14,400,000

RUN-OFF MEASUREMENTS OF NEVADA STREAMS

COLORADO RIVER—Continued

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	1926-1927	Maximum	Minimum		Mean
October	9,340	6,110	7,620	469,000
November	6,780	5,830	6,250	372,000
December	11,700	2,970	6,760	416,000
January	7,570	2,870	5,880	362,000
February	16,400	5,800	8,340	463,000
March	12,900	8,320	11,000	676,000
April	35,900	13,500	21,600	1,290,000
May	91,800	37,600	63,000	3,870,000
June	90,900	46,000	61,500	3,660,000
July	117,000	17,200	41,100	2,530,000
August	25,000	9,340	16,100	990,000
September	114,000	10,800	36,400	2,170,000
The year	117,000	2,870	23,800	17,300,000
<i>1927-1928</i>				
October	23,700	11,200	15,700	965,000
November	21,100	10,900	13,100	780,000
December	11,100	4,610	7,910	486,000
January	9,830	7,020	8,100	498,000
February	12,000	7,420	8,710	501,000
March	24,400	7,690	12,700	781,000
April	25,800	10,900	16,600	988,000
May	101,000	31,800	69,400	4,270,000
June	114,000	37,400	63,300	3,770,000
July	41,600	15,100	25,300	1,560,000
August	14,800	7,430	10,900	670,000
September	9,340	5,130	6,300	375,000
The year	114,000	4,610	21,500	15,600,000
<i>1928-1929</i>				
October	24,700	5,230	10,000	615,000
November	17,900	7,700	9,910	589,000
December	9,110	2,960	5,950	366,000
January	6,740	4,660	5,690	350,000
February	8,470	5,010	6,500	361,000
March	35,400	6,800	15,500	950,000
April	51,400	13,500	29,700	1,770,000
May	108,000	24,800	63,400	3,900,000
June	96,200	57,600	79,400	4,730,000
July	59,300	21,500	34,400	2,120,000
August	60,900	12,300	32,400	1,990,000
September	48,100	14,300	28,500	1,700,000
The year	108,000	2,960	26,800	19,400,000
<i>1929-1930</i>				
October	22,900	10,900	15,400	946,000
November	10,800	7,300	9,810	583,000
December	8,840	4,370	7,480	460,000
January	6,700	3,200	5,170	318,000
February	16,500	4,710	8,650	481,000
March	13,400	8,170	9,960	612,000
April	44,600	9,440	28,100	1,670,000
May	48,300	20,600	32,500	2,000,000
June	69,000	29,200	51,700	3,080,000
July	26,600	13,200	18,800	1,160,000
August	54,800	11,200	25,900	1,590,000
September	14,500	6,070	8,910	530,000
The year	69,000	3,200	18,500	13,400,000

Discharge of Muddy River—Moapa, Nevada

1910.....	122	33	.....	123,200
1913.....	51.8	40.2	.....	17,200
1913-1914.....	205	39.7	47.2	34,200
1914-1915.....	83	37	47.6	34,400
1915-1916.....	57	38	44.6	14,600
1916-1917.....	54	37	46.7	33,800

¹April 22 to October 31 above Narrows. ²July 1 to December 31. ³April 20 to September 30 at Home Ranch

Muddy River—Logan, Nevada

1913.....	53	29	.....	15,200
1914.....	190	37.8	.....	13,000

¹July 1 to December 31. ²October 1, 1913 to February 7, 1914

RUN-OFF MEASUREMENTS OF NEVADA STREAMS

Muddy River—St. Thomas, Nevada

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1913.....	22	0.00	.....	¹ 2,530
1913-1914.....	2,800	0.10	19.3	13,900
1914-1915.....	387	0.10	.....	¹ 13,490
1915-1916.....	350	0.10	21.7	¹ 12,500

¹May 23 to December 31. ²Missing; June 11 to July 9; August 27 to September 30.

³December 16 to September 30.

Muddy River above Indian Reservation

1914-1915.....	82	38	47.9	34,600
1915-1916.....	59	38	47.3	34,300
1916-1917.....	52	36	45.3	33,600

Muddy River at R. E. Pumping Plant

1914-1915.....	135	30	44.4	¹ 28,800
1915-1916.....	57	34	44.4	32,300
1916-1917.....	55	35	43.4	31,400

¹November 7 to September 30

Muddy River at Weiser Ranch

1915-1916.....	53	28	41.4	¹ 26,200
1916-1917.....	53	29	41.2	29,800

¹November 17 to September 30.

SNAKE RIVER BASIN

Discharge of Salmon Falls Creek near San Jacinto, Nevada

1910.....	232	24	56	123,000
1911.....	953	18	138	100,000
1911-1912.....	1,280	26	212	154,000
1912-1913.....	608	.....	151	109,000
1913-1914.....	828	16	182	132,000
1914-1915.....	246	14	74.7	54,000
1915-1916.....	617	.....	148	108,000
1919-1920.....	568	16	114	83,100
1920-1921.....	.....	.....	.....	¹ 136,350
1921-1922.....	1,140	23	170	123,000
1922-1923.....	509	30	134	96,700
1923-1924.....	600	16	111	80,900
1924-1925.....	716	24	144	104,000
1925-1926.....	314	18	78	56,500
1926-1927.....	802	24	133	96,300
1927-1928.....	579	18	122	88,400
1928-1929.....	521	19	117	84,400
1929-1930.....	276	20	72	52,400

¹June 6 to December 31. ²Missing; May 16-31; June 1-5; July 13-31; August 1.

Bruneau River near Rowland, Nevada

1913-1914.....	972	10	151	109,000
1914-1915.....	271	6.5	63.3	45,900
1915-1916.....	975	12	146	106,000
1916-1917.....	1,300	.....	174	126,000
1917-1918.....	301	5	69.1	50,000

Owyhee River near Gold Creek, Nevada

1916-1917.....	.....	.....	.....	¹ 61,653
1917-1918.....	217	.....	21.1	15,300
1918-1919.....	.....	.....	39.4	28,600
1919-1920.....	.....	.....	46.7	33,800
1920-1921.....	620	2	85.0	61,600
1921-1922.....	.....	.....	.....	¹ 49,612
1922-1923.....	217	.....	25.3	18,300
1923-1924.....	580	2	25.0	18,200
1924-1925.....	690	1	59.6	43,100

¹Missing, November 15 to April 17. ²Missing, December 1 to March 31

Discharge of Owyhee River at Mountain City, Nevada

1926-1927.....	1,060	6	135	¹ 85,700
1927-1928.....	1,510	2	109	78,800
1928-1929.....	706	2	92.1	66,700

¹November 15 to September 30.

RUN-OFF MEASUREMENTS OF NEVADA STREAMS

Owyhee River near Owyhee, Nevada

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1914-1915.....	.....	.....	.....	38,500
1915-1916.....	1,280	10	158	114,000
1916-1917.....	.....	.....	.....	124,587
1917-1918.....	382	2	54.6	39,500
1918-1919.....	920	.....	101	73,000
1919-1920.....	.....	.....	.....	Incomplete
1920-1921.....	.....	.....	.....	Incomplete
1921-1922.....	2,170	.....	154	111,000
1922-1923.....	364	8	62.5	45,200
1923-1924.....	690	1	54.5	39,600
1924-1925.....	1,120	3	133	96,000
1925-1926.....	300	1	54.5	30,100

¹April 1 to September 30. ²Missing, November 21 to April 22. ³October 1 to July 5.

South Fork Owyhee River near Deep Creek, Nevada

1921.....	1,150	24	.....	66,400
1921-1922.....	960	.....	105	76,200
1922-1923.....	326	.....	50.8	37,100
1923-1924.....	107	8	.....	10,502

¹May 10 to September 30. ²Missing, December 1 to April 24.

Jack Creek near Tuscarora, Nevada

1912-1913.....	.....	.....	.....	557
1913-1914.....	244	2.0	42.5	30,800
1914-1915.....	.....	.....	25	18,100
1915-1916.....	121	2.3	25.9	18,800
1916-1917.....	465	.....	44.6	32,200
1917-1918.....	124	1	19.1	13,800
1918-1919.....	280	.....	24.3	17,600
1919-1920.....	219	2	27.8	20,100
1920-1921.....	336	2	59.7	43,200
1921-1922.....	300	2	35.9	26,000
1922-1923.....	109	2	20.5	14,800
1923-1924.....	121	1	16.3	11,800
1924-1925.....	170	2	.....	20,000

¹October 1 to June 30. ²June 1 to September 30.

GREAT BASIN AND MINOR BASINS IN NEVADA

Discharge of Thousand Springs Creek near Tecoma, Nevada

1911.....	776	0	22.1	16,000
1912.....	.....	.....	.....	6,600
1912-1913.....	.....	.....	.....	85,093
1913.....	.....	.....	.....	4,720

¹January 1 to December 31. ²March 1 to September 30. ³Missing, December 1 to March 31. ⁴October, November and December.

Snake Creek near Baker, Nevada

1913-1914.....	75	2.3	.....	6,780
1915.....	39	1.6	.....	3,200

¹October 1 to June 30. ²May 16 to September 30.

Baker Creek near Baker, Nevada

1913-1914.....	170	.....	21.9	15,900
1914-1915.....	100	2.7	.....	11,030

¹Missing, December 16 to March 14.

Cleveland Creek near Osceola, Nevada

1914.....	44	8.4	.....	3,760
1914-1915.....	30	5.0	10.5	7,620
1915-1916.....	32	5.3	10.7	7,760
1916.....	11	6.9	.....	1,360

¹June, July, August and September. ²October, November and December.

White River near Preston, Nevada

1914.....	44	8.4	3,760
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¹June, July, August and September.

RUN-OFF MEASUREMENTS OF NEVADA STREAMS
Discharge of Currant Creek at Cazier's Ranch, near Currant, Nevada

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1913.....	14	1.1	.....	1,600
1914.....	17.9	3.6	.....	2,330
1914-1915.....	24	2.6	7.49	5,430
1915-1916.....	23	4.0	.....	3,285
1916-1917.....	24	4.0	6.41	4,650
1923.....	21	1.0	.....	3,060
1929.....	.....	.....	.....	1,712
1930.....	.....	.....	.....	3,335

¹May 5 to September 30. ²May 25 to September 30. ³Missing, March 21 to June 23. ⁴January 21 to August 18. ⁵Deliveries by Water Commissioner during irrigation season.

Big Warm Springs near Duckwater, Nevada

1915-1916.....	14.0	10,100
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Duckwater Creek near Duckwater, Nevada

1915.....	11.3	8.9	9.83	468
1915-1916.....	10	3.7	7.86	5,700
1917.....	9.3	2.1	.....	1,990

¹September 7 to 30. ²June 1 to October 15.

Overland Creek near Ruby Valley, Nevada

1917.....	125	1.4	10,400
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¹April 24 to September 30.

Birch Creek near Austin, Nevada

1913.....	12.0	1.5	780
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¹June 13 to September 30.

Intermittent Springs near Pahump, Nevada

1916.....	39.0	0.4	4,720
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¹April 1 to September 30.

WALKER LAKE BASIN

Discharge of East Walker River near Bridgeport, Calif.

1921-1922.....	1,050	53	.....	133,900
1922-1923.....	648	54	157	114,000
1923-1924.....	231	4	59.2	43,000
1924-1925.....	246	2	.....	57,900
1925-1926.....	334	2	101	73,100
1926-1927.....	491	2	129	93,600
1927-1928.....	326	3	116	84,000
1928-1929.....	255	.....	72	52,000

¹Missing, December 1 to May 2. ²Missing, October 23 to February 28; August 27 to September 11.

East Walker River near Yerington, Nevada.

1902.....	161	51	.....	18,803
1903.....	440	0	.....	79,562
1904.....	696	60	254	184,600
1905.....	306	15	.....	40,064
1906.....	1,230	54	322	235,000
1907.....	1,700	83	390	284,000
1908.....	375	55	.....	57,600

¹October 6 to December 31. ²January 1 to December 31 except May 10 to 30 missing. ³January 1 to December 31. ⁴May 1 to July 31 only. ⁵January 1 to December 31. ⁶January 1 to July 31.

East Walker River near Mason, Nevada

1910.....	118	64	.....	7,210
1911.....	1,550	32	341	247,000
1911-1912.....	244	6	.....	47,200
1913-1914.....	1,470	0.5	335	242,000
1914-1915.....	374	1.5	106	76,600
1915-1916.....	528	29	162	118,000

¹November 21 to December 31. ²January 1 to December 31. ³October 1 to September 15.

RUN-OFF MEASUREMENTS OF NEVADA STREAMS
East Walker River above Mason Valley, Nevada

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1917-1918.....	129	75	-----	118,500
1921.....	600	41	-----	40,400
1921-1922.....	1,100	34	228	165,000
1922-1923.....	643	82	146	106,000
1923-1924.....	131	1	-----	43,800

¹October 1 to January 5. ²May 23 to September 30.

Discharge of Walker River at Mason, Nevada

1910.....	(Misc. Meas. see Water Supply Paper No. 290, page 152)			
1910.....	295	130	-----	18,080
1911.....	4,710	100	823	596,000
1911-1912.....	1,350	25	-----	166,000
1913.....	(Misc. Meas. see Water Supply Paper No. 360, page 176)			
1913-1914.....	3,360	27	790	573,000
1914-1915.....	1,530	27	312	226,000
1915-1916.....	1,850	36	455	330,000
1921.....	1,200	17	-----	73,100
1921-1922.....	2,270	34	-----	291,610
1922-1923.....	(Misc. Meas. see Water Supply Paper No. 570, page 88)			

¹November 21 to December 31. ²October 1 to September 15. ³May 15 to September 30. ⁴Missing, December 1 to February 28.

Walker River near Wabuska, Nevada

1902.....	(Misc. Meas. see Water Supply Paper No. 85, page 107)			
1902.....	200	1	-----	12,977
1903.....	964	1	170	122,888
1904.....	1,522	40	443	322,200
1905.....	578	30	-----	30,297
1906.....	3,270	90	-----	390,470
1907.....	2,810	135	-----	233,700
1920.....	259	4	-----	39,900
1920-1921.....	730	1	106	76,800
1921-1922.....	2,170	4	342	248,000
1922-1923.....	662	12	181	131,000
1923-1924.....	290	0	-----	52,600
1924-1925.....	301	0	-----	19,600
1925-1926.....	119	6	40.3	29,200
1926-1927.....	1,520	8	138	100,000
1927-1928.....	408	8	64.5	46,900
1928-1929.....	76	2	25.3	18,300

¹July 21 to December 31. ²January 1 to December 31. ³May, June and July.

⁴May 1 to September 30. ⁵June 1 to August 31. ⁶January 15 to September 30.

⁷Missing, October 11 to February 28.

Discharge of Walker River at Schurz, Nevada

1913.....	(Misc. Meas. see Water Supply Paper No. 360, page 177)			
1913-1914.....	2,530	0.2	663	480,000
1914-1915.....	1,170	4	257	186,000
1915-1916.....	1,450	1	389	282,000
1916-1917.....	1,860	0.8	405	293,000
1917-1918.....	2,040	0	189	137,000
1918-1919.....	1,970	14	-----	133,942
1919-1920.....	183	0	54.8	39,800
1920-1921.....	622	0	63.7	46,200
1921-1922.....	1,970	0	303	220,000
1922-1923.....	810	1	145	105,000
1923-1924.....	293	0	67.8	49,300
1924-1925.....	250	0	7.5	5,420
1925-1926.....	121	0	19.8	14,400
1926-1927.....	1,480	1	103	74,900
1927-1928.....	350	0	40.3	29,300
1928-1929.....	54	1	7.1	5,160

¹Missing, January 12 to April 12.

West Walker River near Coleville, Calif.

1902.....	(Misc. Meas. see Water Supply Paper No. 85, page 108)			
1902.....	113	60	-----	13,139
1903.....	2,030	60	311	225,091
1904.....	2,100	60	389	282,900
1905.....	1,160	44	216	156,600

RUN-OFF MEASUREMENTS OF NEVADA STREAMS
WEST WALKER RIVER NEAR COLEVILLE, CALIFORNIA—Continued

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1906.....	3,300	50	582	² 423,000
1907.....	4,170	85	675	² 491,000
1908.....	1,050	85	.....	³ 146,000
1909.....	2,220	55	.....	⁴ 245,000
1910-1911.....	1,680	50	.....	⁵ 234,000
1915.....	1,170	42	.....	⁶ 87,500
1915-1916.....	1,560	19	344	250,000
1916-1917.....	2,200	.....	353	226,000
1917-1918.....	2,110	30	265	192,000
1918-1919.....	1,960	50	253	183,000
1919-1920.....	1,410	51	235	171,000
1920-1921.....	2,190	.....	311	225,000
1921-1922.....	2,290	.....	368	266,000
1922-1923.....	1,570	34	305	221,000
1923-1924.....	711	14	93.6	67,900
1924-1925.....	1,490	18	275	200,000
1925-1926.....	1,160	25	177	128,000
1926-1927.....	2,000	24	326	236,000
1927-1928.....	1,280	27	190	138,000
1928-1929.....	1,110	23	151	109,000
1929-1930.....	1,320	19	181	132,000

¹October 5 to December 31. ²January 1 to December 31. ³January 1 to July 31.
⁴March 1 to September 30. ⁵October 1 to August 31. ⁶June 18 to September 30.

Discharge of West Walker River near Wellington, Nevada

1917-1918.....	1,810	.....	.....	¹ 150,000
1918-1919.....	1,770	26	203	147,000
1919-1920.....	990	23	163	121,000
1920-1921.....	1,220	.....	192	139,000
1921-1922.....	.....	.....	339	245,000
1922-1923.....	1,270	.....	235	170,000
1923-1924.....	.....	.....	.....	² 27,700
1924.....	.....	.....	.....	358,800
1924-1925.....	.....	.....	.....	165,000
1925-1926.....	772	17	182	132,000
1926-1927.....	1,520	15	260	188,000
1927-1928.....	1,045	.....	187	135,000
1928-1929.....	570	.....	116	84,000

¹December 20 to September 30. ²October 1 to May 11. ³March 9 to September 30.
 1917-1918 to 1923-1924, inclusive, below Saroni Canal. 1924 to date, above diversion of Saroni Canal.

West Walker River at Hudson, Nevada*

1914.....	(Misc. Meas. see Water Supply Paper No. 390, page 214)			
1914-1915.....	1,440	31	238	172,000
1915-1916.....	1,630	38	316	229,000
1916-1917.....	2,110	32	315	229,000
1917-1918.....	1,950	16	203	146,000
1918-1919.....	1,900	.....	238	172,000
1919-1920.....	960	13	139	101,000
1920-1921.....	755	19	136	98,500
1921-1922.....	2,370	.....	284	² 205,000
1922-1923.....	1,360	26	228	¹ 165,000
1923-1924.....	470	14	75.2	³ 54,600
1924-1925.....	.....	.....	.....	⁴ 7,590

*Record discontinued. ¹Near Hudson. ²Near Hudson, October 1 to February 28.

Saroni Canal near Wellington, Nevada

1920.....	57	.....	.....	¹ 1,380
1920-1921.....	43	.....	.....	16,600
1921-1922.....	.....	.....	26.2	19,000
1922-1923.....	.....	.....	.....	15,400

¹July, August and September. Combined flow of Saroni Canal and West Walker River near Wellington shows quantity of water flowing from Antelope Valley.

CARSON-HUMBOLDT SINK

Discharge of East Fork Carson River near Gardnerville, Nevada

1902.....	1,800	28	298	¹ 215,989
1903.....	2,852	21	462	² 335,124

RUN-OFF MEASUREMENTS OF NEVADA STREAMS

DISCHARGE OF EAST FORK CARSON RIVER—Continued

	DISCHARGE IN SECOND FEET—			Run-off in acre feet
	Maximum	Minimum	Mean	
1904.....	3,310	18	.....	² 345,900
1905.....	1,930	12	.....	³ 199,000
1906.....	(Misc. Meas. see Water Supply Paper No. 212, page 79)			
1908.....	860	82	257	¹ 186,000
1909.....	3,430	104	570	¹ 413,000
1910.....	2,020	75	392	¹ 283,000
1917.....	2,090	66	.....	¹ 83,100
1924-1925.....	2,990	36	.....	² 260,000
1925-1926.....	1,140	31	198	¹ 143,000
1926-1927.....	2,540	37	442	³ 320,000
1927-1928.....	1,340	37	257	¹ 187,000

¹January 1 to December 31. ²January 1 to July 31. ³January 1 to July 15. ⁴June 22 to October 31. ⁵December 17 to September 30. ⁶October 1 to September 30.

Carson River at Empire, Nevada*

1902.....	1,712	10	351	¹ 253,459
1903.....	2,065	12	429	¹ 309,794
1904.....	3,250	30	728	¹ 527,800
1905.....	1,430	0	293	¹ 211,800
1906.....	3,020	51	798	¹ 579,000
1907.....	4,000	173	.....	¹ 404,000
1908.....	750	17	212	¹ 172,200
1909.....	2,930	67	678	³ 490,000
1910.....	1,580	7.5	372	³ 316,000
1911.....	4,440	36	875	⁶ 634,000
1911-1912.....	2,030	11	250	¹ 181,000
1912-1913.....	2,090	14	267	¹ 193,000
1913-1914.....	5,160	22	806	⁵ 583,000
1914-1915.....	3,100	4	451	¹ 327,000
1915-1916.....	3,100	16	647	¹ 471,000
1916-1917.....	3,250	13	643	¹ 465,000
1917-1918.....	1,440	5	300	¹ 217,000
1918-1919.....	2,630	6	321	¹ 233,000
1919-1920.....	1,350	5	192	¹ 139,000
1920-1921.....	2,000	7	.....	² 258,972
1921-1922.....	3,290	16	534	¹ 387,000
1922-1923.....	770	22	.....	¹ 44,100

*Record discontinued. ¹January 1 to December 31. ²January 1 to December 31, except March 19 to June 6. ³18,200 acre feet diverted by Brunswick Mill added to river discharge. ⁴October 1 to September 30. ⁵Missing December 5 to 31. ⁶October 1 to February 3.

Discharge of Carson River near Ft. Churchill, Nevada

1911.....	4,470	43	.....	¹ 483,000
1911-1912.....	1,640	9	240	² 174,000
1912-1913.....	1,360	23	.....	¹ 143,000
1913-1914.....	6,150	26	853	¹ 617,000
1914-1915.....	2,220	8	411	¹ 297,000
1915-1916.....	3,950	12	756	¹ 550,000
1916-1917.....	3,050	27	660	¹ 478,000
1917-1918.....	1,500	4	308	¹ 223,000
1918-1919.....	3,140	2	354	¹ 256,000
1919-1920.....	1,680	2	200	¹ 145,000
1920-1921.....	1,850	9	.....	² 286,866
1921-1922.....	3,900	9	635	¹ 460,000
1922-1923.....	2,170	.....	455	¹ 329,000
1923-1924.....	390	.....	126	¹ 91,200
1924-1925.....	1,960	.....	.....	¹ 257,035
1925-1926.....	982	.....	158	¹ 114,000
1926-1927.....	2,430	.....	470	¹ 341,000
1927-1928.....	2,710	.....	234	¹ 170,000
1928-1929.....	746	.....	126	¹ 91,500
1929-1930.....	1,900	14	160	¹ 116,000

¹April 13 to December 31. ²Missing July 1 to September 30. ³Missing December 8 to December 31. ⁴Missing December 1 to December 31.

West Fork Carson River at Woodfords, California*

1902.....	448	30	133	¹ 95,522
1903.....	502	25	119	¹ 86,323
1904.....	1,085	47	.....	¹ 130,700
1905.....	370	20	.....	¹ 72,780

RUN-OFF MEASUREMENTS OF NEVADA STREAMS

WEST FORK CARSON RIVER—Continued

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1906.....	1,570	22	231	¹ 168,000
1907.....	1,450	47	292	¹ 212,000
1908.....	643	26	91.4	¹ 66,400
1909.....	1,230	17	212	¹ 153,000
1910.....	580	20	124	¹ 89,600
1911.....	1,300	20	211	¹ 153,000
1911-1912.....	710	17	100	¹ 73,000
1912-1913.....	647	23	103	¹ 74,400
1913-1914.....	1,050	9	149	¹ 108,000
1914-1915.....	672	8	120	¹ 87,200
1916.....	1,069	11	254	¹ 86,500
1916-1917.....	944	3	131	¹ 95,000
1917-1918.....	618	.....	77.5	¹ 56,100
1918-1919.....	958	0	101	¹ 73,200
1919-1920.....	742	6	73	¹ 53,100

*Record discontinued. ¹January 1 to December 31. ²Missing February 1 to 6. ³Missing January 1 to 8. ⁴Missing January 1 to 8. ⁵Missing January 1 to 8.

Discharge of Humboldt River at Palisade, Nevada

1897.....	.....	.....	.....	¹ 485,000
1898.....	.....	.....	.....	¹ 188,000
1899.....	.....	.....	.....	¹ 514,000
1900.....	.....	.....	.....	¹ 259,000
1901.....	.....	.....	.....	¹ 263,000
1902.....	.....	.....	.....	¹ 280,000
1903.....	.....	.....	.....	¹ 238,441
1903-1904.....	1,835	57	.....	¹ 389,360
1904-1905.....	1,220	34	.....	¹ 214,950
1905-1906.....	2,620	20	.....	¹ 460,870
1906-1907.....	.....	.....	.....	¹ 785,900
1907-1908.....	.....	.....	.....	¹ 284,500
1908-1909.....	.....	.....	.....	¹ 336,100
1909-1910.....	.....	.....	.....	¹ 185,700
1910-1911.....	.....	.....	.....	¹ 280,620
1911-1912.....	2,650	65	417	¹ 302,000
1912-1913.....	1,270	60	359	¹ 260,000
1913-1914.....	2,780	38	742	¹ 537,000
1914-1915.....	382	12	133	¹ 96,600
1915-1916.....	1,780	17	333	¹ 242,000
1916-1917.....	3,170	32	635	¹ 459,000
1917-1918.....	595	13	129	¹ 93,600
1918-1919.....	1,440	9	245	¹ 178,000
1919-1920.....	803	14	177	¹ 128,000
1920-1921.....	4,210	20	862	¹ 624,000
1921-1922.....	3,350	27	613	¹ 444,000
1922-1923.....	1,450	27	325	¹ 235,000
1923-1924.....	537	9	161	¹ 117,000
1924-1925.....	2,220	15	435	¹ 315,000
1925-1926.....	459	6	126	¹ 90,900
1926-1927.....	1,820	14	339	¹ 245,000
1927-1928.....	.....	.....	.....	¹ 142,670
1928-1929.....	.....	.....	.....	¹ 118,000
1929-1930.....	794	16	147	¹ 107,000

¹January 1 to December 31. ²October 1 to September 30.

Humboldt River at Battle Mountain, Nevada*

1921.....	1,560	10	.....	¹ 374,000
1921-1922.....	1,560	11	465	¹ 337,000
1922-1923.....	1,070	17	.....	¹ 168,000
1923-1924.....	511	37	.....	¹ 76,400

¹March 1 to September 30. ²Missing, July 16 to September 30. ³Missing April 20 to September 30. ⁴Discontinued April 19, 1924.

Discharge of Humboldt River at Comus.

1917-1918.....	312	1.0	68.7	49,700
1918-1919.....	1,250	0	141	102,000
1919-1920.....	234	0	36.8	26,700
1920-1921.....	2,700	0.1	709	514,000
1921-1922.....	2,070	14	506	367,000
1922-1923.....	910	8	.....	¹ 113,000
1925.....	1,180	28	.....	¹ 108,000

RUN-OFF MEASUREMENTS OF NEVADA STREAMS

DISCHARGE OF HUMBOLDT RIVER—Continued

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1925-1926.....	429	11	.....	³ 88,800
1926-1927.....	⁴ 97,919
1927-1928.....	⁵ 48,641
1928-1929.....	No record
1929-1930.....	⁶ 31,906

¹Missing, July 1 to September 30. ²May 23 to September 30. ³Missing, June 1 to September 30. ⁴Partial. ⁵March 11 to June 30. ⁶March 30 to July 31.

Humboldt River near Golconda, Nevada*

1901.....	3,080	0.5	256	¹ 185,806
1902.....	523	1	120	² 86,763
1903.....	740	0.5	171	³ 122,980
1904.....	1,063	4	.....	⁴ 261,000
1905.....	356	0	133	⁵ 96,060
1906.....	1,420	0	373	⁶ 270,000
1907.....	3,160	100	998	⁷ 722,000
1908.....	880	1.5	239	⁸ 174,000
1909.....	900	3	335	⁹ 243,000
1910-1911.....	776	0	180	¹⁰ 129,000
1911-1912.....	1,240	0	195	¹¹ 142,000
1912-1913.....	680	10	187	¹² 135,000
1913-1914.....	1,730	19	642	¹³ 464,000
1914-1915.....	352	0.2	65.9	¹⁴ 47,700
1915-1916.....	1,320	0.4	226.0	¹⁵ 164,000
1916-1917.....	1,950	2.5	460	¹⁶ 330,000

*Record discontinued. ¹January 1 to December 31. ²Missing January to February 4.

Humboldt River at Winnemucca, Nevada*

1924-1925.....	670	2	¹ 72,000
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*Record discontinued. ¹October 1 to May 31.

Discharge of Humboldt River near Oreana, Nevada

1895.....	.....	.....	.....	¹ 135,914
1896.....	.....	.....	.....	² 204,000
1897.....	.....	.....	.....	³ 456,480
1898.....	.....	.....	.....	⁴ 92,538
1899.....	.....	.....	.....	⁵ 477,747
1900.....	430	22	120	⁶ 86,618
1901.....	.....	.....	.....	⁷ 172,800
1902.....	511	19	88	⁸ 63,593
1903.....	580	8	121	⁹ 87,757
1904.....	950	3	289	¹⁰ 210,400
1905.....	440	0	101	¹¹ 73,020
1906.....	1,010	16	303	¹² 221,000
1907.....	2,220	75	720	¹³ 588,000
1908.....	670	16	164	¹⁴ 119,000
1909.....	680	6	287	¹⁵ 207,000
1910.....	(Misc. Meas. see Water Supply Paper No. 290, page 174)			
1910-1911.....	760	.....	165	¹⁶ 119,000
1911-1912.....	1,240	.....	182	¹⁷ 133,000
1912-1913.....	1,270	20	174	¹⁸ 126,000
1913-1914.....	2,000	30	632	¹⁹ 457,000
1914-1915.....	318	0	77.9	²⁰ 56,400
1915-1916.....	788	2.6	151	²¹ 110,000
1916-1917.....	1,900	17	.....	²² 190,161
1917-1918.....	291	0	91.7	²³ 66,400
1918-1919.....	585	0	79	²⁴ 57,200
1919-1920.....	120	0	8.57	²⁵ 6,220
1920-1921.....	1,960	0	432	²⁶ 312,000
1921-1922.....	2,260	6	442	²⁷ 319,000
1924-1925.....	573	11	.....	²⁸ 50,827
1925-1926.....	(Misc. Meas. see Water Supply Paper No. 630, page 116)			
1927.....	361	44	.....	²⁹ 63,080
1928.....	480	8	252	³⁰ 42,458
1929.....	70	2	28	³¹ 4,052
1930.....	126	3	41	³² 8,834

¹King and Malone report on file State Engineer's Office. ²U. S. G. S. Water Supply Papers. ³October 1 to June 30, except November 1 to February 20. ⁴March 1 to August 14. ⁵March 15 to July 31. ⁶May 21 to July 31. ⁷April 1 to July 15. 1928, 1929 and 1930 taken from Water Commissioner's Reports.

RUN-OFF MEASUREMENTS OF NEVADA STREAMS**Discharge of Humboldt River near Lovelock, Nevada**

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1912.....	640	0	.....	¹ 25,800
1912-1913.....	323	0	.....	² 12,344
1913-1914.....	1,450	1.0	475	344,000
1914-1915.....	241	0	26.3	19,100
1915-1916.....	167	0	6.25	4,540
1916-1917.....	(Misc. Meas. see Water Supply Paper No. 460, page 196)			
1917-1918.....	(Misc. Meas. see Water Supply Paper No. 480, page 176)			
1918-1919.....	0	0	0	0
1919-1920.....	0	0	0	0
1920-1921.....	1,520	0	182	133,000
1921-1922.....	1,700	0	305	221,000
1922-1923.....	203	0	.....	³ 2,990
1923-1924.....	270	0	.....	⁴ 8,030
1924-1925.....	0	0	.....	0
1925-1926.....	0	0	.....	6,590
1926-1927.....	0	0	.....	0
1927-1928.....	0	0	.....	0
1928-1929.....	0	0	.....	0
1929-1930.....	0	0	.....	0

¹June 27 to September 30. ²Missing, January 1 to May 31. ³Missing, February 1 to March 31. ⁴River dry except months of February and March.

Marys River at Marys River Cabin near Deeth, Nevada*

1913.....	205	2.5	.....	¹ 25,600
1913-1914.....	457	2.2	.....	² 48,018

*Record discontinued. ¹March 22 to September 30. ²Missing, December 1 to February 28.

Bishop Creek near Wells, Nevada*

1910.....	176.3	5.1	14.0	10,200
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*Record discontinued.

Marys River near Buena Vista, Nevada*

1913.....	200	5	¹ 27,300
1913-1914.....	459	3	.....	² 66,344

*Record discontinued. ¹April 1 to September 30. ²Missing, December 1 to February 28

Hanks Creek near Buena Vista, Nevada*

1913.....	6.0	0.2	.....	¹ 2,470
1913-1914.....	100.0	1.5	.....	² 10,537

*Record discontinued. ¹March 22 to September 30. ²Missing, November 17 to March 13.

Discharge of Marys River near Deeth, Nevada

1902.....	31	10	.....	¹ 1,192
1903.....	349	8	.....	² 47,141
1912.....	439	2	.....	³ 47,800
1912-1913.....	205	.....	44.5	32,200
1913-1914.....	402	5	90.2	65,300
1914-1915.....	94	1.5	18.6	13,500
1915-1916.....	381	1.4	68.2	49,500
1916-1917.....	420	2.8	78.6	57,000
1917-1918.....	130	1	31.5	22,800
1918-1919.....	286	1	39.2	28,400
1919-1920.....	239	1	32.3	23,400
1920-1921.....	530	1	98.7	71,500
1921-1922.....	616	0	71.8	52,000
1922-1923.....	223	3	42.8	31,000
1923-1924.....	102	0	17.5	12,700
1924-1925.....	410	1	55.2	39,900
1925-1926.....	136	1	19.6	14,200
1926-1927.....	428	1	54.6	39,400
1927-1928.....	350	.....	46.1	⁴ 25,100
1928-1929.....	.....	.....	.....	⁵ 10,999
1929-1930.....	.....	.....	.....	⁶ 1,503

¹November 24 to December 31. ²January 1 to July 14. ³January 1 to September 30.

⁴October 1 to June 30. ⁵May 17 to July 14, water commissioner report. ⁶May 15 to July 15.

RUN-OFF MEASUREMENTS OF NEVADA STREAMS
North Fork Humboldt River near Halleck, Nevada*

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1904.....	.....	.....	.....	¹ 67,980
1905.....	66	0	21.1	15,270
1906.....	334	0	71.8	51,800
1907.....	1,020	4	185	133,000
1908.....	530	0.5	29.5	21,200
1909.....	502	1.5	61.7	44,700
1910.....	.....	.....	.....	² 1,874
1911.....	528	1	.....	³ 32,172
1911-1912.....	756	2	85.8	62,000
1912-1913.....	414	1	56.7	41,000
1913.....	30	1	.....	⁴ 3,990

*Record discontinued. ¹Missing, January 1 to February 24. ²September 1 to December 31. ³January 1 to September 30. ⁴October 1 to December 31.

North Fork of Humboldt River at Devils Gate, near Halleck, Nevada*

1913-1914.....	702	7.5	.....	¹ 81,300
1914-1915.....	177	2.8	30.9	22,400
1915-1916.....	613	5.8	93.2	67,700
1916-1917.....	1,110	9	152	110,000
1917-1918.....	244	12	30.3	21,900
1918-1919.....	647	6	.....	² 46,766
1919-1920.....	141	10	.....	³ 7,265
1920-1921.....	770	9	.....	73,599

*Record discontinued. ¹Missing, October 1 to November 10. ²Missing, June 1 to July 31. ³Missing, February 1 to June 17; September 18 to 30.

Discharge of Star Creek near Deeth, Nevada

1913.....	273	11	.....	¹ 10,600
1913-1914.....	372	3.5	44.9	32,500
1914-1915.....	62	1.6	10.7	7,760
1915-1916.....	126	1.3	18.5	13,400
1916-1917.....	383	2.3	40.8	29,500
1917-1918.....	83	1.4	10.2	7,390
1918-1919.....	184	0.5	13.9	10,100
1919-1920.....	167	1.0	20.7	15,000
1920-1921.....	391	5	53.4	38,700
1921-1922.....	253	4	33.8	24,400
1922-1923.....	218	5	26.0	18,900
1923-1924.....	99	2	13.7	9,930

¹June 4 to September 30.

Lamoille Creek near Lamoille, Nevada

1915.....	283	3.5	57.1	¹ 18,500
1915-1916.....	259	2.0	41.4	30,100
1916-1917.....	315	6.8	.....	² 21,170
1917-1918.....	252	2.0	27.4	19,800
1918-1919.....	295	3	36.1	26,100
1919-1920.....	356	5	45.2	32,700
1920-1921.....	259	5	63.8	46,200
1921-1922.....	373	2	43.9	31,800
1922-1923.....	289	4	.....	³ 12,800

¹May 8 to September 30. ²Missing, March 1 to 31; June 9 to July 3. ³Missing, June 13 to September 30.

Lamoille Creek near Halleck, Nevada

1913.....	452	8	.....	¹ 28,100
1913-1914.....	556	8	117	84,600
1914-1915.....	113	0	24.2	17,500
1915-1916.....	201	0	32.5	25,600
1916-1917.....	311	0	.....	² 10,774
1917-1918.....	115	0	18.6	13,400
1919.....	183	0	.....	³ 14,400

¹May 12 to September 30. ²Missing, December 10 to March 19. ³February 1 to September 30.

Discharge of Secret Creek near Halleck, Nevada

1917.....	143	4.1	.....	¹ 5,720
1918.....	32	0.3	.....	² 3,020
1918-1919.....	72	1	.....	³ 6,080
1920.....	112	1	.....	⁴ 10,000
1920-1921.....	288	2	37.8	27,400

RUN-OFF MEASUREMENTS OF NEVADA STREAMS

DISCHARGE OF SECRET CREEK—Continued

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1921-1922.....	300	2	22.8	16,500
1922-1923.....	80	3	13.8	10,000
1923-1924.....	90	2	9.6	6,950

¹May 28 to September 30. ²April 1 to September 30. ³October 1 to July 31.⁴March 7 to September 30.

Maggie Creek near Carlin, Nevada

1913.....	8.6	4.4	.....	1,400
1913-1914.....	368	0.3	46.6	33,700
1914-1915.....	27	0.1	5.57	4,030
1915-1916.....	183	2.6	27.8	20,200
1916-1917.....	291	0.3	44.6	32,300
1917-1918.....	30	0.2	57.6	4,170
1918-1919.....	150	0	15.9	11,500
1919-1920.....	85	0	14.3	10,400
1920-1921.....	416	0	44.5	32,300
1921-1922.....	740	1	.....	² 42,658
1923.....	73	3	.....	³ 7,730
1923-1924.....	36	0	4.1	2,950

¹June 6 to September 30. ²Missing, January 1 to March 27; June 11 to September 30. ³April 1 to September 30.

Discharge of South Fork of Humboldt River near Elko, Nevada

1902.....	1,385	0	223	161,072
1903.....	1,168	2	176	126,819
1904.....	1,183	2	.....	¹ 106,600
1905.....	816	0	123	89,520
1906.....	1,400	0	210	152,000
1907.....	1,260	20	248	180,000
1908.....	850	15	103	74,400
1909.....	1,090	2	143	103,000
1910.....	.....	.....	.....	² 2,481
1910-1911.....	856	0	82.2	59,300
1911-1912.....	1,470	5	162	117,000
1912-1913.....	632	6	104	75,300
1913-1914.....	2,400	2.5	199	144,000
1914-1915.....	341	0	36.3	26,300
1915-1916.....	388	0	68.1	49,500
1916-1917.....	1,450	0	162	118,000
1917-1918.....	297	0	34.8	25,200
1919.....	356	0	.....	³ 29,000
1919-1920.....	418	0	.....	⁴ 31,879
1920-1921.....	2,040	0	.....	⁵ 163,353
1921-1922.....	1,050	10	.....	⁶ 93,306
1922-1923.....	(Misc. Meas. see Water Supply Paper No. 570, page 148)			
1923-1924.....	430	0	56.4	41,000
1924-1925.....	815	4	127	91,800
1925-1926.....	218	0	.....	29,400
1926-1927.....	1,160	3	.....	⁷ 71,694
1927-1928.....	1,370	0	70.6	51,300
1928-1929.....	1,410	0	64.7	46,800

¹Missing, February 21 to 28. ²September 1 to December 31. ³April 3 to September 30. ⁴Missing, December 1 to May 9. ⁵Missing, February 1 to March 31. ⁶Missing, December 1 to March 28. ⁷Missing, January 1 to February 28.

Pine Creek at Fallsade, Nevada

1902.....	(Misc. Meas. see Water Supply Paper No. 85, page 101)			
1903.....	(Misc. Meas. see Water Supply Paper No. 100, page 160)			
1904.....	(Misc. Meas. see Water Supply Paper No. 133, page 297)			
1912.....	82	1.4	.....	¹ 6,350
1912-1913.....	28	1.0	10.3	7,460
1913-1914.....	785	2.5	36.0	26,000

¹January 18 to September 30.

Discharge of Reese River near Berlin, Nevada

1913.....	173	2.5	.....	¹ 1,910
1913-1914.....	164	1.0	26.1	18,900
1914-1915.....	128	1.5	.....	² 15,073
1915-1916.....	65	1.5	.....	³ 5,610

¹June 10 to September 30. ²Missing, November 11 to February 28.³Missing, December 12 to May 6.

RUN-OFF MEASUREMENTS OF NEVADA STREAMS
Big Creek near Austin, Nevada

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1913-1914.....	10.8	3.9	.....	¹ 2,700
1916.....	8.5	3.3	.....	¹ 1,396

¹Missing, October 1 to 12; July 1 to September 30. ²March 9 to September 30.

Rock Creek near Battle Mountain, Nevada

1918.....	39	0	.....	¹ 1,440
1918-1919.....	377	0	34.6	25,000
1919-1920.....	181	0	21.1	15,300
1920-1921.....	846	0	64.9	47,000
1921-1922.....	846	0	57.3	41,500
1922-1923.....	240	0	15.2	11,000
1924.....	55	0	.....	¹ 1,590
1925.....	92	3	.....	² 2,860
1927.....	242	4	.....	¹ 14,200
1928.....	.....	.....	.....	³ 4,019
1929.....	.....	.....	.....	³ 3,391
1930.....	.....	.....	.....	³ 3,530

¹March 20 to September 30. ²April 5 to September 30. ³April 20 to September 30.

⁴March 5 to July 9. ⁵March 26 to May 31. ⁶March 18 to May 10. ⁷March 15 to June 30.

Rock Creek at Rock Creek Ranch near Battle Mountain, Nevada*

1915.....	17	0.4	6.75	¹ 1,890
1916.....	(Misc. Meas. see Water Supply Paper No. 400, page 256)			¹ 3,680
1916-1917.....	183	2.8	.....	¹ 5,745

*Record discontinued. ¹May 13 to September 30. ²Missing, April 8 to June 14.

Little Humboldt River near Paradise Valley, Nevada

1921-1922.....	319	10	38.7	28,106
1922-1923.....	44	7	16.6	12,100
1924.....	27	8	.....	¹ 3,680
1924-1925.....	35	5	14.1	10,200
1925-1926.....	66	8	16.8	12,200
1926-1927.....	234	9	.....	¹ 15,022

¹April 1 to September 30. ²Missing, February 1 to April 30.

Discharge of Martin Creek near Paradise Valley, Nevada

1921-1922.....	258	7	39.2	28,400
1922-1923.....	85	5	19.0	13,700
1923-1924.....	45	6	12.1	8,800
1924-1925.....	300	6	23.3	16,900
1925-1926.....	112	7	24.3	17,600
1926-1927.....	280	6	.....	¹ 25,661
1927-1928.....	.....	2	28.5	20,700
1928-1929.....	74	4	15.6	11,300

¹Missing, December 1 to March 31.

Cottonwood Creek near Paradise Valley, Nevada

1925.....	(Misc. Meas. see Water Supply Paper No. 610, page 116)			
1925-1926.....	22	0	4.1	2,950
1926-1927.....	75	0	11.0	7,990
1927-1928.....	91	0	8.46	6,140
1928-1929.....	19	0	3.9	2,800

H. L. I. L. & P. Feeder Canal, Mill City, Nevada

1914.....	142	0	.....	¹ 26,600
1915.....	(Misc. Meas. see Water Supply Paper No. 410, page 172)			
1915-1916.....	226	0	.....	21,100
1916-1917.....	187	0	44.6	32,300
1917-1918.....	.....	.....	.....	¹ 5,540
1918-1919.....	110	0	8.8	6,360
1919-1920.....	.....	.....	.....	¹ 5,900
1920-1921.....	233	0	57.3	41,500
1921-1922.....	117	0	31.0	22,500
1922-1923.....	215	0	.....	¹ 10,553
1923-1924.....	(Misc. Meas. see Water Supply Paper No. 590, page 118)			

RUN-OFF MEASUREMENTS OF NEVADA STREAMS**H. L. I. L. & P. FEEDER CANAL—Continued**

	DISCHARGE IN SECOND FEET—			Run-off in acre feet
	Maximum	Minimum	Mean	
1925.....	220	0	.....	¹ 16,100
1925-1926.....	173	0	.....	² 32,500
1926-1927.....	216	0	8.6	³ 76,260
1927-1928.....	233	0	.....	15,400
1928-1929.....	34	0	.....	5,390

¹February 19 to September 30. ²October 19 to January 14. ³December 13 to February 23. ⁴Missing, November 1 to March 31. ⁵March 1 to September 30. ⁶October 1 to March 31. ⁷October 1 to March 31.

Discharge of H. L. I. L. & P. Outlet Canal, Humboldt, Nevada

1914.....	148	2.2	.....	¹ 17,500
1914-1915.....	259	0	29.6	21,400
1916.....	153	0	.....	² 12,300
1917.....	277	0	5.16	³ 1,870
1918.....	258	0.4	.....	⁴ 25,600
1919.....	73	0	.....	⁵ 2,520
1920.....	112	0	.....	⁶ 1,520
1921-1922.....	131	0	7.1	2,690
1922-1923.....	195	0	.....	⁷ 15,338
1923-1924.....	243	.....	47.0	34,100
1925.....	(Misc. Meas. see Water Supply Paper No. 610, page 118)			
1925-1926.....	272	0	48.2	34,800
1927.....	55	1	.....	⁸ 2,940
1927-1928.....	143	0	.....	12,000
1928-1929.....	107	0	.....	1,350

¹February 15 to September 30. ²June 5 to August 29. ³April 1 to September 30. ⁴March 28 to August 10. ⁵June 14 to July 11. ⁶May 13 to 20. ⁷Missing, October 24 to March 31. ⁸April 26 to August 31.

Truckee River at Nevada-California Line*

1901.....	4,370	230	938	677,521
1902.....	3,596	268	751	543,111
1903.....	3,211	280	753	545,263
1904.....	6,730	230	1,647	1,195,000
1905.....	2,090	300	756	547,200
1906.....	5,410	309	1,420	1,030,000
1907.....	15,300	645	2,090	1,520,000
1908.....	1,870	310	762	552,000
1909.....	8,110	385	1,530	1,110,000
1910.....	3,890	385	974	705,000
1911.....	5,830	385	1,550	1,130,000
1911-1912.....	2,230	330	.....	¹ 411,000

*Record discontinued. ¹October 1 to August 31.

Truckee River at Vista, Nevada*

1901.....	4,213	128	906	652,906
1902.....	4,336	146	.....	¹ 507,783
1903.....	5,650	130	786	569,037
1904.....	8,940	533	1,978	1,435,000
1905.....	1,860	130	697	503,100
1906.....	5,470	325	1,610	1,170,000
1907.....	6,560	775	.....	1,430,000

*Record discontinued. ¹Missing, November 30 to December 31.

Discharge of Truckee River at Clarks, Nevada*

1907.....	3,620	550	.....	¹ 506,000
1908.....	1,620	120	626	454,000
1909.....	7,650	330	1,550	1,120,000
1910.....	.....	.....	.....	² 494,000
1911.....	5,210	290	1,620	1,170,000
1911-1912.....	1,510	80	526	382,000
1912-1913.....	1,750	65	530	383,000
1913-1914.....	7,760	270	1,470	1,060,000
1914-1915.....	4,320	150	903	654,000
1915.....	.....	.....	.....	³ 87,000

*Record discontinued. ¹July 1 to December 31. ²January 1 to June 6. ³October 1 to December 31.

RUN-OFF MEASUREMENTS OF NEVADA STREAMS

Truckee River at Reno, Nevada*

	DISCHARGE IN SECOND FEET			Run-off in acre feet
	Maximum	Minimum	Mean	
1906.....	2,660	185	.....	1,271,000
1907.....	14,600	520	1,980	1,430,000
1908.....	1,660	125	562	407,000
1909.....	8,540	220	1,420	1,030,000
1910.....	3,360	215	864	626,000
1911.....	6,060	215	1,430	1,030,000
1911-1912.....	1,570	18	392	285,000
1912-1913.....	1,520	19	394	286,000
1913-1914.....	5,590	79	1,130	818,000
1914-1915.....	3,900	36	627	455,000
1915-1916.....	5,020	88	962	699,000
1916-1917.....	3,680	152	822	595,000
1917-1918.....	2,040	76	480	348,000
1918-1919.....	4,060	97	630	456,000

*Record discontinued. July 1 to December 31.

Truckee River near Wadsworth, Nevada*

1904.....	.....	.....	.....	1,010,000
1905.....	1,883	108	659	476,100

*Record discontinued.

Lake Winnemucca Inlet near Wadsworth, Nevada*

1904.....	.....	.....	.....	152,800
1905.....	216	26	113	82,040

*Record discontinued.

Discharge of Truckee River at Tahoe, California

1901.....	555	0	155	112,730
1902.....	445	25	204	148,298
1903.....	445	13	205	149,190
1904.....	931	13	629	457,400
1905.....	622	15	301	217,900
1906.....	838	229	589	428,000
1907.....	1,340	453	971	704,000
1908.....	775	19	369	267,000
1909.....	890	35	488	353,000
1910.....	898	108	441	319,000
1911.....	861	145	452	328,000
1911-1912.....	617	18	257	187,000
1912-1913.....	520	5	234	169,000
1913-1914.....	618	0	204	148,000
1914-1915.....	652	5	264	191,000
1915-1916.....	1,010	12	269	195,000
1916-1917.....	1,160	23	386	280,000
1917-1918.....	725	0	314	228,000
1918-1919.....	725	0	265	192,000
1919-1920.....	518	0	245	178,000
1920-1921.....	465	0	145	105,000
1921-1922.....	487	0	226	164,000
1922-1923.....	490	0	240	174,000
1923-1924.....	402	0	245	178,000
1924-1925.....	476	0	81.3	58,900
1925-1926.....	384	0	86.7	62,800
1926-1927.....	429	0	84.6	61,300
1927-1928.....	490	0	228	165,000
1928-1929.....	315	0	107	77,500

CHAPTER XXI—OFFICE FINANCES
SEGREGATED EXPENDITURES FROM APPROPRIATION FOR SUPPORT OF IRRIGATION DURING PERIOD JANUARY 1, 1929, TO DECEMBER 31, 1930, INCLUSIVE

Month 1929	Appropriation by Legislature	Salaries	Traveling	Supplies	Equipment	Miscellaneous	Totals	Reversion
1929	\$39,800.00							
January	\$881.38	\$27.70	\$68.77	\$749.22	\$145.93	\$1,873.00	
February	1,361.78	38.93	40.00	.....	38.50	1,479.21	
March	850.31	165.82	91.76	1,368.75	51.29	2,527.93	
April	881.02	440.43	78.82	9.50	114.51	1,524.28	
May	660.00	245.90	70.45	675.89	87.56	1,739.80	
June	577.67	333.89	39.90	11.07	99.74	1,062.27	
July	775.70	239.64	93.87	117.04	43.90	1,270.15	
August	800.44	271.58	50.76	82.75	108.32	1,313.85	
September	951.55	248.03	50.91	197.46	85.65	1,533.60	
October	900.30	435.09	106.52	4.25	121.96	1,568.12	
November	690.00	149.60	143.65	.....	54.97	1,038.22	
December	616.80	201.32	47.68	1.00	83.00	949.80	
Totals	\$9,946.95	\$2,797.93	\$883.09	\$3,216.93	\$1,035.33	\$17,880.23	
1930								
January	\$824.05	\$296.23	\$43.00	\$58.58	\$45.75	\$1,267.61	
February	771.00	75.97	2.90	.....	113.04	962.91	
March	859.95	55.58	170.84	85.10	398.40	1,569.87	
April	725.00	164.11	154.31	26.58	119.16	1,189.16	
May	732.75	299.68	88.95	34.00	129.91	1,285.29	
June	731.66	239.46	30.38	15.12	160.47	1,227.29	
July	990.00	513.13	78.16	.....	92.56	1,673.85	
August	1,125.00	195.78	64.71	.....	136.82	1,522.31	
September	1,050.00	194.65	118.41	85.35	72.83	1,521.24	
October	1,113.88	498.96	26.99	.....	114.62	1,754.45	
November	1,205.00	465.10	298.12	.....	100.92	2,069.14	
December	1,602.10	1,473.35	554.81	1,427.56	724.37	5,782.19	
Totals	\$11,730.39	\$4,522.00	\$1,631.78	\$1,732.29	\$2,208.85	\$21,825.31	
Grand totals	\$21,677.34	\$7,319.93	\$2,514.87	\$4,949.22	\$3,244.18	\$39,705.54	\$94.46

REPORT OF STATE ENGINEER

FEES RECEIVED AND DISPOSITION MADE OF SAME

Month 1929	Fees received	Deposited with State Treasurer	Paid for publications	Refunds on canceled applications	Recording certificates and transfers	Blue prints	Excess collections	Balance held for publications	Balance held for recording
Balance, 1928.....	\$11,829.16	\$356.50	\$587.50	\$112.50	.....	\$1.00	\$1.00	\$2,387.50	\$9,039.16
January, 1929.....	656.00	218.00	262.50	12.50	.....	.50	2.00	2,337.50	9,039.16
February.....	445.50	313.50	387.50	62.50	.....	1.50	.....	2,025.00	9,049.16
March.....	877.00	440.50	287.50	12.50	.....	5.00	9.00	2,437.50	9,059.16
April.....	1,290.00	706.00	175.00	37.50	.....	2.00	32.00	2,475.00	9,059.16
May.....	1,313.00	697.00	276.00	25.00	.....	12.00	4.00	2,775.00	9,059.16
June.....	687.50	316.50	412.50	62.50	.....	2.50	6.00	2,662.50	9,059.16
July.....	1,096.00	624.50	275.00	100.00	.....	16.00	8.00	2,725.00	9,069.16
August.....	798.80	495.30	312.50	312.50	.....	4.50	4.00	2,375.00	9,089.16
September.....	1,461.00	793.00	375.00	25.00	.....	4.50	101.00	2,537.50	9,089.16
October.....	1,604.50	626.25	512.50	.....	.....	5.75	5.00	2,912.50	9,169.16
November.....	677.80	458.80	312.50	37.50	.....	4.00	.....	2,737.50	9,209.16
December.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals.....	\$23,049.76	\$5,896.85	\$4,175.00	\$800.00	.....	\$59.25	\$172.00	\$2,737.50	\$9,209.16
1930									
Balance, 1929.....	\$11,946.66	\$528.50	\$437.50	.....	.....	\$7.00	\$19.00	\$2,662.50	\$9,209.16
January.....	917.00	455.50	187.50	.....	.....	1.00	21.00	2,537.50	9,229.16
February.....	585.00	319.65	312.50	\$25.00	\$21.00	0.15	30.00	2,225.00	9,218.16
March.....	409.80	939.00	375.00	12.50	.....	.....	55.00	2,400.00	9,218.16
April.....	939.00	621.50	375.00	12.50	.....	.....	.....	2,237.50	9,209.16
May.....	889.00	507.00	25.00	12.50	9.00	3.00	2.00	2,362.50	9,229.16
June.....	860.00	481.50	162.50	50.00	.....	9.00	12.00	2,350.00	9,225.16
July.....	526.00	283.50	225.00	25.00	4.00	5.00	.....	2,050.00	9,235.16
August.....	672.20	455.20	475.00	25.00	.....	3.00	4.00	2,025.00	9,235.16
September.....	525.50	291.50	237.50	12.50	.....	1.00	8.00	1,937.50	9,235.16
October.....	840.00	583.50	162.50	175.00	.....	6.50	.....	1,487.50	9,245.16
November.....	608.25	297.50	725.00	12.50	.....	.....	9.25	1,362.50	9,245.16
December.....	454.50	346.50	112.50	112.50	.....	4.00	4.00	1,362.50	9,245.16
Totals.....	\$19,972.91	\$5,171.35	\$3,437.50	\$512.50	\$34.00	\$45.65	\$164.25	\$1,362.50	\$9,245.16

SEGREGATED STATEMENT OF FEES COLLECTED BY STATE ENGINEER FROM JANUARY 1, 1929, TO DECEMBER 31, 1930, BOTH DATES INCLUSIVE

Month	Fees received	Proof of appropriation	Applications — Publications	Fees	Issuing and recording permits	Proof of completion of work	Proof of beneficial use	Protests	Clerical collections	Excess collections	Blue prints
1929											
January	\$656.00	\$10.00	\$287.50	\$177.50	\$90.00	\$8.00	\$8.00	\$30.00	\$31.00	\$1.00	\$2.00
February	445.50	.....	225.00	132.50	10.00	1.00	4.00	36.00	24.00	2.00	1.00
March	313.50	10.00	137.50	87.50	30.00	8.00	6.00	8.00	20.50	.....	3.00
April	877.00	10.00	412.50	232.50	85.00	2.00	10.00	16.00	56.00	.....	10.00
May	1,290.00	.....	550.00	330.00	280.00	8.00	5.00	7.00	65.00	32.00	4.00
June	1,313.00	.....	600.00	360.00	256.00	5.00	12.00	11.00	33.00	4.00	24.00
July	687.50	.....	362.50	217.50	55.00	8.00	1.00	2.00	25.50	6.00	5.00
August	1,096.00	10.00	437.50	362.50	273.00	4.00	2.00	18.00	43.00	8.00	32.00
September	798.80	20.00	275.00	175.00	240.00	9.00	1.00	6.00	54.80	4.00	9.00
October	1,461.00	.....	562.50	337.50	343.00	26.00	17.00	35.00	21.00	101.00	9.00
November	1,604.50	80.00	887.50	532.50	10.00	21.00	18.00	11.00	25.00	5.00	11.50
December	677.80	40.00	175.00	105.00	278.80	10.00	5.00	14.00	34.00	.....	8.00
Totals	\$11,220.60	\$180.00	\$4,912.50	\$2,970.00	\$1,950.80	\$60.00	\$89.00	\$194.00	\$432.80	\$172.00	\$118.50
1930											
January	\$917.00	.....	\$362.50	\$217.50	\$230.00	\$12.00	\$7.00	\$30.00	\$17.00	\$19.00	\$14.00
February	585.00	\$20.00	87.50	57.50	372.00	2.00	3.00	3.00	15.00	21.00	2.00
March	409.80	10.00	50.00	35.00	195.00	12.00	5.00	21.00	33.50	30.00	.30
April	939.00	.....	262.50	157.50	436.00	5.00	.....	4.00	13.00	55.00	.....
May	689.00	.....	175.00	105.00	340.00	7.00	6.00	2.00	28.00	2.00	10.00
June	860.00	20.00	337.50	207.50	190.00	8.00	2.00	8.00	54.00	12.00	18.00
July	526.00	.....	237.50	142.50	50.00	9.00	4.00	8.00	64.00	.....	10.00
August	672.20	10.00	200.00	125.00	263.20	8.00	3.00	19.00	26.00	4.00	6.00
September	525.50	.....	225.00	135.00	111.50	1.00	4.00	10.00	26.00	8.00	2.00
October	840.00	.....	250.00	155.00	313.00	23.00	20.00	17.00	26.00	.....	13.00
November	608.25	10.00	287.50	172.50	20.00	20.00	12.00	37.00	14.00	9.25	8.00
December	454.50	.....	100.00	65.00	192.80	25.00	6.00	15.00	18.00	4.00	8.00
Totals	\$8,026.25	\$70.00	\$2,575.00	\$1,575.00	\$2,713.20	\$129.00	\$72.00	\$174.00	\$334.50	\$164.25	\$91.30
Grand totals	\$19,246.85	\$250.00	\$7,487.50	\$4,545.00	\$4,664.00	\$189.00	\$161.00	\$368.00	\$767.30	\$336.25	\$209.80

GENERAL STATEMENT FOR 1929-1930

Held for 1928:			
For recording certificates.....	\$9,029.16		
For publications.....	2,800.00		
Total held for 1928.....	\$11,829.16		
Fees collected, 1929.....	\$11,220.60		
Fees collected, 1930.....	8,026.25		
Credits held for canceled checks.....	283.80		
Total collected and held for 1929-1930.....	19,530.65		
		Deposited with State Treasurer, 1929.....	\$5,896.85
		Paid for publications, 1929.....	4,175.00
		Paid for refunds, cancellations and publications, 1929.....	800.00
		Paid for blue prints, 1929.....	59.25
		Paid for excess collections, 1929.....	172.00
		Paid for recording certificates, 1929.....	0.00
		Deposited with State Treasurer, 1930.....	5,171.35
		Paid for publications, 1930.....	3,437.50
		Paid for refunds, cancellations and publications, 1930.....	512.50
		Paid for recording certificates, 1930.....	34.00
		Paid for blue prints, 1930.....	45.65
		Paid for excess collections, 1930.....	164.25
		Held for publications.....	\$1,362.50
		Held for recording.....	9,245.16
		Held for unclaimed checks.....	283.80
Total.....		Total held.....	10,891.46
Total.....	\$31,359.81	Total.....	\$31,359.81

SEGREGATED EXPENDITURES FROM APPROPRIATION FOR SUPPORT OF COOPERATIVE WATER RESOURCES U. S. G. S.

Month 1929	Appropriated by Legislature \$2,500.00	SALARIES				Traveling Expense	General Expense	Totals	Balance
		Stream Measurements	Gage Observers	Stream Observers	General Expense				
January.....	\$0.50	.....	\$0.50	.....
March.....	\$83.50	.....	.....	.....	83.50	.....
May.....	\$3.50	3.50	.....
July.....	9.10	9.10	.....
August.....	88.00	.....	.....	.....	88.00	.....
November.....	\$309.81	.....	.....	.....	309.81	.....
December.....	83.50	.....	.....	83.50	.....
Totals.....	\$309.81	\$255.00	\$0.50	\$0.50	\$12.60	\$577.91	\$1,922.09	
February.....	
March.....	\$191.74	.....	\$0.50	.....	191.74	.....
May.....	358.31	.....	.....	.....	358.31	.....
July.....	581.04	.....	.....	.....	665.54	.....
October.....	242.65	.....	.....	.....	326.65	.....
November.....	214.85	.....	.....	.....	297.85	.....
Totals.....	\$1,588.09	\$331.00	\$3.00	\$3.00	.....	\$1,922.09	.....
Grand totals.....	\$2,500.00	\$1,897.90	\$556.00	\$3.50	\$3.50	\$12.60	\$2,500.00	\$0.00	

SEGREGATED EXPENDITURES FROM APPROPRIATION FOR SUPPORT OF COOPERATIVE SNOW SURVEY

Month 1929	Appropriated by Legislature \$1,500.00	Salaries	Traveling expenses	General expenses	Totals	Balance
May 1 to June 1.....	295.00	.....	123.84	418.84	.....
June 1 to August 1.....	7.50	7.73	15.00	30.23	.....
August 1 to October 12.....	37.25	50.10	14.97	102.32	.....
October 12 to December 3.....	.....	42.55	57.35	99.90	.....
October 12 to December 3.....	96.00	66.80	214.78	377.58	.....
Totals.....	\$1,500.00	\$636.75	\$274.08	\$587.90	\$1,498.73	\$1.27

SEGREGATED EXPENDITURES FROM APPROPRIATION FOR SUPPORT OF COLORADO RIVER COMMISSION

Month 1929	Appropriated by Legislature	Salaries— Commis- sioners, Engineers	TRAVELING EXPENSES			MISCELLANEOUS			Stenographer, taxi	Equipment, Office rent, maps	Totals
			Auto	Train	Subsistence	Phones	Wires	Office supplies			
1929	\$10,000.00										
January						\$2.89	\$17.38				\$20.27
February		\$270.00	\$3.00	\$146.18	\$189.00	5.95	56.30				62.25
March		180.00		93.62	135.50	51.35	90.51	\$59.90			789.94
April						3.50	4.16	66.30	\$10.00		519.83
May							12.06				12.06
June						1.80	58.54				60.44
July						21.20	25.46	52.98			99.64
August						9.00	18.93				27.93
September		500.00	3.85	108.40	36.75	6.71	16.82	50.00	42.60		774.23
October						23.40	66.05	30.00			119.45
November							7.47	92.75			540.00
December						2.15	29.20	82.86			719.17
Totals	\$10,000.00	\$1,532.26	\$6.85	\$810.68	\$361.25	\$127.95	\$403.08	\$335.34	\$115.20	\$52.60	\$3,745.21
1930											
January						\$55.40	\$222.39	\$43.60			\$356.14
February								28.50			28.50
March		\$310.00		979.77	\$1,518.55	72.63	1,075.53	2.50	\$1,381.48	\$246.78	5,587.24
April							5.28				5.28
May							277.63				277.63
Totals	\$10,000.00	\$310.00		\$1,292.15	\$1,518.55	\$428.03	\$1,303.20	\$74.60	\$1,381.48	\$246.78	\$6,254.79
Grand totals	\$10,000.00	\$1,842.26	\$6.85	\$2,102.83	\$1,879.80	\$255.98	\$1,706.28	\$409.94	\$1,496.68	\$299.38	\$10,000.00

SEGREGATED EXPENDITURES FROM APPROPRIATION FOR SUPPORT OF RANGE COMMISSION DURING THE PERIOD
 JANUARY 1, 1929, TO DECEMBER 31, 1930, INCLUSIVE

Month	Appropriation	Auto Claimant	Subsistence	Maps	Stenographer and reporting	Miscellaneous	Telegrams	Totals	Balance
1929									
January	\$1,750.00							\$40.00	
June									
November									
Totals	\$1,750.00				\$40.00			\$40.00	\$1,710.00
1930									
January	\$1,750.00	\$3.50	\$30.25					\$33.75	
June								9.28	
July				\$286.00				286.00	
September		3.50	665.50		\$446.50	\$55.00	118.00	1,418.50	
December									
Totals	\$1,750.00	\$7.00	\$695.75	\$286.00	\$446.50	\$55.00	\$127.28	\$1,617.53	\$132.47
Grand totals	\$3,500.00	\$7.00	\$695.75	\$286.00	\$486.50	\$55.00	\$127.28	\$1,657.53	\$1,842.47

**SEGREGATED EXPENDITURES FROM APPROPRIATION FOR
SUPPORT OF CARSON RIVER ADJUDICATION**

	Appropriated by Legislature	Publication of hearings	Reporting in District Court	Balance
1929.....	\$7,000.00			
April.....	<u> </u>	\$30.00	\$33.25	\$6,936.75
Totals.....	\$7,000.00	\$30.00	\$33.25	\$6,936.75

CHAPTER XXII**Recommendations****WATER COMMISSIONERS' SALARIES AND EXPENSES**

The State Engineer is charged with the administration and distribution of water on adjudicated streams within the State. If efficient distribution is to be accomplished skilled engineers must be employed and paid with reasonable promptness. The water law directs that the State Engineer prepare a budget for submission to the various Boards of County Commissioners setting forth the unit assessment on each acre of cultivated land embraced under distribution activities in each county. The assessed amounts are collected as are other taxes, with the result that the money represented is not available in the various county treasuries until long after the services rendered by the water commissioners are completed.

It is therefore recommended that a State Revolving Fund of \$20,000 be established to pay State water commissioners who are supervising the distribution of water. This fund would be under the direct supervision of the Board of Examiners and all bills from water commissioners would go through the Board of Examiners and the counties would reimburse the revolving fund.

As matters now stand taxes are levied, for instance, in March for the coming year's expenses. The first half of the money comes in in November and the second half the following July. In other words, all of the anticipated money is expended anywhere from six to twelve months before it is received, and this necessitates borrowing from banks and the commissioners must pay interest; and it makes it very difficult to get efficiency from them when they are not being paid regularly.

This fund, when once appropriated, would be a continuing thing. No new money would ever need to be added, and it appears to be the only practical solution, since taxes cannot be collected ahead of the current year.

WATER APPLICATIONS

In our last biennial report it was stated there were about 1,500 old applications pending in this office for action and with the present force it would be impossible to clean them up. Considerable progress has been made this year in cleaning up old applications, but new ones were coming in all the time, taking their place, and while 584 applications were acted upon during the past biennium, some of them of long standing and very difficult, at the same time 592 new applications were received during the same period; therefore, it will be seen that for the first time in the history of the office action on applications has kept pace with those received, and it will be impossible to clean up the old applications without an extra appropriation for that purpose.

It is therefore recommended that the sum of \$20,000, in addition to the amount required to carry on regular routine activities, be allowed for the purpose of clearing up the accumulated mass of applications upon which it has been impossible, during the past biennium, to make field investigations required by law. This matter is of paramount importance to the livestock industry of the State, and should

receive careful and considerate attention. The value of the Stock Watering Act to stockmen is dependent upon its efficient and speedy administration, which cannot be accomplished without adequate funds for that purpose.

LITTLE HUMBOLDT RIVER, PEAVINE CREEK, SILVER CREEK, K-C CREEK, BAKER CREEK, LEHMAN CREEK, PIUTE CREEK, BATTLE CREEK AND BARTLETT CREEK ADJUDICATIONS

It is anticipated that the Final Order of Determination of the State Engineer in these matters will be filed with the proper District Courts during the next biennium and hearings on the same set by the courts. The hearings will have to be reported at a cost of \$10 per day, and a complete transcript of testimony prepared.

It is conservatively estimated that \$4,000 will be required for this purpose. If the adjudications are to proceed to successful completion it will be necessary that this amount be appropriated, the State to be reimbursed when the court enters its final decree and assesses the costs among the parties represented in the action.

SNOW SURVEYS

The 1929 Legislature appropriated the sum of \$1,500 for cooperative snow work, which proved to be inadequate for the comprehensive investigations that many of our districts demanded. As a result of the many demands snow surveys were only carried on where the interested districts signified their desire to cooperate on a dollar for dollar basis.

It is therefore recommended that the sum of \$2,500 be appropriated for carrying on and enlarging upon the work already initiated and that an additional sum of \$2,000 be appropriated for the biennium for cooperative snow survey work on the Humboldt River, provided that the water users on the Humboldt River provide an equivalent sum for these surveys.

COOPERATIVE STREAM MEASUREMENT

The work is carried on by the United States Geological Survey cooperating financially with the State on a dollar for dollar basis.

There is no need to dwell upon the value of a knowledge of our natural water resources as afforded by extensive stream flow and hydrographic records. Without such records ultimate maximum development of water resources becomes impossible and determination of water rights and distribution of water on our stream systems very difficult. When it is considered that the Federal Government cooperates in this valuable work on a dollar for dollar basis, it is poor economy to curtail appropriations for this purpose.

It is respectfully recommended that at least \$5,000 be appropriated for this purpose.

FIREPROOF VAULT SPACE FOR RECORDS OF STATE ENGINEER

Former biennial reports have repeatedly called attention to the advisability of providing fireproof housing for records which at this time are valued at in excess of \$1,000,000, if they can be valued at all. As a matter of fact, these records can scarcely be given a monetary

value since, if destroyed, many of them could never be replaced. There has never been, nor is there now, protection of any kind against loss by fire.

It is therefore once more urgently recommended that \$5,000 be appropriated for the purchase of adequate fireproof files for properly housing the records of the State Engineer's office.

BOND COMMISSION

Our Bond Commission is a very important body and we believe it is a step in the right direction. However, when a bond issue has been passed upon and issued there is no method of checking on the expenditures from there on, although at the time of the examination the security may be sufficient if the plans for the construction remain the same and the expenditures are properly made. Therefore, it is recommended that the law be supplemented by a provision that our Bond Commission may require a periodical report, as often as may be required, to check expenditures during construction, and any change in the original plans that are submitted at the time the bond issue is contemplated must be submitted to the Bond Commission for its approval.

COLORADO RIVER COMMISSION

The work that must be carried on by this Commission has a direct bearing on the future welfare of this State and it is recommended that a special fund of not less than \$10,000 be appropriated to cover any expense due to the Arizona litigation now in the Supreme Court and also to follow through in the work of securing electro-chemical and other industries to locate in Nevada to use our share of the power when it is ready for delivery. The Commission is justified in expending a reasonable amount of money in contacting these companies so that they may not all locate in California.

RANGE COMMISSION

An appropriation of \$3,500 was made for the past biennium for the work of the Range Commission. Of this amount \$1,790 has been expended, the balance of the appropriation having reverted. It is believed that a sufficient record has been established to render an intelligent report to the Legislature.

The law creating the Range Commission is a continuing thing and study should be given it during the coming biennium, the same as in the past, and a small appropriation should be made for expenses. The sum of \$2,000 or \$3,000 would no doubt be sufficient.

Respectfully submitted,

GEO. W. MALONE,
State Engineer.

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