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HISTORY OF THE ORGANIZATION,

OF THE

Stanislaus and San Joaquin
Water Company

SAN JOAQUIN COUNTY, STATE OF CALIFORNIA

CONTAINING REPORTS AND OTHER DATA RELATIVE
THERETO

PREPARED BY
HENRY I. WILLEY
Consulting Engineer to the Company

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TABLE OF CONTENTS.

	PAGE.
History of Organization of Corporation	3
Report of Professor George Davidson on Physical, Geographical and Engineering Characteristics	8
Report of Barrow, Wade, Guthrie & Co., of London, Manchester, New York, Chicago, and San Francisco, (J. Jenkin, Expert), Embracing Accounts and Financial Status . .	48
Report of Gunnison, Booth & Bartnett Concerning all Legal Questions, and Opinion of Woods & Levinsky upon the Title	55
Report of Thomas Poyzer, Embracing Appraisement and Valuation of Lands Supplied with Water	64
Copy of Deed of Trust of all Property of Corporation to California Safe Deposit and Trust Company	66
Copy of Water Contract	108
Copy of Article on Irrigation Securities, Relating Particularly to the Status of this Corporation, and Indicating the Esteem in which it is held in Stockton and Vicinity (from Stockton <i>Mail</i> , of January 4, 1896)	112

HISTORY.



BEFORE submitting in full the within following Reports, I deem a brief statement relative to the irrigation of the area under consideration and history of the corporations organized for such purpose, prior to the Stanislaus and San Joaquin Water Company, to be in order.

Prior to the advent of American Argonauts in California, the Papal pioneers from Spain had introduced irrigation successfully at many of the Missions, but little or no attention was elicited by these developments at that time.

The pioneers of 1849 viewed the State as a rich mineral producing field where, by arduous labor and the endurance of great privation for a period, they would be rewarded with a competency or riches which would enable them to return from whence they came, there to enjoy the fruits of such labor and hardship. Gradually it was discovered that the rich, abundant natural grasses rendered this a great pastoral section, and many deserted the mines to accumulate vast areas of choice grazing lands. Later it was demonstrated that cereal crops could be largely produced at great profit, when it dawned upon those who had "come to make their pile and then return home" that happy homes could be had here ; then occurred a scramble for arable lands everywhere. For from twenty to forty years thereafter hundreds of thousands of acres were planted each year to cereals, until the rich surface soil was bereft of the properties that created the bountiful crops of wheat,

oats and barley, and it became absolutely necessary that other crops should be cultivated in order to obtain fair fruits for labor done.

It became obvious that horticulture must generally succeed agriculture to draw upon lower, richer strata of soil, and obtain thereby larger returns for labor.

It was evident that horticultural pursuits even would not prove profitable if the average rainfall were depended upon. Artificial augmentation of water supply was found imperatively necessary. Natural water supply would guarantee luxurious growth of foliage and an occasional partial fruit crop, but irrigation would guarantee continuous crops of first quality and great quantity.

The foregoing facts apply with equal force to nearly all of the arable lands of the Sacramento and San Joaquin Valleys and Southern California where irrigation is very generally practiced now. Until comparatively recently no irrigation works have been completed in the central portion of the State, but for many years, and in many sections, efforts were made to secure such beneficent developments—memorable among them the attempts to divert the water of the Stanislaus River from the natural course and convey it onto and over the rich acres lying adjacent thereto.

On January 24, 1855, a corporation, called the San Joaquin County Water Company, was organized for the purpose of diverting the Stanislaus River and conveying the water a distance of about seven miles for hydraulic mining purposes. Subsequently Judge Schell, owner of a beautiful fertile valley near Knights Ferry, planted a large orchard and vineyard, because he knew the water for irrigation thereof would insure profitable results. This water-way then became known as the "Schell Ditch."

In 1874, a corporation, known as the "Farmington Water Company," was organized, with Col. Buckley, a well-known United States Engineer, as promoter, to develop an irrigation enterprise somewhat similar to that of the "*Stanislaus and San Joaquin Water Company*," but fairly profitable crops of cereals were obtainable, about three out of five years, without irrigation then, and, owing to apathy on the part of the land owners, Col. Buckley was compelled to abandon the project.

In 1888, the farmers, discovering that cereal production was no longer profitable, organized the San Joaquin Land and Water Company and made an earnest effort to develop this beneficent project; but, although there were no engineering obstacles of any serious magnitude to overcome, the progress made was slow and unsatisfactory because of the unwieldy form of management. In 1892, Eastern capitalists, viewing the great possibilities of such an enterprise, agreed to furnish the requisite capital upon certain preliminaries easy of fulfillment being complied with. Before these things could be accomplished the financial crisis of 1893 occurred, and no capital could be obtained abroad or at home for this or any kindred purpose.

An organization called the Farmington Co-operative Water Company, and an ephemeral preliminary organization of the present Company, having no stability, were started with the avowed purpose of constructing an irrigation system upon the lines herein designated, but it was obvious to all really interested in the future of the country to be benefited that these were purely speculative projects, having no pecuniary backing whatever.

In this emergency, and with these most discouraging conditions, two farmers, Messrs. H. W. Cowell and N. S.

Harrold, men who were wealthy in money and in vast unincumbered acres, but who had no more to gain proportionally than any of their neighbors, determined to effect a stable organization and complete the irrigation system, not only in the hope of improving their own holdings, but of becoming public benefactors. In 1894, there was properly organized the *Stanislaus and San Joaquin Water Company*, and, with the utmost vigor, skill, and economy, this great project was pushed through toward completion.

The time was in some respects propitious; lumber and labor — two chief items of expense — were extremely low; and, contractors long idle, were so anxious to obtain work, that they made astonishingly low bids; and no one viewing the works can fail to note the enormous amount of work resulting from the comparatively small expenditure of money. Ten dollars per acre is a reasonable or average cost per acre for irrigation works; these will not have cost quite half that sum when completed, as designed.

The Stanislaus and San Joaquin Water Company were fortunate in obtaining the services, as Resident Engineer, of W. L. Rockwell, Civil and Irrigation Engineer, who had just left the "Prosser Falls" Irrigation Works, in the State of Washington, and who had had considerable previous experience in such work.

To Mr. Rockwell's ability, integrity, energy, and economy is due in a very great measure the many commendable characteristics of these works, now so highly praised by the expert examiners. Furthermore, no report relating to this project would be complete without conspicuous mention of the work of Mr. S. D. Woods, attorney to the corporation. Realizing its beneficence, Mr. Woods has not only seen that every legal matter was without a flaw, and vigor-

ously guarded all the rights of the corporation, but has freely added his wise counsel and great executive ability in all the important deliberations which were constantly necessary during the period of rapid construction.

The works of the Company, as at present constructed, are described in detail in Professor Davidson's report, and consist in general of about 90 miles of canal, 4000 feet of tunnel, 3 miles of flumes (96 miles in all), two dams (upper and lower), and all necessary gates, weirs, drops, bridges, etc., and are easily accessible to 200,000 acres of irrigable land.

This, in brief, is the history of the gradual development of this great irrigation system.

A careful perusal of the following reports, etc., will give a complete and comprehensive understanding of the merits of this enterprise to any one desiring to read them.

Respectfully submitted,

HENRY I. WILLEY,

Consulting Engineer to the Company.

REPORT
ON THE
ENGINEERING AND TOPOGRAPHICAL FEATURES OF
THE STANISLAUS AND SAN JOAQUIN
WATER COMPANY'S
SYSTEM.

BY GEORGE DAVIDSON, CONSULTING ENGINEER.



GEORGE DAVIDSON,
CONSULTING ENGINEER,
530 CALIFORNIA STREET.

SAN FRANCISCO, CAL., December 31, 1895.

MR. J. DALZELL BROWN,
Secretary and Treasurer of the
California Trust and Safe Deposit Co.,
San Francisco, Cal.:

SIR :—

I have just returned from a personal examination of the Irrigation System of the "Stanislaus and San Joaquin Water Company," and herewith submit the results of my observations.

The examination was made in my professional capacity as Consulting Engineer and Expert, and this report, there-

fore, covers the topographical features of the country to be irrigated, and the engineering details of the system, so far as they have been executed.

I have appended a map of the locality and some photographs of the system, for the purpose of enabling you the more readily to follow the statements.

I deem it proper and necessary to make the preliminary statement that this system is operated by a *private corporation formed and existing under the laws of this State* relating to corporations in general, and that this corporation was not formed under the powers of the "Wright Act," recently held to be unconstitutional by Judge Ross of the United States Circuit Court.

I will group what I have to say under the following heads and order :

Locality of the irrigable area, and the general topographical features ; general character of the soil and drainage. Pages 10-12.

Necessity for irrigation in this locality; the climatic conditions ; dry and wet seasons ; amount and irregularity of the rainfall ; season for irrigation ; fruits, cereals and nuts. Pages 13-17.

Environment of the area ; geographical advantages of the position for traffic; Stockton and its harbor; water transportation ; railroad transportation ; neighboring towns ; mines of the "Mother Lode" of California, and roads thereto. Pages 17-19.

Conclusions as to locality and surroundings. Page 19.

Ditch system in general. Pages 20, 21.

Irrigable acreage. Page 21.

Water supply. The Stanislaus River. Page 22.

Ditch system in detail: Main Ditch above Knights Ferry; Main Ditch below Knights Ferry; Laterals. Pages 23-34.

Character and cost of construction. Pages 34-36.

Present capacity of the system in detail. Pages 36-39.

Duty of water. Pages 39-42.

Possible enlarged capacity and acreage. Pages 41-42.

Sediment. Page 42.

Recommendations. Pages 43-46.

General conclusion. Page 46.

The Area.—The area which this Company proposed to themselves to irrigate, when they began work in March, 1895, comprises the larger part of the lands lying in the southeast part of San Joaquin County and the northern triangular part of Stanislaus County.

This area is bounded on the west by the marsh land lying along the east side of the San Joaquin River, on the south by the Stanislaus River to its junction with the San Joaquin, on the east by the lower foothills of the Sierra Nevada, and on the north by Little John Creek and Mormon Slough.

This area embraces a little over 200,000 acres of arable land. Its general slope is to the westward, and its inclination is favorable for irrigation. From a point on the Stockton and Oakdale R. R., 150 feet above tide water, to Stockton, a distance of 22 miles in a straight line, the slope changes gradually from 10 to 5 feet per mile at Stockton, 20 feet above the sea. This amount of slope gives ample drainage to the San Joaquin River. (See the contours in black on the accompanying map, which has been



LAND TO BE IRRIGATED.

prepared from the maps of this section compiled in the State Engineering Department, by Mr. C. E. Grunsky, C. E., Assistant.)

In this broad area of level plains there are, towards the foothills, some low mesa lands that cannot be reached by the present system.

Soil.—All the lands of this area are arable, and there are few or no outcroppings of rock. The soil varies from adobe (a rich, black, stiff, clay soil), in the northern part of the area, to a sandy loam in the southern half, and is generally underlaid by a hard pan, which in some areas comes to within 2 feet of the surface. Only in one small area did I see a slightly alkali adobe soil. With regard to the matter of alkali, it is a well known fact that many lands have been ruined in irrigated districts by over-irrigation, the raising of the sub-surface water plane and the bringing thereby of the alkali salts in solution to the surface, which there evaporates. With reference to this locality, however, I think that the natural drainage and the economic use of water will minimize, if not prevent, any injury to the land that might arise from this source.

The State Engineer's Report, Part IV, p. 47, thus generally describes this region: "The high plains on either side of the Stanislaus * * * are largely composed of a loose sandy soil, whose texture and physical conformation present conditions peculiarly favorable to the successful use of water for a crop."

The report of the land-grader, Mr. Thomas Poyzer, describes in detail the character of the soil and its adaptability for use of those lands for which water contracts have been already secured by the Company. I have marked

these lands on the map by the shaded areas, and as it will be noticed that they are distributed over the entire irrigable area, an inspection of Mr. Poyzer's report will give you a fair idea of the character of the soil throughout the irrigable area.

The irrigable lands under the Main Ditch and the Farmington lateral, before these two ditches reach the plains, comprise about 7000 acres, and vary in character of soil as the lands of the plains.

Drainage.—There are many marked natural lines of drainage across the plains towards the San Joaquin, notably those followed by the Little John and Lone Tree Creeks. There are other lighter lines of drainage hardly visible from the roads, but, from a higher view, they are seen meandering through the plains towards the west. An inspection of Sheet No. 4, of the Topographical and Irrigation Map of the State, will show you these lines. There are no signs of erosion in these lines; and there is little erosion in the two creeks mentioned.

These non-erosion features confirm the fact that the rainfall throughout this region is of moderate quantity. This condition, and those of the low and nearly uniform grades, and of the character of the soil, allow it to absorb nearly all the water of precipitation.

Some of these lines of drainage have been largely taken advantage of by the engineer in the location of the ditches, and have saved much constructive work. It may be necessary, however, after the large area has been saturated, to abandon the employment of these lines as ditches and to use them as drainage-ways.

Necessity for irrigation in this locality; the climatic conditions ; dry and wet seasons ; amount and irregularity of the rainfall ; season for irrigation ; production under irrigation ; fruits, cereals and nuts.

The whole subject matter of irrigation is practically unknown to 68,000,000 people out of the present population of 70,000,000 in the United States. It is unknown throughout the great valley of the Mississippi; in the interior Northern States it has demanded, in some measure, the attention of the new populations. But the people of the southwestern and western parts of the United States are particularly alive to the necessity of irrigation, because the rainfall is so light in much of these regions that it is insufficient to insure a cereal crop every year.

In the State of California this same condition of insufficient rainfall largely exists from the southern boundary to about the latitude of Marysville, Cal.

Moreover, with us the seasons are wholly distinct from those of the Eastern States. Here, as you know, we have the "dry season" from the beginning of April to the middle of October with little or no rain, during which there are no clouds and no storms, and only occasionally do the sea fogs reach into the interior valleys. The "wet season," beginning about the middle of October, lasts until the end of May, with moderate rainfall usually unaccompanied by lightning and thunder.

The area to be irrigated by this Company is located about midway of the length of the Great Valley of California and on its eastern side. At the north end of the valley, about Redding, the rains are ample for all crops; at the south end, about Bakersfield, distant some 200 miles, the rainfall is only about three inches, and crops cannot be

obtained without irrigation. From statistics that I have gathered, I find that the rainfall over the country between Stockton and the foothills averages between 14 and 15 inches per annum. This average would be amply sufficient for a crop, were it regular in time and quantity; the amount, however, is by no means regular in time of distribution during any one season, and is very different in different seasons.

I here present some statistics on the rainfall. The western part of this area to be irrigated has somewhat less rainfall than the eastern part.

The mean annual rainfall at Stockton on its western edge is 13.8 inches for 28 years from three authorities, with the following details for 24 years from the Asylum.

MEAN MONTHLY RAINFALL.

September, 0.05 inches.	February, 2.58 inches.
October, 0.51 inches.	March, 2.17 inches.
November, 1.21 inches.	April, 1.57 inches.
December, 2.66 inches.	May, 0.66 inches.
January, 2.82 inches.	June, 0.17 inches.

From 1853-54 the following extremes occurred (no record 1857-66).

GREATEST RAINFALL.		SMALLEST RAINFALL.	
1853-54	22.04 inches.	1869-70	9.23 inches.
1867-68	21.74 inches.	1870-71	6.86 inches.
1871-72	20.80 inches.	1876-77	6.92 inches.
1883-84	20.39 inches.	1881-82	10.72 inches.

Such seasons as 1869-70, 1870-71, and 1876-77 mean a failure of all crops on unirrigated lands.

At Farmington, on the line of the lateral ditch, and just at the edge of the plains on the eastern side, the mean annual rainfall for the seven years ending 1883-84, was 15.0

inches, with a range from 23.34 inches in 1883-84, to 8.38 inches in 1876-77 (6.92 inches at Stockton).

At Knights Ferry, to the south and 12 miles from the plains, I have obtained from Mr. F. M. Barnett his record for the rainfall from December 26th, 1887, to May 15th, 1892, showing a mean annual rainfall of 14.7 inches, with a range from 27.0 inches in 1889-90, to 9.0 inches in 1887-88; also the record of Mr. E. A. Clifford from 1891-92 to 1893-94, 4 years, with an average of 19.35 inches, and a range from 11.5 in 1891-92, to 23.0 in 1894-95, the mean rainfall for 9 years being 16.75 inches. The record of Mr. W. F. Cooper, at Rock Farm, on the Stanislaus, gives an average of 15.04 inches, from and including 1885-86 to 1893-94.

An inspection of the table shows me that in some years the first rains do not occur until nearly Christmas, notably that of 1887-88, when there was a rainfall of only 9.0 inches, to the end of the season, June 3rd, at Knights Ferry; and that of 1889, when there was a rainfall of 27.0 inches at the same place, to May 11th.

The grain crop in this locality is assumed to require about 100 days to mature. Plowing commences after the first rains have made the grounds moist. About the 8th of December I noticed nearly half the lands had been under the plow, and gang-plows were seen in every direction. One of the most hazardous periods of the season is after the grain has come up, and at that time, if no rain falls, there is one of two things to be done. Either re-plow with the later rains, put in another seeding, and trust to sufficient following rainfall for a crop, or utilize the waters of irrigation. The U. S. Commissioners of Irrigation note a remarkable case in their report of 1873, at page 24, where a

wheat crop of 3000 acres was saved by bringing in irrigation waters. The same field had failed for two previous years. It should be borne in mind that, in the seasons of low precipitation, the weather is, as a rule, exceptionally favorable to growing crops.

The conditions of rainfall over this area are thus very unsatisfactory to the agriculturist and the horticulturist, and seriously retard the growth and prosperity of the district.

To supplement the deficiencies and irregularities in the rainfall, and to assure the certainty of annual crops in this locality, the Irrigation Company proposes to utilize the water of the Stanislaus River, by supplying it from a period from about the first of March to about the first of September.

With these waters of irrigation, not only will the root crops and those of cereals become assured, but fruit-trees, nut-trees, and trees planted solely for valuable woods, will soon follow every road-side, every ditch-side, and be cultivated in small areas on every farm. Similar results are seen in Italy, India, Spain, and other countries. Moreover, on the lands under the ditches a second crop can be obtained by artificial fertilization, as shown in the statistics of the State Board of Agriculture, in a case where even irrigation was not used.

The climatic conditions of this area, other than those of the rainfall, are very satisfactory. The climate is very favorable for the growth of cereals, fruits, and nut-bearing trees; the orange grows well as far in as Knights Ferry. The native tree is the white oak. It is frequent towards the San Joaquin River, is sparsely distributed in the southeastern part, and abounds in the foothills. In winter, there is very rarely any snow, and the temperature tables show

few days below 32° Fahr. The average temperature for fifteen years was 60.3°. The prevailing winds of spring, summer, and fall are from the west-northwest, and are tempered by the cool airs from the Golden Gate through Carquinez Straits. In winter, when the rain-storms come on, the wind is from the southeast and southwest, with a mild temperature. The occasional north wind is strong, dry, cold, and parching.

Environment of the area; geographical advantages of the position for traffic; Stockton and its harbor; water transportation; railroad transportation; neighboring towns; mines of the "Mother Lode" of California, and roads thereto.

I have pointed out the relation of the area to be irrigated to the San Joaquin and Stanislaus Rivers, and its relation to Stockton, and have mentioned its general features.

The area lies between tide-water on the west and the foothills on the east. About 20 miles to the east of these foothills stretches the "Mother Lode" of California, parallel to the line of the foothills. Along the course of the lode are many gold mines now in operation, that draw on the plains for a large part of their supplies; and these lands in the vicinity of Stockton supply their share. With the renewed activity in mining, the demand from this region will increase. Thus this area has two demands for its products: one from the direction of tide-water, and the other from the mines. It is very favorably situated to satisfy both, as will be seen by a consideration of the transportation facilities of the locality.

This irrigable area is cross-barred by railroads. Three lines run down the valley, parallel with each other, about

6 or 7 miles apart, in a northwesterly and southwesterly direction, centering in Stockton. The middle one, the San Francisco and San Joaquin Railroad, is building for competition with the other two, extending down the valley to Bakersfield. Another, a branch of the Southern Pacific Railroad, traversing the valley, runs through Stockton, north 40 miles to Sacramento and beyond, and another branch runs west 90 miles to San Francisco. On the north side of the area, the Stockton and Oakdale branch runs 13 miles east to Peters, thence to Oakdale and beyond, with a small branch of 12 miles to Milton, in the foothills.

Numerous wagon roads, also, traverse the county in all directions. The old Mariposa Stage road runs from Stockton through Knights Ferry and thence to the mines on the "Mother Lode" in Stanislaus and Tuolumne counties. It is still largely used and crosses the irrigable area diagonally. Beyond Knights Ferry this is the main traveled road to Jamestown and Sonora, near which is the well-known "Rawhide" mine. So that as regards transportation facilities, this area compares favorably and advantageously with any other region in the Great Valley.

In the northwestern part of the irrigable area is situated the City of Stockton, the County Seat of San Joaquin County. It is distant 60 miles nearly in a direct line from San Francisco and 95 miles by tide-water. It has 20,000 inhabitants, is situated on tide-water, with channels along its ample water front. The water-ways to it have been improved by the U. S. Engineers and are intended to carry 9 feet of water at low water down to Suisun Bay. Large stern-wheel passenger steamboats, freighters and barges ply throughout the year between Stockton and Antioch, Martinez, and San Francisco in competition with the railroad.

It is also well supplied with city electric railway service. Natural gas is supplied from 20 wells that furnish from 2500 to 10,000 feet each daily. The public buildings are fine specimens of architecture, and the Hazleton Free Public Library is a beautiful structure. The large channel and wharfage facilities which the city gave to the San Francisco and San Joaquin Railroad Company have an appraised value of \$300,000.

It is busy with thriving industries: flour mills, factories for agricultural implements, foundries and iron works, planing mills, carriage factory, woolen mills, paper mills, tannery, potteries, wineries, etc. As a manufacturing city its aggregate output is very large, amounting to \$13,000,000 per annum. The assessed value of property in the city is \$15,000,000, and in the county \$35,000,000.

There are half a dozen small towns in the irrigable area, usually on the lines of the existing railroads, and the new town of Escalon is already laid out on the new competing railroad.

A glance at the map of the Great Valley of California will show you more readily its geographical advantages and relation to the whole valley as a future transportation centre.

Conclusions as to Locality and Surroundings The details which I have given of the irrigable area, its topography, soil, climatic advantages, its relation to the Great Valley, and the deep-water shipping, but 63 miles distant, clearly indicate that I believe the locality is very favorably situated for profit from the application of the waters of irrigation to its soil.

Ditch System in General.—An inspection of the map will enable you to take in the features of the whole system. You will see that the water to be used is diverted from the Stanislaus River at a point about 6 miles above the town of Knights Ferry; thence it is carried by ditches, flumes, and tunnels to a point just above Knights Ferry, where a small diversion takes place. About 10% of the volume is taken off to the northward by the "Farmington" lateral to the bed of the Little John Creek, down which it runs for a distance of about 10 miles, when it is taken out and carried by ditch to a point $1\frac{1}{2}$ miles east of the town of Farmington, about 22 miles distant by this water-way. I went to Knights Ferry, through Farmington, and saw the ditch at various places along the road. Below the point of diversion of this Farmington lateral, the main body of water is carried by ditches and flumes along the hillside, above the river, for 11 miles to a natural catch basin, $1\frac{1}{2}$ miles in length. From the lower end of this it is taken by a short ditch to a natural water-way, Lone Tree Creek, running nearly westerly to the San Joaquin River. About a mile below the point where it enters the creek-bed, in Sec. 27, T. 1 S., R. 10 E., is the point of main diversion. At this point the "Escalon" lateral, running to the southwest, now constructed to the town of Escalon, on the San Francisco and San Joaquin Railroad, will take its proportion for itself and its laterals. This Escalon lateral is now constructed for 5 miles, and is being continued to intercept the "Lathrop" lateral. At this point of main diversion Lone Tree Creek also becomes a lateral, and carries its proportion of water for 12 miles, to a point of minor diversion in Sec. 26, T. 1 S., R. 8E. From this point of minor diversion, the Lathrop lateral is now constructed for 10 miles along a half-

section line to its present end in Sec. 12, T. 1 S., R. 7 E., about 40 miles by the water-course from the headworks. In all, then, there are 60 miles of ditch and utilized waterways. There are not, as yet, any distributing ditches from the laterals to the acreage under contract.

At the point of main diversion it is proposed also to take a proper proportion of the water by the "Clyde" lateral to the northwest, to irrigate the lands about the towns of Clyde, Cometa, and Trigo and beyond, on the Oakdale branch of the Southern Pacific Railroad.

Irrigable Acreage.—The point of main diversion is at an elevation of about 170 feet above tide-water. You will see, therefore, by an examination of the contour lines of the map, the extent of the country lying under the existing and proposed laterals from this point, which could be irrigated by this system. I will discuss later the acreage that can be actually irrigated by the amount of water that can now be brought down to this point by the existing main ditch; for the present I call your attention to the acreage under this point that it is possible to irrigate, if the water supply would permit. In round numbers, this acreage amounts to about 7 townships, or 160,000 acres. And if we take into consideration the lands lying under the Farmington lateral at Farmington, and those lying along the Stanislaus River and the Little John Creek, before they reach the plains, there will be about 40,000 acres more; or, say in all, about 200,000 acres of arable lands lying under the ditches. This amount is about one-half of the arable level area of San Joaquin County.

Water Supply “The Stanislaus River (from which
The Stanislaus River “this Company divert the water
“for their system), ranks among the first of the more
“important perennial streams which take their origin amidst
“the higher peaks of the Sierra Nevada. The volume of its
“discharge may well rank fourth or third. The high
“plains on either side (of the river) are largely composed
“of a loose, sandy loam, whose texture and physical con-
“formation present conditions peculiarly favorable to the
“successful use of water for crops.”*

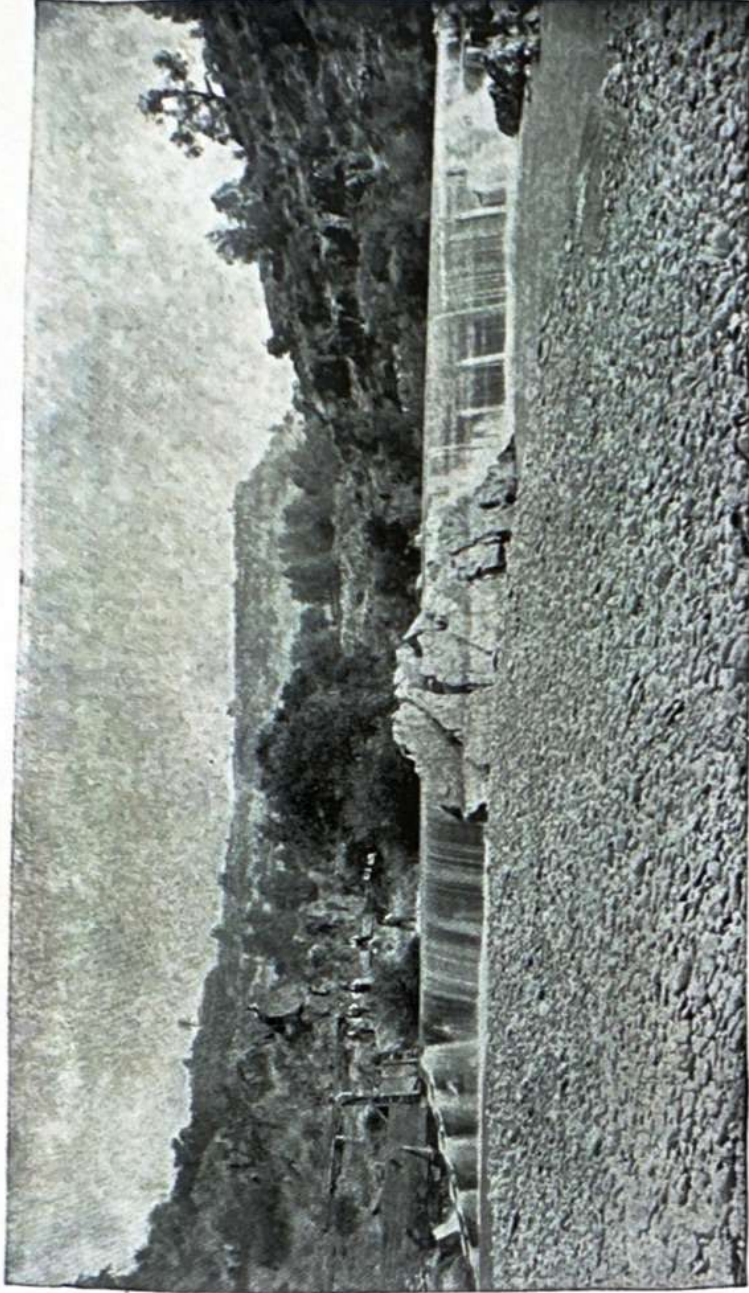
The drainage area is 1051 square miles, and its water runs through deep cañons in the foothills out upon the rolling lands and plains.

In the 6 years, — 1878-79 to 1883-84, — the flow of the river was gauged at Oakdale 12 miles below Knight's Ferry. From the report of the State Engineer on the “Physical Data of California,” at pp. 428-430, I condense the tables, and give the mean discharge of cubic feet per second in the different months. It must be borne in mind, that the winter rainfall of the plains is in large measure snowfall in the mountains at the sources of this river, and this snowfall thereby becomes an immense reservoir from which the river waters of March, April, May, June, and July are mainly derived.

Mean discharge, in cubic feet per second of time, of the Stanislaus River, from 6 years' gaugings:

Nov., 144 cub. ft. per sec.	May, 5,290 cub. ft. per sec.
Dec., 535 cub. ft. per sec.	June, 4,929 cub. ft. per sec.
Jan., 688 cub. ft. per sec.	July, 2,158 cub. ft. per sec.
Feb., 2,043 cub. ft. per sec.	Aug., 449 cub. ft. per sec.
Mar., 2,845 cub. ft. per sec.	Sept., 127 cub. ft. per sec.
Apr., 4,247 cub. ft. per sec.	Oct., 162 cub. ft. per sec.

* Report of the State Engineer, Part IV, page 47.



MEMBERS OF STOCKTON COMMERCIAL ASSOCIATION AT THE UPPER DAM.

In other seasons the rainfall occurs with a comparatively high temperature and small snowfall; then the waters will at once reach the river courses, and in the dry season there will be a small supply.

A comparison of these figures with those I give later for the ultimate capacity of the system,—that is, 750 second feet,—will show that there is ample water flowing in the Stanislaus River from February through July for all the wants of the system.

Ditch System in Detail.—

[See also Appendix.]

MAIN DITCH ABOVE KNIGHTS FERRY.

INTAKE.

The present intake of this system is at a point on the north or right bank of the Stanislaus River, about 6 miles above the town of Knights Ferry, and is about 35 feet high, known as the Six-Mile Bar, celebrated in the early days of placer mining in this State as one of the richest bars of any of our streams. The present headworks consist of a crib-dam, about 300 feet long and 25 feet wide; this abuts against the rocks on either side of the stream and against the up-stream side of an irregular line of rocks, stretching from the left bank more than half-way across. It was built many years ago by a mining company, to divert the water into a small ditch for mining purposes. It is considered only a temporary expedient, and it will soon be superseded by a new masonry dam, 4300 feet farther down the river. The head-gate, at the present intake, is an ordinary timber-gate, raised and lowered by means of a winch.

This old gate, and the present flume leading from it to the ditch, are too small. This was distinctly understood by the engineer in enlarging the old ditch. He expects to be able to complete the new dam and headworks in the spring of 1896.

UPPER DITCH.

The ditch from the old upper dam to the proposed lower dam is 4300 feet long, 8 feet wide on the bottom, with a vertical upper side and $\frac{1}{2}$ to 1 outer slope, built to carry 5 feet depth of water. It is an enlargement of an old mining ditch, has a grade of 4 feet to 5000 feet and a theoretical capacity of 140 second feet. The material in this cut is various, ranging from loose to solid rock, and the cost of construction was about \$1 per running foot. When I examined the present headworks, there were 32 second feet running. The whole system was about to be filled for the first time, and it was deemed inexpedient to let in the water too rapidly. Although this portion of the canal will be abandoned when the lower dam and headworks are constructed, it will be kept in repair for emergencies. The cost to enlarge was \$4300.

LOWER DAM.

This dam was begun three years ago and was built to a height of 30 feet from its base to the present water-surface, when the floods overtook the work and destroyed a small part of it. It is situated in a narrow rocky gorge of the river, and there will be few engineering difficulties to be overcome in continuing its construction to the proposed height. It is 30 feet long and 60 feet wide at the base, and, when completed, will be 60 feet high and 200 feet long with a crest of 12 feet in width. The present base-work



FLUME ONE, 1150 FEET LONG.

was built of boulders imbedded in Portland cement and is reported as being built on a solid rock base. It has stood the test of the floods of two seasons. These floods rise 25 feet above low water. The estimated cost of completing this dam is \$10,000. The excavation for the headworks of this dam and a new short canal 500 feet in length therefrom will be in solid rock and they will be perfectly secure from all floods. This latter work will increase the cost to \$13,000.

DITCH No. 1.

Leaving these proposed headworks I examined this ditch through its length of 9000 feet. It is cut under a high rocky cliff in a classified material of earth, loose and solid rock, at a cost of \$1 per foot. It is an enlargement of the old mining ditch to a bottom width of 9 feet. It is constructed to carry 6 feet depth of water on a grade of 4 feet per 5000 feet, and has a capacity of about 215 second feet. In the enlargement of the old ditch, it was deepened 2 feet and widened to 9 feet, leaving its outside wall intact. The material removed was used to increase the height and width of its outside wall to the necessary proportions. With 1 and $\frac{1}{2}$ feet depth of water running in it, there was only one slight leak in its entire length. It cost to enlarge \$8500.

FLUME No. 1.

At the lower end of Ditch No. 1 the water enters Flume No. 1, a new flume replacing the small mining flume. This flume is 1112 feet in length with a cross section of 6x10 feet. The grade is 9.35 feet per 5000 feet and its capacity is 765 second feet. This flume is 36 feet above the ground at its lowest part and 15 feet on the average. The work

and material are first-class throughout. The cost was \$3600.

TUNNEL NO. 1.

At the lower end of Flume No. 1 the water enters Tunnel No. 1. Its length is 1047 feet, width 12 feet, to carry 6 feet depth of water, grade $7\frac{1}{2}$ feet per 5000 feet and capacity 340 second feet. Its cost was \$35,000, of which I am informed the present Company paid \$12,000 for 350 feet in the middle.

FLUME NO. 2.

This Flume connects Tunnel No. 1 with Tunnel No. 2. Its length is 1520 feet, cross section 6x10 feet, grade 12.3 feet per 5000 feet, capacity 875 second feet, and cost \$4500.

TUNNEL NO. 2.

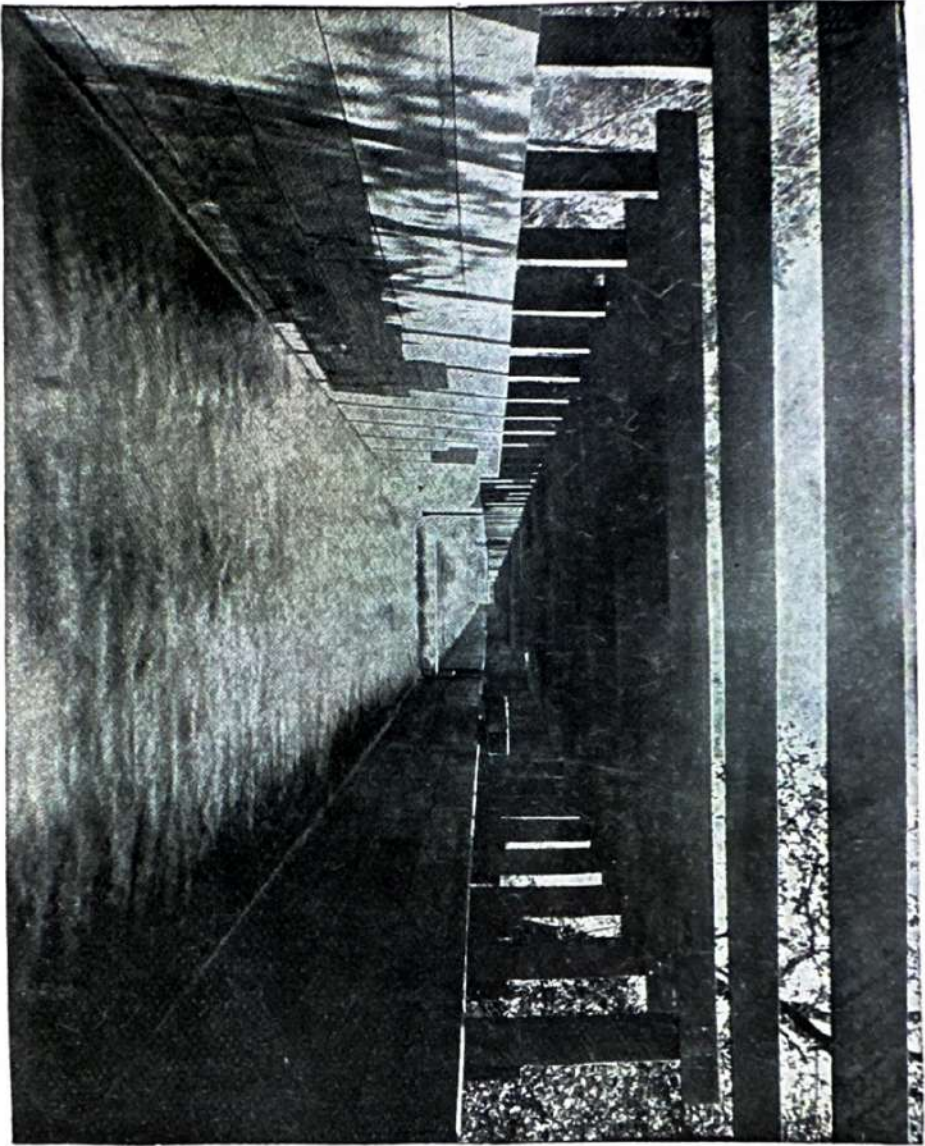
Its length is 1037 feet, 14 feet wide, to carry 6 feet depth of water, grade 5.4 feet per 5000 feet, capacity 360 second feet, and cost the old Company \$29,000. This Tunnel is in more easily worked material than Tunnel No. 1.

DITCH NO. 2.

It is 3000 feet in length, 9 feet wide on the bottom, to carry 6 feet depth of water, with a vertical upper side, lower slope $\frac{1}{2}$ base to 1 vertical, grade 4.5 feet per 5000 feet, capacity 235 second feet, and cost \$2500.

FLUME NO. 3.

Its length is 2300 feet, cross section 8x8 feet, grade 10.5 feet per 5000 feet, and capacity 850 second feet. The highest point is 51 feet above ground and the average 25 feet. The lower end is 2 feet below the ditch grade. Cost, \$8000.



INTERIOR OF FLUME TWO.



LOWER END OF TUNNEL TWO, 1637 FEET LONG.



FLUME THREE, 2380 FEET LONG.

DITCH No. 3.

Its length is 1600 feet, 9 feet wide on the bottom, to carry 6 feet depth of water, upper side vertical, outer slope $1/2$ base to 1 vertical; grade 4.5 feet per 5000 feet; capacity 235 second feet, and cost \$2000. The bottom is 2 feet above the flume bottoms, so that the capacity can be increased 30% by deepening.

FLUME No. 4.

Its length is 332 feet, cross section 8x8 feet, grade 10.5 feet per 5000 feet, and cost \$1200. It is 32 feet above ground in the highest part. Capacity, 850 second feet.

DITCH No. 4.

Its length is 2400 feet, the same cross-section and grade as Ditch No. 2; capacity 235 second feet. The bottom is 2 feet above the flume bottoms, so that the capacity can be increased 30% by deepening. It cost \$2500.

FLUME No. 5.

Its length is 436 feet, same cross-section, grade and capacity as Flume No. 3. Capacity 850 second feet; average height above the ground 12 feet. Cost \$1500.

DITCH No. 5.

Its length is 1200 feet, same cross-section, grade and capacity as Ditch No. 2. The bottom of the ditch is 2 feet above the flume bottoms, so that the capacity can be increased as before. Cost \$1000.

MAIN DITCH BELOW KNIGHTS FERRY.

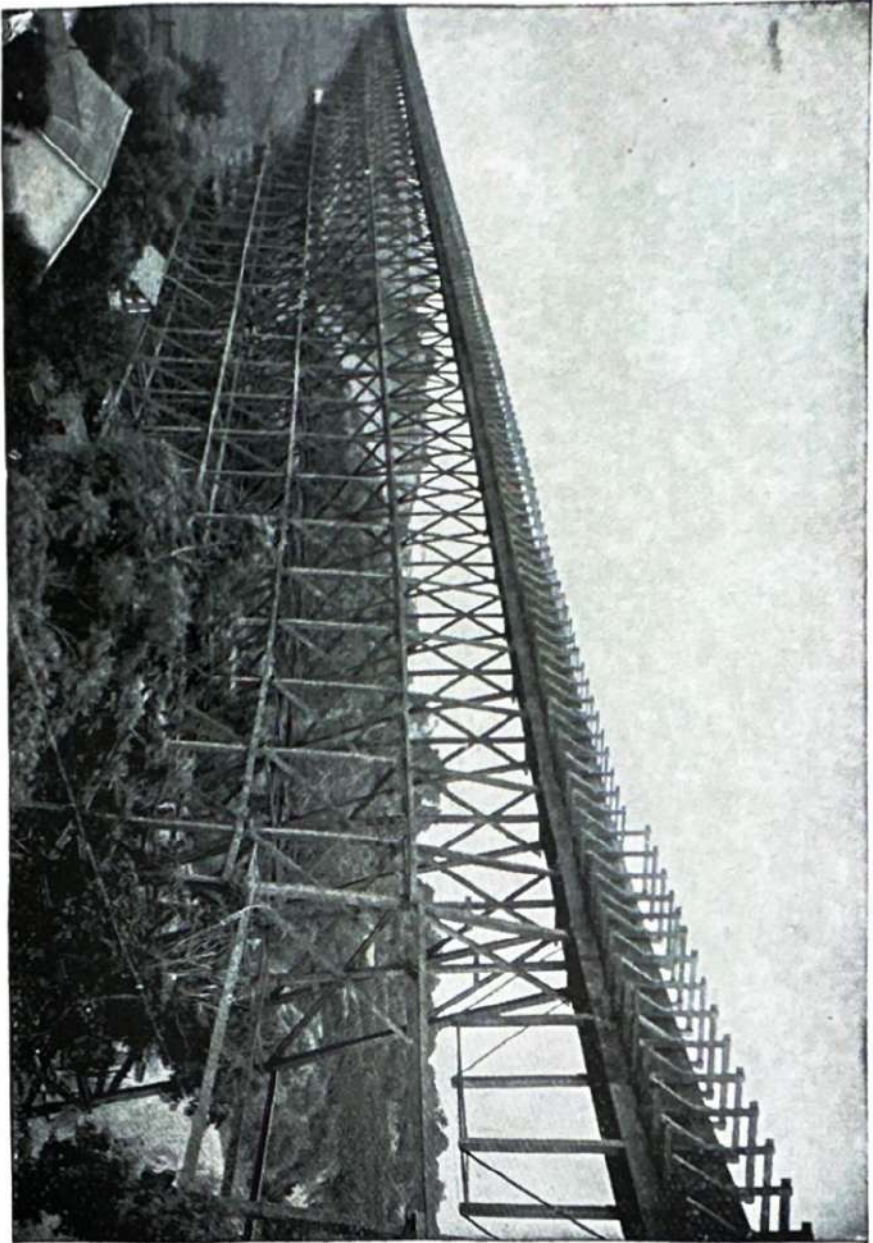
FLUME No. 6.

100 314
27 57

To this point, the ditch has followed (with the exception of the tunnel) the line of the old mining ditch; the Farmington lateral, leaving the main ditch at this point, continues to follow the old Schell Ditch into the Little John Creek. This flume is 2700 feet long, in two sections of 1200 feet each, resting in the middle against the brow of a projecting hill. The highest part of the first section above ground, is 87 feet, and of the second section, 84 feet. It is a good piece of work, though, in my opinion, in need of more strengthening, to insure its steadiness in very high winds. The cross-section is 5x6 feet; grade, 59 feet per 5000 feet; capacity, 770 second feet; cost, \$12,000. At its lower end, the high velocity is checked by a strong check-apron and basin. I will speak of this flume hereafter.

DITCH No. 6.

To this point,— that is, about 6 miles from the proposed new headworks, the work has been heavy and difficult, and it has been done in first-class manner. It will be noticed that the flumes have been made of a very much larger capacity than the tunnels or ditches, in order to allow for an ample increase in the capacity of these latter. Below this point, the work is less difficult and expensive, as it is mainly in earth or easily worked rock, for a distance of 11 miles, to the point of main diversion; the natural water-courses have been utilized as much as possible. This ditch is 1400 feet long, 8 feet wide on the bottom, to carry 6 feet depth of water, with an upper slope 1 base to 1 vertical, and an outer slope of $\frac{1}{2}$ base to 1 vertical, grade of 5 feet per 5000 feet, and a capacity of 310 second feet, and cost \$2800.



LOWER END OF FLUME SIX, 2700 FEET LONG.

From Flume No 6 to Hells Lake.
2.63 miles.

From report madeⁿ 1904 by Thompson
to Chas. T. Fulkner.

From Hells Lake to Flume No 10

3.12 miles = 16473.6 ft. total fall 9.55
includes 4 flumes = 850.0 with fall 1.72

15623.6 of ditch fall 2.43
or 0.155 per 100'

CREEK BED.

From the end of Ditch No. 6 the water is carried to a natural creek bed for 11,000 feet to a small reservoir and dam. The creek was rectified at a cost of \$3000. This dam has a wooden spill-way large enough for emergencies. The dam, called the Hilts Dam, cost \$2500. At the time of my visit on December 7th, in the afternoon, the water, which had lately been let in at the headworks, was just covering the spill-way and was about to enter Flume No. 7. There was no absolute necessity for this dam. A ditch properly located would have been better.

*2 1/2 miles
13600 feet*

FLUME NO. 7.

Its length is 320 feet, cross section 6x8 feet, grade 8 feet per 5000 feet, capacity 530 second feet, and cost \$900.

*Grade 8 feet
per 5000 feet*

DITCH NO. 7.

Its length is 3700 feet, width 14 feet on the bottom, to carry 6 feet depth of water, upper slope 1 base to 1 vertical, outer slope $1\frac{1}{2}$ base to 1 vertical, grade 1.25 feet per 5000 feet and capacity 300 second feet. I walked its entire length and some distance beyond. The soil is adobe; it will puddle, and the line has been run so that the cut and fill give the required outer bank. Cost \$785.

FLUME NO. 8.

Its length is 176 feet, cross section 6x8 feet, grade 8 feet per 5000 feet and capacity 530 feet, the same as Flume No. 7, and cost \$375.

*Grade 8 feet
per 5000 feet*

DITCH NO. 8.

Its length is 5500 feet, the dimensions and grade are the same as those of Ditch No. 7, capacity 300 second feet, and cost \$3200.

FLUME NO. 9.

Same as Flume No. 7. Length 128 feet, capacity 530 second feet, and cost \$400.

DITCH NO. 9.

Its length is 7100 feet, the dimensions and grade are the same as those of Ditch No. 7, capacity 300 second feet, and cost \$4500.

FLUME NO. 10.

Its length is 320 feet, same dimensions and grade as Flume No. 7, capacity 530 second feet, and cost \$975. It is 40 feet above ground in its highest part.

DITCH NO. 10.

Its length is 1426 feet, width on the bottom 12 feet, to carry 5 feet depth of water; slope 1 base to 1 vertical on each side; grade 2.5 feet per 5000 feet, and capacity 240 second feet. The material is soft sand and clay rock. Cost \$4725.

FLUME NO. 11.

Its length is 320 feet, the dimensions and grade the same as Flume No. 7. Cost \$800.

DITCH NO. 11.

Length 934 feet, dimensions and grade the same as those of Ditch No. 10. Cost \$800.

FLUME NO. 12.

Length 272 feet, dimensions and grade the same as those of Flume No. 7. Cost \$600.

From Flume No. 10 to Table Lando
 562 miles = 26505.6'; Total fall. 18.21'
 length of flumes 3206.0 " " 4.41'
 length of ditch 23299.6 " " 13.80'
 slope = .593 feet 1000'

49' - 7x8
height - fall 0.35 (total)

Flume 9 1/2
71' - 6x10
total fall 0.13

L=332' - 7x8
height 14' - total fall 0.71'

54' - 7x8 - height 38'
fall 0.18

271' - 7x8
total fall 0.22'

DITCH NO. 12.

Length 2247 feet; dimensions and grade are the same as those of Ditch No. 10, cost \$3450, and capacity 240 second feet.

FLUME NO. 13.

Length 656 feet, dimensions and grade the same as those of Flume No. 7, and cost \$2000. Its highest part is 76 feet above ground.

At the upper end of this flume there was being constructed a flume and flume bridge across the Stanislaus River to the Ditch of the Oakdale Water Company, by which that Company is to be supplied with water for irrigation purposes under some arrangement with the Stanislaus and San Joaquin Irrigation Company. Whatever amount of water passes across the river must be deducted from the amount I have estimated to reach the point of main diversion for use in the latter Company's system.

*at County River
Bridge
L = 660 - 728
h = 70 - total fall 0.*

DITCH NO. 13.

Total length 1400 feet, dimensions and grade for 800 feet the same as Ditch No. 7, capacity 300 second feet; for 600 feet 10 feet wide on the bottom, to carry 6 feet depth of water, both slopes $\frac{1}{2}$ base to 1 vertical, grade 5 feet per 5000 feet, capacity 330 second feet, and cost \$2540.

FLUME NO. 14.

Length 320 feet; dimensions and grade are the same as those of Flume No. 7, cost \$600.

*L = 320 - 728
h = 46 - total fall*

DITCH NO. 14.

Total length 5546 feet; for 2400 feet 8 feet wide on the bottom, to carry 5 feet depth of water, upper side vertical, slope of lower side 1 base to 1 vertical, grade 5 feet per

5000 feet, capacity 190 second feet; for 3146 feet, dimensions and grade the same as Ditch No. 7, capacity 300 second feet; total cost \$2600.

FLUME No. 15.

Length 608 feet, dimensions and grade the same as those of Flume No. 7. Cost \$2000.

DITCH No. 15.

Length 830 feet, dimensions and grade the same as Ditch No. 7, capacity 300 second feet, and cost \$581.

FLUME No. 16.

Length 112 feet, dimensions and grade the same as for Flume No. 7, and cost \$340.

DITCH No. 16.

Length 351 feet, dimensions and grade the same as Ditch No. 7, capacity 300 second feet, and cost \$640.

FLUME No. 17.

Length 176 feet, dimensions and grade the same as Flume No. 7, and cost \$555.

DITCH No. 17.

Total length 6893 feet; for 3600 feet 8 feet wide on the bottom, to carry 5 feet depth of water, upper side vertical, lower slope 1 base to 1 vertical, grade 5 feet per 5000 feet, capacity 190 second feet; for 3300 feet same dimensions and grade as Ditch No. 7, capacity 300 second feet; total cost, \$5635.

653' - 708'
51' - total feet 114'

728'
total feet 1046'

728'
total feet 1119'

FLUME NO. 18.

Length 272 feet, dimensions and grade the same as Flume No. 7, and cost \$890. Its highest part is 80 feet above ground.

DITCH NO. 18.

Total length 6528 feet; for 2200 feet 8 feet wide on the bottom, to carry 5 feet depth of water, upper side vertical, lower slope 1 base to 1 vertical, grade 5 feet per 5000 feet, capacity 190 second feet; for 2400 feet, same dimensions and grade as Ditch No. 7, capacity 300 second feet; for 1900 feet 12 feet wide on the bottom, to carry 5 feet depth of water, both slopes 1 base to 1 vertical; grade 5 feet per 5000 feet, capacity 350 second feet. Total cost \$5600.

DITCH NO. 19.

Length 2000 feet, 20 feet wide on the bottom, to carry 4 feet depth of water, both slopes 1 base to 1 vertical, grade 2 feet per 5000 feet; capacity 245 second feet. Cost \$2500, approximately.

LATERALS.

ESCALON LATERAL.

Length, 4 miles to date, 14 feet wide on the bottom, to carry $2\frac{1}{2}$ feet depth of water, both slopes 2 base to 1 vertical, grade 2 feet per 5000 feet, capacity 85 second feet. Cost \$3800. Drop-boxes to lower the grade, every 1500 feet, to cost \$150 per mile.

LATHROP LATERAL.

Length 10 miles, 24 feet wide on the bottom, to carry $2\frac{1}{2}$ feet depth of water, both slopes 2 base to 1 vertical,

grade 1 foot per 5000 feet, capacity 95 second feet, and cost \$9750. Drop-boxes every 1500 feet, to cost \$150 per mile.

FARMINGTON LATERAL.

Length 12 miles, 8 feet wide on the bottom, to carry 2 feet depth of water, both slopes $1\frac{1}{2}$ base to 1 vertical, grade 15 inches per 5000 feet. Cost \$500 to the present company. Capacity about 20 second feet.

LONE TREE CREEK BED.

The improvement of the bed will cost about \$1500 per mile for 12 miles. It may be, after the area has been under irrigation for some years, that it will be advisable to abandon this creek as a lateral and use it for drainage purposes.

Character and Cost of Construction. . . . In the foregoing summary the figures of dimensions, grades and costs I obtained from the Chief Engineer of the Company, Mr. W. L. Rockwell; the capacities I calculated myself from his data. I will speak of this matter of capacity under the head of Capacity and Acreage.

The construction throughout has been good. The location of the line is to be criticized in a few unimportant places, but generally all advantage has been taken of the lay of the country, and the work has been done with no unnecessary expenditure of money.

The total cost of the construction work done and material used by the present Company has been about \$150,000. This figure I obtain from the figures in detail given me by Mr. Rockwell, largely taken from the contractors' vouchers and certain figures from the office of the



MAIN CANAL, VALLEY DIVISION, FORTY MILES FROM THE HEADGATE.

Company about which Mr. Rockwell could not say definitely. This total figure, I understand, does not include engineering, legal or rights of way expenses, but simply covers the actual labor and materials as done by the contractors or the Company. The figures for the flumes are approximate, those for the earth-work are more nearly right; the total sum is probably not more than \$10,000 out of the way.

At the rates paid for earth-work the Company has obtained full value for its expenditures. These rates were, I am informed, as follows:

FROM HEADGATES TO FLUME NO. 6.

95 cents per cubic yard for solid rock.
60 cents per cubic yard for loose rock.
20 cents per cubic yard for earth.

(This was all hand labor.)

FROM FLUME NO. 6 TO FLUME NO 17.

35 cents per cubic yard for hardpan.
14 cents per cubic yard for earth.

(This was hand and horse labor.)

FROM FLUME NO. 17 TO END OF MAIN DITCH.

37½ cents per cubic yard for hardpan.
14 cents per cubic yard for earth.

(This was hand and horse labor.)

These rates are very reasonable, and that for solid rock work especially so. It seems there can have been very little or no profit in it to the contractor. It was possible to obtain these rates only from the fact that all the work done by the present Company has been done since March, 1895, that is in the last eight months, and, as you know, times

have been hard during this period, and men have been glad to work for bare living wages. In good times it would not be possible to duplicate the work for the same money.

The flumes have been well built, the flume-box is of surface redwood on the water face, the trestles are of pine, all fastened with wire nails. The footings have been well placed. The timbers are, in general, ample in size and number. These flumes ought to last, with prompt care, for at least ten years, without the necessity of any large amount of renewal. The figures for the cost have been based on lumber at \$27 per M., delivered, everything included.

Present Capacity of the System . . You will see from an inspection of the theoretical capacities, as I have calculated them from the data furnished me by Mr. Rockwell, that the general capacity of the main line has not as yet been properly equated. It varies from 215 second feet below the proposed new headworks to 850 second feet at Flume No. 5, to 300 second feet at Ditch No. 6, to 190 second feet at Ditches Nos. 14 and 16.

The final capacity of the system is gauged by the capacities of the larger flumes, that is, of the flumes from Flume No 6 to the headworks. This capacity is about 750 second feet. This theoretical capacity will not vary much from the actual capacity, for the flumes have been very carefully built, and it is possible, therefore, to assign very close values to the necessary factors in the calculations. The flumes below this point have a theoretical capacity of about 525 second feet, and as they are short, can be increased to the

larger capacity by increasing their depth through the addition of a top plank.

The ditches have not been built to the same capacity as the flumes. They run from 215 to 300 second feet. It is evident that the policy of the Company has been to utilize the means at their disposal so as to get the water down upon the plains for the irrigation season of 1896, and at the same time to put in the larger flumes up to the capacity they have named to themselves, that is, apparently about 750 second feet. This policy is to be commended from a business point of view, because it has been the experience in enterprises of this kind that, in order to secure water contracts from the farmers, who are usually very suspicious of signing any papers in advance, it is very necessary to make an actual demonstration of the fact that a company is going to put water on their lands by letting them see the water flowing into the ditches. There have been so many broken promises and so much underhand manipulation in irrigation matters by irresponsible parties that nothing short of this will carry conviction, except of course in the case of a small proportion of wide-awake men. From an engineering point of view such a policy makes the enlargements a little more expensive than if the works had been built to their full size at one time.

The actual capacity of the system to-day is governed by the capacity of the first 4300 feet of ditch above the proposed new dam. This ditch has a theoretical capacity of about 145 second feet. Its actual capacity will probably be about 25 second feet less to be deducted on account of the sinuosities and leakages of the line, or about 120 second feet. Of this not more than 100 second feet will arrive at the point of main diversion.

When the proposed dam is built, the actual capacity will be governed by that of Ditch No. 1, of 9000 feet in length, which has a theoretical capacity of 215 second feet. Its actual capacity will probably be 35 second feet less, or 180 second feet; and by that of Ditches Nos. 14, 17 and 18, which is theoretically 190 second feet and will be actually 40 second feet less, or 150 second feet. That is, of the quantity of 215 second feet which will enter at the new head-works, there will arrive for use at the point of main diversion about 150 second feet. You will observe that I have not taken into account any amount that may be diverted into the Farmington Lateral. Whatever may be diverted for that ditch must be deducted from the amount just given. I do not know what contracts the Company have secured along the course and under the ditch. Probably the demand for this lateral will not exceed 20 second feet for some time.

It must be said, in relation to these figures, that they are only approximate, but yet probably fairly so. The factor of roughness of the banks enters very powerfully into the calculations, and this is the factor to which it is impossible to assign a rigorous value. And again the formulæ do not take into consideration the sinuosities and leakages of the line, and some allowance must be made for these features. In the case of flumes, it is possible to arrive at a value which shall be reasonably accurate, but in the case of such ditches as these it is not possible to do so; so that the only proper way to obtain the correct figure for the flow is by actual experiment on the ground. In view of this fact and the absence of such measures, which were impossible at the time of my visit, because the water had not reached more than half way to the point of main diversion, I have deemed

it necessary to assign such values to the flow as would be smaller rather than larger than the actual values. I have also omitted from consideration the amount of drainage into the canal from the hills above the line. This might, as it sometimes does, offset the leakage.

Under the heading of "Recommendations," I will give some views and figures upon increasing the capacity as the demand calls for an increase. It is usually the case that three or more years elapse before the full capacity of the system is utilized, and therefore the increase can be gradual.

I have appended a tabular view of the length, cost, velocity and capacity of each section of the line that will enable you to compare at a glance the essential features of the foregoing details.

Duty of Water.—It has been found in Italy, India and Spain, after many years of practice that, on ordinary soils, a depth of from 10 to 12 inches of water is sufficient to properly mature the usual crops, whether this water come as rain or be artificially applied at proper times and amounts. I consider it safe to take a depth of 12 inches as sufficient for a crop of wheat, barley, oats or grapes. As a matter of fact, a good crop of wheat can be raised in California with $10\frac{1}{3}$ inches. The varying conditions of soil and weather determine, after experience, the proper proportions and time.

You will understand that this depth of 12 inches means so many inches of water applied directly on the field where the crop is sown. I exclude for the moment any additions by rainfall, so that these remarks may apply to any arid region. Upon this basis of 12 inches, one second foot of water, measured at its point of application upon the given

field, will cover 2 (1.98) acres of ground one foot deep in 24 hours, or during the 100 days required for the maturing of a crop, one second foot will cover 200 acres to the same depth. As this depth of water is never applied at one watering, it is usual to express the matter in other terms, as follows: one second foot of water flowing through 24 hours will give a depth of nearly 3 inches over 8 acres. This depth of 3 inches will moisten the average soil to a depth of 14 or more inches. If the waterings are 25 days apart, this second foot will irrigate 8x25 or 200 acres, before the water is again turned on to the field first irrigated.

This acreage watered by a given volume of water is usually termed the "duty of water" for the particular kind of crop.

This depth of 12 inches, applied on a given field, covers all loss by evaporation over the field; but it does not cover any losses of the water by seepage or evaporation during its course from the distributary head to the points of application in the fields. In endeavoring, therefore, to ascertain the duty of water of any irrigation system it is necessary for us to deduct a certain amount, on account of these losses, from the quantity of water arriving at the point of main diversion, that is, taking the system as a whole; and then to see whether such loss is supplemented in any measure by the rainfall. A consideration of these losses enables us to arrive at the actual duty of the water of the given system. With reference to this particular locality, with its climatic conditions and its average rainfall of 15 inches, I think it is safe to say that the loss, through absorption and evaporation from the point of main diversion to the places of application, will be compensated by the lessened requirements of water due to the rainfall, and this even in

seasons of less than the average rainfall; so that, for this system, we may put the actual duty of water for every second foot arriving at the point of main diversion at 200 acres.

In this system, then, the irrigated acreage with the new headworks will be 150 second feet by 200 acres, or 30,000 acres. At present it is 100 second feet by 200 acres, or 20,000 acres. In **the final capacity of the enlarged system** it will be 650 second feet by 200 acres, or 130,000 acres.

There is a further condition which will give an acreage under contract at about 50% greater than the acreage irrigated. This is the condition that part of the land cultivated should lie fallow. The present mode of agriculture demands that part of the lands cultivated to cereals and root crops must lie fallow for at least one season in two or, at least, three seasons. Where lands are put entirely to cereal crops, half the acreage should lie fallow every year, and where there is a third of the lands planted in orchards, one-half of the remainder should lie fallow. I think a third part will, in a few years, be a fair proportion in the locality under discussion.

If the water contracts of this Company were so drawn that the user bought a certain volume of water for application wheresoever he chose, he would contract for just so much water as would suffice for the lands he proposed to cultivate each year. I understand, however, that the contracts are so drawn that he must use the water on the specified tract for which he buys the water rights, so that while, for the first year or two, he would buy water rights only for the land he would be actually using, yet, in succeeding years, if he proposed to let the first used lands lie fallow, he would be obliged to increase his purchase of

water rights so as to include those lands that had previously lain fallow. Therefore, at the end of three years, all of the cultivable land of any land owner will be under contract, while water will be used over only two-thirds of it. So that, with the new headworks, there will probably be 45,000 acres under contract at the end of three years. At present there can be 30,000 acres under contract. In the final enlarged capacity there can be 195,000 acres under contract. You will recall the figure I arrived at as the irrigable area to be 200,000 acres.

It will probably be found to be the case in this system, as it has been in nearly all others, that, after the land has been irrigated for several years, the sub-surface plane of moisture comes nearer to the surface, and therefore the amount of water necessary for a crop is diminished and the actual duty thereby increased. In case of orchards, where the system of individual watering of each tree by its local sub-surface pipe is practiced, the duty runs up to as high as 500 acres per second foot.

Sediment.—The question of sediment carried by the waters of irrigation is important and cannot be overlooked. In the case of the Stanislaus River the detritus is a mixture of the products of what may be designated the natural abrasion by cultivation, by animals on the range, by washings from the roads, and by rainstorms; and the artificial abrasions by the operations of the miner.

The products from the first sources, containing as they do earth and comminuted vegetable matter, are of benefit to any lands that receive them; the products from the latter source may or may not be. I judge that the sediment in the latter case, coming from the quartz mines and the placer

mines along the river bars, contains a large proportion of powdered quartz or sand. This, in small quantities, would be of benefit to the heavy adobe lands of the plains, though not desirable on the sandy loams. From the appearance of the river at its lowest stage early in December, I think that the amount of sediment entering the canal during the irrigating season will be so small that it need not be considered a serious factor in the question. And if the quantity of mining detritus should ever become so large as to be a detriment to the use of such river waters for irrigation purposes, the State will be obliged to make the proper regulations for the impounding of this mining detritus, just as the Federal Government has regulated hydraulic mining in those cases where the detritus from this source shoals the navigable waters under its jurisdiction. Such regulation will be a settlement of the points now at issue between the farmer and the miner, and in this country, where both interests are so important, the proper regulation must be determined after a due regard to the interests of both. (See the State Engineer's Report, Part III, page 31.)

Recommendations.—I have certain recommendations that I deem it proper to make regarding the existing system and also regarding the improvements.

The first is with regard to Flume No. 6. By a reference to the details under the heading "Ditch System in Detail," you will observe that the two sections of the flume are very long, some 1200 feet each, and very high, about 90 feet to the flume-box. I noticed, in examining this large piece of work, several places where I think strengthening would be advisable. I would advise that the stringers should be insured against a rocking movement by the addition of

properly sized and fastened posts running from the upper end of the bent-posts below the cap, past the cap and up alongside of the stringers and terminating on the flume-box posts. The stringers are properly horsed from the inside, but lack this strengthening on the outside. Also, I would advise that the decks be more securely fastened together by proper strengthening at the deck-cap. There should have been a centre stringer so as to put more weight on the centre bent-posts. It may be necessary later to add this stringer. And, finally, I would advise the proper guying by several steel cables of the top of the bent-post to the ground. All these additions I advise as strengtheners against any motion that might otherwise be possible in a high wind, or in the sudden gusts that are likely to occur in this region. I would advise also that at the feet of the bent-posts, in the cañons, proper water-ways be provided to carry off the natural drainage waters coming down from the hills above. All these precautions should not cost to exceed \$1500.

With regard to the manner of increasing the capacity of the main ditch line, I would advise that, when this becomes necessary, it be done after due consideration of the velocities and capacities obtaining in the existing ditches and flumes. I remarked above that the line runs through so many various kinds of materials, and has so many different curves, that it is impossible to make any general theoretical formulæ fit the many different cases, so that the only safe guides are those obtained from experience.

The first increase would naturally come in the first 9000 feet below the new headworks. The capacity of this section is theoretically 215 second feet, and as it is fairly straight, this is probably near what will be found to be the

actual capacity. To increase this to three times its present capacity will cost probably \$12,000 per 5000 feet, reckoned on the basis of the cost of removing such material as exists, at 60 cents per cubic yard. This ditch is on a steep rocky hillside, and the increase will call for the removal of at least two cubic yards for one that will be in the water-way.

The increase in Ditches Nos. 2, 3, 4 and 5 will also be expensive, though not so much so, as they run through similar materials but on less steep hillsides.

Below Flume No. 6 the work will be easier, being mostly in easily worked rock and earth.

It may be necessary to protect the waterside of the outer banks of the ditches against erosion. This may be done by revetting the face with stone, in excessive cases, or by planking or planting a suitable grass. In some cases willows have already been planted.

In all the work upon the ditches, large or small, especial care should be exercised to have the bottoms and sides as smooth as practicable. The factor of roughness is very large and out of all reasonable proportion to the cost of preparation. For example, the capacity of the tunnels can be increased 20% by smoothing down the wetted surface.

I estimate that an increase in the capacity to deliver 650 second feet at the point of main diversion will cost, including the new dam and headworks, about \$60,000; and that 50 miles of distributing ditches will cost \$15,000 more. These distributing ditches should be very carefully surfaced.

I think it advisable to provide a proper water-way through Paulsell Lake, which is very shallow and gives too much surface for evaporation and percolation. This ditch can be easily built.

There were here and there minor details which needed

attention, such as are usually noticeable in similar works during their progress, but these and such others as may from time to time arise, may be safely left to the judgment of the Company's Engineers, and without doubt will receive attention in due time. The rains of this winter will probably disclose some weak spots in the exposed new work that will need looking after.

General Conclusion.—I conclude from my examination:

1. That this system is now capable of delivering 100 second feet of water through its ditches.

2. That when the ditches and flumes are finished and maintained in good condition, the duty of water in this system can be put at 200 acres per second foot, and that it will, therefore, be capable of irrigating 20,000 acres during the coming season.

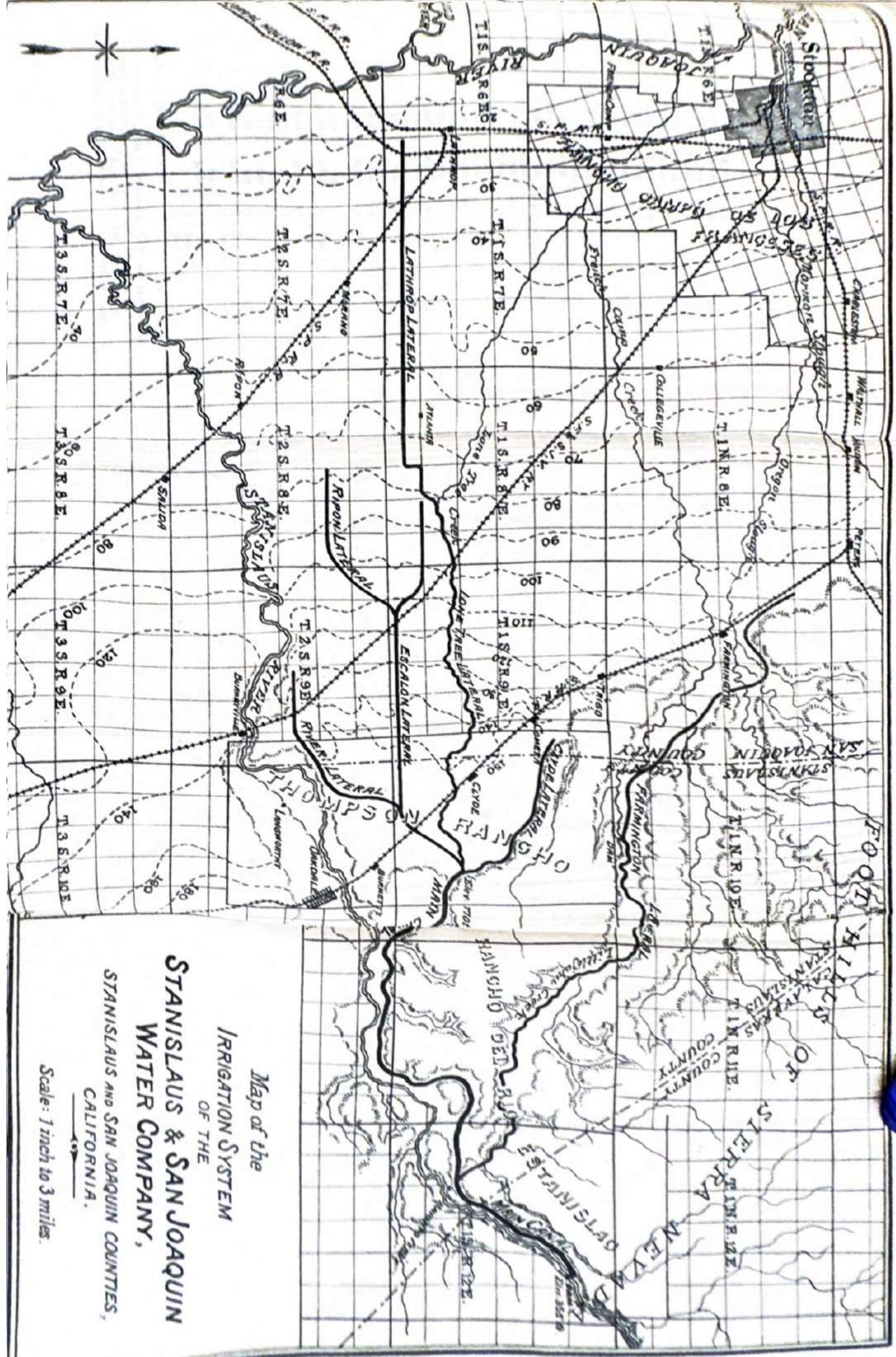
3. That the capacity of the system can be increased to 650 second feet, to irrigate 130,000 acres, at an expense of about \$75,000.

4. That the irrigable area lying under its ditches comprise 200,000 acres.

5. That this area is very favorably situated with regard to transportation facilities, markets and climatic conditions other than rainfall.

And, finally, that this is a good beginning of a good system in a good locality.

(Signed) GEORGE DAVIDSON.



Map of the
 IRRIGATION SYSTEM
 OF THE
STANISLAUS & SAN JOAQUIN
 WATER COMPANY,

STANISLAUS AND SAN JOAQUIN COUNTIES,
 CALIFORNIA.

Scale: 1 inch to 3 miles.

TABULAR VIEW OF CERTAIN DETAILS.

	Length. Feet.	Cost.	Computed Velocities. Ft. per Sec.	Computed Capacities. Cu. Ft. per Sec.
Upper Ditch . .	4,300	\$ 4,300	3.1	215
Ditch No. 1 . .	9,000	8,500	3.4	215
Flume No. 1 . .	1,200	3,600	12.7	765
Tunnel No. 1 . .	1,047	35,000	4.8	345
Flume No. 2 . .	1,520	4,500	12.7	875
Tunnel No. 2 . .	1,037	20,000	4.2	360
Ditch No. 2 . .	3,000	2,500	3.8	230
Flume No. 3 . .	2,300	8,000	13.	835
Ditch No. 3 . .	1,600	2,000	3.8	230
Flume No. 4 . .	332	1,200	13.	835
Ditch No. 4 . .	2,400	2,500	3.8	230
Flume No. 5 . .	436	1,500	13.	835
Ditch No. 5 . .	1,200	1,000	3.8	230
Flume No. 6 . .	2,720	12,000	25.6	770
Ditch No. 6 . .	1,400	730	4.1	310
Creek	11,000	1,500	Large enough to carry storm waters	
Dam		2,500		
Flume No. 7 . .	320	900	11.	525
Ditch No. 7 . .	3,700	1,800	2.3	300
Flume No. 8 . .	176	400	11.	525
Ditch No. 8 . .	5,500	2,700	2.3	300
Flume No. 9 . .	128	300	11.	525
Ditch No. 9 . .	7,100	3,500	2.3	300
Flume No. 10 . .	320	1,000	11.	525
Ditch No. 10 . .	1,426	4,750	2.9	250
Flume No. 11 . .	320	800	11.	525
Ditch No. 11 . .	934	1,300	2.9	250
Flume No. 12 . .	272	800	11.	525
Ditch No. 12 . .	2,247	3,500	2.9	250
Flume No. 13 . .	656	2,000	11.	525
Ditch No. 13 . .	1,400	2,540	2.3 Sec. I	300
" "			4.6 Sec. II	330
Flume No. 14 . .	340	600	11.	525
Ditch No. 14 . .	5,546	2,600	3.3 Sec. I	190
" "			2.3 Sec. II	300
Flume No. 15 . .	608	2,000	11.	525
Ditch No. 15 . .	831	581	2.3	300
Flume No. 16 . .	112	340	11.	525
Ditch No. 16 . .	351	640	2.3	300
Flume No. 17 . .	176	525	11.	525
Ditch No. 17 . .	6,893	5,635	3.3 Sec. I	190
" "			2.3 Sec. II	300
Flume No. 18 . .	272	890	11.	525
Ditch No. 18 . .	6,528	5,600	3.3 Sec. I	190
" "			2.3 Sec. II	300
" "			4.1 Sec. III	350
Ditch No. 19 . .	5,000	Apprx. 2,500	2.5	245

Pausell Lake, 6600 feet; should be used as ditch, not as reservoir.
 Escalon Lateral, 4 miles, @ \$950, \$3800; vel., 1.8; cap., 86.
 Lathrop Lateral, 10 miles, @ \$975, \$9750; vel., 1.5; cap., 95.
 Farmington Lateral, 22 miles, @ \$—, \$—; vel., —; cap., —.

BARROW, WADE, GUTHRIE & CO.
CHARTERED ACCOUNTANTS.
ALSO AT
NEW YORK AND CHICAGO.
J. JENKIN, SAN FRANCISCO.
MILLS BUILDING, SIXTH FLOOR
EDWIN GUTHRIE & CO.
LONDON AND MANCHESTER, ENGLAND.

SAN FRANCISCO, CAL., February 15, 1896.

J. DALZELL BROWN, ESQ.,

Secretary California Safe Deposit and Trust Co.

San Francisco, Cal.:

DEAR SIR:—

We have carefully examined the books in detail of the Stanislaus and San Joaquin Water Company; are favorably impressed with the intelligent manner the accounts are formulated, and also with the accuracy of all postings, footings, etc. We are, therefore, in a position to certify that all matters of income and expenditure have been carefully and accurately classified and recorded.

The relationship of this Company, as successors to the San Joaquin Land and Water Company has been, we understand, passed on by Messrs. Gunnison, Booth & Bartnett, the attorneys for the California Safe Deposit and Trust Company, so that all questions as to the legal status of this Company, and its title to real estate, riparian rights, water rights, rights of way, franchises in general, need no remarks from us.

Neither is it within our province to express an opinion as to the value of the canals and works of this corporation

as stated in the accounts. The fact that this has been done, as we understand, by well known and reputable engineers and appraisers, is sufficient. Nevertheless, we cannot but see the fact that this corporation, as successors in interest to a preceding Company, in placing against the capital stock it has issued, certain values for "water rights," "real estate," and "canal and works," has done so on conservative figures. From our personal knowledge of works for irrigation and the values of waters available for that purpose, and, from inquiries we have made relative thereto for this Company, we are convinced that the value of the water available for sale, as water rights, will eventually realize a much higher figure than is represented in the books. For the purpose of the accounts, we find the value of the water rights was placed at \$866,500, against which have been credited for water rights sold to this date, \$138,989.20, leaving a balance for unsold water rights of \$727,510.80. When water rights have been sold exhausting this balance, the Company will still have available water for the issue of further water rights to a very considerable amount.

The Company, we find, was incorporated 20th October, 1894, with a capital stock of 15,000 shares, at \$100 per share, or a capital of \$1,500,000. The number of shares, however, issued is 10,070, at \$100 each, showing an actual paid-up capital of \$1,007,000. There are, therefore, shares of capital stock not issued to the extent of 4930 shares, or \$493,000.

We have examined the stock ledger of the Company, and find same to agree with the capital stock account in the Company's general ledger.

The amount charged to the construction account on the Company's books of \$167,999.37 has been expended by the

present Company during its operations. The value of expenditures on works prior to its incumbency is represented in the canal and works account as \$200,000. This is confirmed partially by the books of the old corporation, which books we have seen, and which apparently are not complete. This incompleteness is occasioned by the practice of not placing a liability incurred on the books until it is paid, and, consequently, the chargings to sundry accounts are not made. In this connection, we would remark that we learn that the present Company, at the end of each month, has no outstanding liabilities not recorded in its books. The books, therefore, contain a completed record for the period ending 31st December, 1895. The value of the canal and works as it now stands, has, we understand, been passed on by competent engineers and appraisers, and the aggregate of the expenditures by the old and the new Company compares favorably therewith.

The water rights issued represent the irrigation of about 13,898.92 acres of land, which at \$10 per acre (the value of the water right), produce a time asset of \$138,989.20. We say "Time Assets," because the payments are deferred to cover a period of 20 years, or at the rate of 50 cents per annum per acre, with interest on the deferred payments at the rate of 6 per cent. per annum.

We have carefully read through the water right agreement—a question on which we have a special knowledge from actual experience elsewhere—and consider that, while a great boon is offered to the farmer in water facilities, the Company has protected itself on all necessary points.

There appears to be no doubt that water rights will be rapidly taken up as the Company's works extend, enabling it to fulfill such contracts. The necessity for irrigation in the San Joaquin Valley is a demonstrated fact.

The water rentals, payable in November of each year, are at the rate of \$1.50 per acre.

The security for payment of water rights and water rents is a lien on the land by the water right agreement duly signed, acknowledged, and recorded. We have examined each water right agreement issued in duplicate, and compared same with the water right register and with the money value of same in the ledger, and found them in order.

It is premature, at the present moment, to say what will be rental income in November next, for two reasons: we do not know absolutely the acreage that the Company will reach in the meantime; moreover, we do not know the number of acres the holders of water rights will elect to irrigate according to an option given them in their water right. From November next, it is hoped that the Company will have so far completed its works that all water rights issued will be revenue bearing.

The revenue per acre, as arranged by the water right agreement, is as follows:

On account of water rights and interest on deferred payment	\$0 80
On account of water rentals	<u>1 50</u>
Total	\$2 30

We attach herewith a blank printed water right form in evidence of certain statements made in this report.

The arrangement entered into for the purpose of the issuance of bonds appears to us to be a conservative one, and one that is an absolute protection to the bond-holders. The fact that the Trustees, the California Safe Deposit and Trust Company, will not only receive a trust deed on all the Company's property and be the custodians of the water

right agreements for the benefit of the bond-holders, but, further, that they will receive all incomes from water rights and rentals, and reserve from such revenues the amount necessary as a sinking fund for the redemption of the bonds at maturity, and only the excess of revenues over and above the sinking fund to be paid to the corporation, affords a security to the bond-holders of the most absolute kind. That the Company sees its way clear for such an arrangement as this, shows its confidence in the enterprise and that it is with reason sanguine of success.

The geographical position, the occupancy and cultivation of the land, its topography, its climate, its soil, and its proximity to railways and water-ways for local or foreign markets, indicate that this enterprise properly and economically managed with the same persistence that has characterized the past which has evolved the present works, notwithstanding the engineering difficulties encountered, must, *per se*, be an ultimate and substantial success.

We submit herewith a general statement of the books in the form of assets and liabilities for December 31, 1895, with our certificate attached thereto.

The accuracy, intelligence and neatness of the Company's books and accounts cannot be too highly commended.

Every facility has been afforded us in making our investigation, enabling us to submit this report.

Yours faithfully,

BARROW, WADE, GUTHRIE & CO.

STANISLAUS AND SAN JOAQUIN WATER
COMPANY.

BALANCE SHEET, DECEMBER 31, 1895.

LIABILITIES.

Capital Stock—10,070 shares, at \$100 each, fully paid		\$1,007,000 00
Bills Payable Account		180,126 10
Sundry Creditors:		
H. W. Cowell	\$12,001 93	
H. W. Cowell and N. S. Harrold	927 50	
N. S. Harrold	26,887 21	
E. C. Cowell	458 53	
W. L. Rockwell	1,198 84	
John Kelso	5,931 59	
P. A. Buell & Co.	618 66	
J. D. McDoughald	3,610 81	
San Francisco Bridge Co.	7 66	
J. D. Rush	90	
Stockton Milling Co.	178 40	
S. D. Woods	9,749 70	
H. I. Willey	300 75	
George Perley	37 90	
Joshua Cowell	936 49	
J. Dempster McKee	200 00	
W. P. Gillispie	410 78	
Grangers' Union	723 10	
Treasurer in Bank	2,742 40	
Sundries	4,648 84	
		71,571 99
		<u>\$1,258,698 09</u>

ASSETS.

Water Rights	\$727,510 80	
Canal and Works	\$200,000 00	
Canal and Works, con- struction during 1895	167,999 37	367,999 37
		<hr/>
Real Estate	5,000 00	
Tools and Implements	521 50	
Sundry Debtors for Water Rights . .	138,989 20	
Furniture and Fixtures	202 75	
H. W. and J. Cowell	26 18	
		\$1,240,249 80
		<hr/>
Profit and Loss Accounts, viz:		
Abstracts, Notaries, Etc.	404 35	
Advertising	433 00	
Commission, Fees and Collections Expenses	2,260 00	
Interest	1,408 04	
Legal Expenses	1,263 11	
Rebate and Damages	10,937 80	
Rents	144 00	
Salaries	68 35	
Stationery and Printing	925 00	
Traveling	460 64	
	144 00	
		18,448 29
		<hr/>
		\$1,258,698 09
		<hr/> <hr/>

LAW OFFICES OF
GUNNISON, BOOTH & BARTNETT.

A. J. GUNNISON,
A. G. BOOTH,
W. J. BARTNETT,

SAFE DEPOSIT BUILDING,
328 MONTGOMERY STREET.

SAN FRANCISCO, CAL., September 10, 1895.

J. DALZELL BROWN, ESQ.,

Secretary California Safe Deposit and Trust Co.

San Francisco, Cal.:

DEAR SIR:—

Stanislaus and San Joaquin Water Company.—We have made a careful examination of the proceedings taken by the Stanislaus and San Joaquin Water Company in the matter of its issue of 350 bonds, bearing date July 25, A.D. 1895, each for the sum of \$1000, and secured by a mortgage to the California Safe Deposit and Trust Company, as Trustee, covering all the property, real and personal, of said Stanislaus and San Joaquin Water Company, and as the result thereof, submit the following:

Opinion.—We have examined the original Articles of Incorporation and the records of said corporation, and are of the opinion that all the proceedings taken in the matter of the incorporation of the Stanislaus and San Joaquin Water Company, the organization of the corporation, the issue of its bonds bearing date July 25, A.D. 1895, and the mortgage securing the same, have been in strict conformity to the provisions of our statute relating to corpora-

tions, and that said bonds constitute a valid and legal obligation of the Stanislaus and San Joaquin Water Company.

Real Estate.—The title to the first tract or parcel of real estate in said mortgage described is a United States patent to George Hearst, J. B. Haggin and A. B. Preston, and by *mesne* conveyances is vested in the Stanislaus and San Joaquin Water Company, subject to the lien created by said mortgage to the California Safe Deposit and Trust Company, as Trustee, to secure its said issue of bonds.

The title to the main portion of the other property described in said mortgage was held by the San Joaquin Land and Water Company, and from a careful examination thereof, and of the organization and records of said last named company, we are of the opinion that said corporation was legally formed and organized, and acquired a valid title to the property conveyed by it. That all the proceedings relative to the sale and transfer of its property were taken in strict compliance with our statute, the sale having been made by the Board of Directors, after due authorization by the stockholders, and after notice given as required by law.

After the sale and transfer of the property by said corporation, said San Joaquin Land and Water Company was, by a decree of the Superior Court of San Joaquin County, State of California, declared dissolved, and the judgment roll filed April 29, 1895. The conveyances from said San Joaquin Land and Water Company to the grantor of the Stanislaus and San Joaquin Water Company, and the conveyances to the last-named corporation are, we believe, valid conveyances, and the title, in our opinion, is vested

in said Stanislaus and San Joaquin Water Company, subject to the lien created by said mortgage to the California Safe Deposit and Trust Company, Trustee, as aforesaid. The remaining property in said mortgage described consists of rights of way and other property acquired by the said Stanislaus and San Joaquin Water Company not formerly held by said San Joaquin Land and Water Company.

Rights of Way.—Rights of way have been conveyed to the Stanislaus and San Joaquin Water Company by the Oakdale Land and Improvement Company; by various persons along the line of the main canal; by contracts entered into between owners of lands and the said Stanislaus and San Joaquin Water Company for the sale of water rights, which contracts have been assigned to the California Safe Deposit and Trust Company, as Trustee, under the terms of said mortgage. The deeds to the rights of way have not all been executed and recorded, but we are informed that no difficulty exists in the procuring of such rights of way. For a portion of the distance, we are informed, the canal follows the natural course or channel of the Lone Tree Creek in a general westerly direction. The rights of way for the main lateral referred to in subdivision VII of the mortgage, and running in a general northwesterly direction from the main canal, at or near Knights Ferry, we are informed, follows the natural water course or channel of the Little John Creek, a distance of about 14 miles. The length of the canal and the distances above referred to are to be determined from an engineer's report. We are of the opinion that the corporation has the legal right to the water course or channel of the creeks above referred to.

Appropriations of Water.—The main title to the water in question is acquired from appropriations by M. F. Tarpey and J. Gambetta, June 3, 1887, amounting to 350,000 inches, and L. U. Shippee and James A. Morrissey, October 8, 1887, amounting to 300,000 inches, and by Abraham Schell, October 7, 1887, amounting to 100,000 inches.

The said San Joaquin Land and Water Company, in April, 1888, filed a notice of change of place of diversion of the waters of said Stanislaus River, reciting the former appropriations by M. F. Tarpey and J. Gambetta, and by L. U. Shippee and James A. Morrissey, and by Abraham Schell, and further reciting that claims have been kept and said rights maintained by excavations and works whereby said waters were to be diverted in accordance with Section 1416 of the Civil Code of the State of California.

The point of diversion of said waters in said claims and each of them was changed by said notice to a point on the Stanislaus River 4600 feet below a dam of the San Joaquin Ditch Company, known and called the "Schell Dam," and claiming the waters flowing in said river, to the extent of at least 200,000 inches, measured under a four-inch pressure, and reciting the purposes for which said water is claimed, and places of intended use and the means of diversion, which notice was recorded on April 18, 1888, in the records of Calaveras County.

Some prior appropriations of water from the Stanislaus River have been made, but we are informed that none of the appropriators have acquired title, to any considerable amount, of the waters thereof.

The records of the County Recorders' offices will not show the use of the water, but if work has been prosecuted diligently and uninterruptedly to completion, and the water

has been used to the amount claimed by said Company, and for useful and beneficial purposes, we are of the opinion that the title of the Stanislaus and San Joaquin Water Company to the water in question is valid to an amount that the ditch or flume of said Company is capable of carrying, not exceeding however, the amount of 200,000 inches, and subject, nevertheless, to the rights of prior appropriators referred to above.

Various riparian rights have already been acquired, and the corporation, we are informed, is now procuring, and will procure, all necessary rights of such owners, to the end that no question may ever be raised respecting the title of said corporation to the waters claimed by it.

Conclusion.—Some objections may be found to the title of portions of the property under consideration, particularly prior to 1860; many of these defects will be cured by the statute of limitations, and taken as a whole, we are of the opinion that, subject to the said mortgage to the California Safe Deposit and Trust Company the title to said property is vested in said Stanislaus and San Joaquin Water Company.

The mortgage to the California Safe Deposit and Trust Company securing said issue of bonds has been duly executed and recorded in the counties of Calaveras, Stanislaus, Tuolumne and San Joaquin, both as a mortgage of real estate and as a mortgage of personal property, and also recorded as a mortgage of personal property in the City and County of San Francisco, State of California, and said mortgage, in our opinion, constitutes a valid lien and charge upon the entire property of said corporation, mortgagor; and the bonds of said corporation, when duly

executed, under the corporate seal and signed by the President and Secretary thereof, and duly certified by the California Safe Deposit and Trust Company, as Trustee, constitute a legal obligation of said Stanislaus and San Joaquin Water Company.

Respectfully submitted,

GUNNISON, BOOTH & BARTNETT,

Attorneys.



APPENDIX.

[Dictated by S. D. W.]

STOCKTON, CAL., September 14, 1895.

HON. A. G. BOOTH,
San Francisco, Cal.:

DEAR SIR:—

Pursuant to your request, be beg leave to state that we have carefully examined the title to the real property now owned by the Stanislaus and San Joaquin Water Company, which lies principally in the counties of Calaveras, Stanislaus and San Joaquin, in the State of California (a small tract of land and one end of the "New Dam," so called, lying in the County of Tuolumne, State of California), as well as the title to the water rights and rights of way owned by the said Company, and we are able to say that the title to all of said property is, in every respect, a good and sufficient one.

The title may be divided, for convenience, into two parts, as follows:

- 1st. The old title.
- 2d. The new title.

The old title is that which relates to the property formerly owned by the San Joaquin County Water Company, and known as the San Joaquin County Water Company's Ditch, Dam and Appurtenances, and also commonly called

the "Schell Ditch." This property lies in the Counties of Calaveras and Stanislaus. Beyond the record title to this property, the actual, peaceable, notorious, open and exclusive possession of the predecessors, and grantors, by mesne conveyances of the Stanislaus and San Joaquin Water Company, under a claim of title adverse to all the world, and the payment of taxes levied and assessed upon the same for a period greater than five years, makes, in addition to the record title, under Section 1007 of the Civil Code, a title which is denominated as being good against all.

There are some apparent defects in the title of record, but a careful examination and analysis of the same shows them not to affect the quality of the title in any way whatsoever.

The new title is that which affects the property owned by the Company, outside of the above mentioned property, and relates more particularly to the rights of way which have been acquired directly by said Company from the present owners of the lands through which the rights of way extend. These rights of way already acquired run for many miles, and in all cases where not already acquired, contracts for the same have been made and deeds are being signed and delivered almost daily, and, as a matter of fact, the canal has been actually constructed through the lands.

We have examined the title to the water rights acquired by the Stanislaus and San Joaquin Water Company, and find the title to the same good and substantial.

The diversion of the water from the Stanislaus River is actual, and there are no prior or subsequent water rights or diversions that conflict with the rights of the Stanislaus and San Joaquin Water Company, except in one instance, to wit: that owned by the Stanislaus Milling and Power Com-

pany, which is a small prior water right sufficient to run a mill at Knights Ferry. This water right can be arranged for by this Company, upon just and reasonable terms, at any time, provided there should ever be found to be a conflict as between them. The volume of water in the Stanislaus River is such (as will be shown by the Engineer's Reports) that it will prevent any clash between these interests.

Riparian rights have been acquired by the Company sufficient to warrant the Company in its use of the water without interference, and it is the intention to acquire *all* of these rights as rapidly as possible along the actual length of the river, although the physical condition of the river is such that the riparian owners will be unable to use its waters for any purposes whatsoever, except by expensive mechanical appliances, which, by reason of their costly character, they will be unable, individually, to erect and maintain. The decisions are that no riparian owner has any right beyond the limits on his own land.

We passed the title for the Stanislaus and San Joaquin Water Company at the time of the purchase from H. W. Cowell, and for Mr. H. W. Cowell at the time of his purchase from the San Joaquin Land and Water Company. We are therefore pledged to the validity of this title, in all respects, and that pledge we are ready and willing to maintain at all times against all comers.

Very respectfully yours,

WOODS & LEVINSKY,

Attorneys at Law,

Stockton, Cal.

*To the President and Board of Directors of the
California Safe Deposit and Trust Company:*

GENTLEMEN:—

*In Re-mortgage Stanislaus and San Joaquin Water
Company to the California Safe and Deposit Trust Com-
pany, Trustee:*

Pursuant to your request I have made an examination and appraised the value of certain lands in accordance with the provisions of Article Five (5) of said mortgage and respectfully report upon the character and the value of the lands in question, with the improvements thereon, as follows:

The general character of these lands examined are part deep, dark, vegetable loam, and part chocolate-colored loam and part gray sandy sedimentary loam, well adapted to irrigation, and are quite fertile, producing excellent crops in their present condition; all are in excellent state of cultivation, and in nearly all cases well improved, mostly all fenced and good comfortable residences erected thereon, and all the appurtenances requisite for farming purposes.

These lands are so situate that, with but little expense, they could be made available for irrigation from the water of the Stanislaus and San Joaquin Water Company's canals and water-ways, which are so constructed as to cover the greatest amount of the best lands for irrigation, the Company having appropriated all the creeks that run through the lands, connecting therewith their canals, main, and laterals, so that the lands are easily reached, and, with water, these lands will produce all kinds of fruits, together with alfalfas and all kinds of cereals, in abundance. The grade of these lands are favorable both for irrigation and drainage also, in most cases.

The San Francisco and San Joaquin Valley Railroad runs its line through several tracts of these lands, which

will make transportation easy and at moderate cost to lay down produce at Stockton, the head of navigation.

The following tabulated statement embraces number of contracts, mortgages appraisement, and clear value of lands thus far contracting to purchase water:

NUMBER.	NO. ACRES.	AMOUNT MORTGAGE.	APPRAISEMENT PER ACRE.	CLEAR VALUE.
1	220.29		\$45 00	\$ 9,900 00
2	160	\$ 2,000 00	40 00	4,400 00
3	1,400	20,000 00	50 00	50,000 00
4	1,100	12,000 00	47 50	40,250 00
5	1,619.34	23,389 00	50 00	57,561 00
6	100		40 00	4,000 00
7	320	3,062 00	50 00	12,938 00
8	1,120	13,105 00	50 00	42,895 00
9	1,760	50,000 00	60 00	55,600 00
10	640	12,160 00	45 00	16,640 00
11	390	9,610 00	45 00	7,940 00
12	450	10,550 00	45 00	9,700 00
13	640	3,200 00	45 00	25,600 00
14	120		35 00	4,200 00
15	10			
16	147	1,224 50	45 00	5,390 50
17	40	625 00	40 00	975 00
18	9.61		50 00	475 00
19	80	4,500 00	45 00	
20	40		50 00	2,000 00
21	100	2,205 00	40 00	1,795 00
22	160		35 00	5,600 00
23	80		35 00	2,800 00
24	160		35 00	5,600 00
25	140		37 50	5,250 00
26	160		35 00	5,600 00
27	15	450 00	50 00	300 00
28	80	552 00	55 00	3,848 00
29	320		40 00	12,800 00
30	160			
31	160	1,489 60	40 00	4,910 40
32	40			
33	1,226	11,000 00	613 @ \$40 00 613 @ 50 00	44,170 00
34	80			
35	160			
36	651.68			
	14,058.92			

Respectfully submitted,

THOMAS POYZER.

STANISLAUS AND SAN JOAQUIN WATER CO.

TO

CALIFORNIA SAFE DEPOSIT AND TRUST CO.

TRUSTEE.

FIRST MORTGAGE.

TO SECURE THREE HUNDRED AND FIFTY THOUSAND DOLLARS;
TWENTY YEARS; SIX PER CENT.; SINKING FUND;
GOLD BONDS; INTEREST PAYABLE
SEMI-ANNUALLY.

Dated July 25, A. D. 1895.



Parties of First
and
Second Parts.

THIS INDENTURE made and entered into this 25th day of July, A.D. 1895, by and between the Stanislaus and San Joaquin Water Company, a corporation duly organized and existing under and by virtue of the laws of the State of California, having its office and principal place of business in the City and County of San Francisco, State of California, the party of the first part. and the California Safe Deposit and Trust Company, a corporation duly organized and existing under the laws of the State of California, for the purpose, among other things, of holding and administering property in trust, and having its office and principal

place of business in the City and County of San Francisco, State of California, the party of the second part, witnesseth:

That whereas, heretofore, to wit, on the 15th day of ^{Authorization} ~~of~~ ^{of} ~~Stockholders.~~
June, 1895, the stockholders of the Stanislaus and San Joaquin Water Company, said party of the first part, at a meeting of said stockholders duly noticed and called, as required by law, and holden on the said 15th day of June, 1895, at the office and principal place of business of said Stanislaus and San Joaquin Water Company, at and in the City and County of San Francisco, State of California, at which said meeting, stockholders owning all but ten shares of the entire subscribed capital stock of said Stanislaus and San Joaquin Water Company, said corporation, said party of the first part, were present, and, by a resolution unanimously adopted, duly authorized the creation of a bonded indebtedness of three hundred and fifty thousand (\$350,000) dollars, and duly authorized and directed that bonds for such indebtedness be issued in denominations of not less than one thousand (\$1000) dollars each, and in such form and series as the Board of Directors of said corporation might determine upon, and to bear interest at the rate of six (6) per cent. per annum, payable semi-annually, said bonds to be made payable twenty (20) years from the date thereof; and the said stockholders, at said meeting, in order to secure the payment of said bonds, and the said interest to become due thereon, in and by said resolution, duly authorized, empowered and instructed said Board of Directors of said corporation to cause to be prepared and executed, on behalf of the said Stanislaus and San Joaquin Water Company, said corporation, a deed of trust or mortgage, to a Trustee or Trustees therein to be named, upon all the property, real and personal of said corporation, of

every kind and nature, including all water rights, water filings, canals, ditches, laterals, branches, reservoirs, rights of way, franchises and privileges belonging to said corporation, and such as it may hereafter acquire; and the said Board of Directors were further duly authorized, empowered and instructed to provide a sinking fund in said deed of trust or mortgage, for the payment of said bonds at their maturity, and to do and perform any and every other act or thing necessary to carry out the objects of said resolution; and,

Certificate
Filed with
County Clerk.

Whereas, a certificate in due form of law, signed by the Chairman and Secretary of said stockholders' meeting, and by all the Directors of said corporation, has been duly filed in the office of the County Clerk of said City and County of San Francisco, State of California, in which said county the original Articles of Incorporation of said corporation were and are filed, and a duly certified copy thereof duly filed in the office of the Secretary of State of the State of California, as required by Section 359 of the Civil Code of the State of California; and,

Resolutions of
Directors.

Whereas, the Directors of said corporation, sitting and acting as a Board of Directors, at a meeting of said Board of Directors, duly called, assembled and holden at the office of said Stanislaus and San Joaquin Water Company, said corporation, in the City and County of San Francisco, State of California, on the 24th day of July, 1895, in pursuance of the power and authority so given, as aforesaid, to the end and for the purpose of providing means and raising moneys to pay the existing indebtedness of said corporation for labor done and property actually received, and the indebtedness already incurred, and to be incurred, in the construction and completion of its canals and laterals,

and for the purchase or acquisition of rights of way, water rights, and such other property as are within the purposes and objects of said corporation, did order and direct that a bonded indebtedness of this corporation be made and created to the amount of three hundred and fifty thousand (\$350,000) dollars, and that the bonds of this corporation be issued to the number of three hundred and fifty (350), numbered consecutively from one (1) to three hundred and fifty (350), both inclusive, in the sum of one thousand (\$1000) dollars each, bearing date the 25th day of July, 1895, payable at the office of the California Safe Deposit and Trust Company, in the City and County of San Francisco, State of California.

That all of said bonds shall become due and payable on the 25th day of July, A. D. 1915.

That all of said bonds shall bear interest at the rate of six (6) per cent. per annum, payable semi-annually, on the 25th day of each succeeding January and July, after the date of said bonds; and that said interest be payable at the office of the said California Safe Deposit and Trust Company, said party of the second part, in the City and County of San Francisco, State of California; both principal and interest to be payable in gold coin of the United States of America.

And that said bonds be in substantially the following words and figures, leaving blanks for numbers and signatures:

\$1000.00.

No.....

Bond.

UNITED STATES OF AMERICA,

STATE OF CALIFORNIA.

STANISLAUS AND SAN JOAQUIN WATER CO.

Six Per Cent.; Sinking Fund; First Mortgage; Gold Bond.

(Vignette.)

Amount
Maturity.

Stanislaus and San Joaquin Water Company, a corporation duly organized and existing under and by virtue of the laws of the State of California, for value received, promises to pay to the California Safe Deposit and Trust Company (a corporation), or bearer, one thousand (\$1000) dollars, in gold coin of the United States of America of the present standard of weight and fineness, at the office of said California Safe Deposit and Trust Company, in the City and County of San Francisco, State of California, on the 25th day of July, A.D. 1915, with interest thereon from date, until paid, at the rate of six (6) per cent. per annum, payable semi-annually, in like gold coin, at the office of said California Safe Deposit and Trust Company, upon presentation and surrender of the respective coupons hereto annexed, as they severally become due and payable as provided therein.

Interest.

Series.

This bond is one of a series of three hundred and fifty (350) bonds of like form, tenor and effect and of like amount, bearing date this day and numbered consecutively from one (1) to three hundred and fifty (350) both inclusive, aggregating three hundred and fifty thousand (\$350,000) dollars.

Mortgage.

The payment of the principal and interest of this bond and of the other bonds is secured by a mortgage bearing date the 25th day of July, A.D. 1895, duly executed and delivered by said Stanislaus and San Joaquin Water Company to the said California Safe Deposit and Trust Company, conveying to said California Safe Deposit and Trust Company, in trust for the holders of all of said bonds, all the property, real and personal, water rights, water filings, canals, laterals, branches, reservoirs, rights of way, franchises and privileges of the said Stanislaus and San Joaquin

Water Company, and all that it may hereafter acquire as described in said mortgage, which shall be the first mortgage and paramount lien thereon, and which said mortgage is of record in the office of the County Recorder of the Counties of Calaveras, Tuolumne, Stanislaus and San Joaquin, in the State of California.

This bond is also secured by a deposit with said California Safe Deposit and Trust Company of water contracts upon land under the canals of the said Stanislaus and San Joaquin Water Company, amounting, in the aggregate, to not less than one thousand (\$1000) dollars for each of said bonds issued and outstanding, and bearing interest at not less than six (6) per cent. per annum, and is secured by a sinking fund more fully set forth in said mortgage.

Deposit of
Contracts.

In case default shall be made in the payment of the interest as herein provided, and such default shall continue for four (4) months after demand, or if default be made in the payment of the taxes, or any other promise or agreement as set forth in said mortgage, and such default shall continue for such time as in said mortgage specified, then the principal of this bond shall, at the option of the Trustee, or of the holder or holders of a majority in interest of the bonds then outstanding, to be exercised as prescribed in said mortgage, forthwith become and be immediately due and payable.

Default.

The creation of said bonded indebtedness is authorized by the affirmative vote of more than two-thirds ($\frac{2}{3}$) of the stockholders of this corporation, and by the unanimous vote of the Board of Directors thereof, and in manner and form prescribed by law.

Authorization.

This bond is issued subject to all the provisions in said mortgage contained, and shall not be valid until the certificate endorsed hereon shall have been signed by said Trustee.

In Witness Whereof, the Stanislaus and San Joaquin Water Company has caused its corporate name and seal to be hereunto affixed, and this bond to be signed by its President and Secretary, at its office in the City and County of San Francisco, State of California, this 25th day of July, A. D. 1895.

STANISLAUS AND SAN JOAQUIN WATER CO.,

By President.

By Secretary.

Coupons.

And said Board of Directors, at said meeting of said Board, did further order and direct that to each of said bonds, numbered from one (1) to three hundred and fifty (350), both inclusive, there should be attached forty (40) coupons; one (1) payable each half year on the 25th day of January and July in each year thereafter; and that said interest coupons be in substantially the following words and figures, leaving blanks for dates and numbers, and with the signature of C. H. Leadbetter, Jr., Secretary, engraved or lithographed thereon, and which form of interest coupon was fixed and determined upon by said Board of Directors, that is to say:

[COUPON.]

\$30.00.

No.....

Stanislaus and San Joaquin Water Company will pay to bearer Thirty (\$30.00) Dollars, in Gold Coin of the United States of America, of the present standard of weight and fineness, at the office of the California Safe Deposit and Trust Company, in San Francisco, California, on the.....day of....., being Six (6) Months' interest then due on bond No.....

.....Secretary.

Trustee's Certificate.

That each of said bonds shall have a certificate endorsed thereon, signed by the Trustee, or its successors, in sub-

stantially the following words and figures, leaving a blank for the signature of the Trustee, which form of certificate was fixed and determined upon by said Board of Directors, that is to say:

[TRUSTEE'S CERTIFICATE.]

It is hereby certified that the within bond is one of a series of Three Hundred and Fifty (350) Bonds, numbered from One (1) to Three Hundred and Fifty (350), both inclusive, referred to in the mortgage therein mentioned.

CALIFORNIA SAFE DEPOSIT AND TRUST CO.,
Trustee,

By.....President.

And the President and Secretary of said corporation were authorized and directed to sign and execute said bonds, and to affix thereto the corporate name and seal of said Stanislaus and San Joaquin Water Company as the act and deed of said corporation; and

Authorization
of Signature.

Whereas, the Directors of said corporation, sitting and acting as a Board of Directors as aforesaid, at said meeting, in further pursuance of the power and authority so given as aforesaid, to secure the payment of said bonds and the interest thereon, did further order and direct that the said Stanislaus and San Joaquin Water Company make, execute, acknowledge and deliver to the said California Safe Deposit and Trust Company, of the City and County of San Francisco, State of California, a corporation, which was, by said Board of Directors, selected and chosen as the Trustee to be named in said mortgage, a first mortgage upon all the property, real and personal, water filings, water rights, canals, laterals, branches, ditches, flumes, aqueducts, reservoirs, headgates, dams, conduits, rights of way, rights and franchises, and all other property, of every kind and

Directors'
Authorization
of
Trust Deed.

nature whatsoever, and wheresoever situate, owned by and belonging to said corporation, at the time of the execution of said mortgage on the 25th day of July, A.D. 1895, which was, by said Board of Directors, fixed and determined upon as the date of said mortgage; and also upon all the property of every kind and nature thereafter to be acquired by said corporation, which should be a first mortgage and paramount lien thereon; and the President and Secretary of said corporation were authorized, empowered and directed to cause said mortgage to be prepared, and to execute, acknowledge and deliver the same to the said California Safe Deposit and Trust Company of the City and County of San Francisco, State of California, as Trustee, and that said mortgage should convey to said California Safe Deposit and Trust Company, as aforesaid, all the property of said corporation, and all the property to be by it hereafter acquired, to be held by the said California Safe Deposit and Trust Company as Trustee aforesaid, and to execute, acknowledge and deliver said mortgage in the corporate name and under the corporate seal of said Stanislaus and San Joaquin Water Company, said party of the first part; and

ors' ration
Fund. *Whereas*, the Directors of said corporation, sitting and acting as a Board of Directors as aforesaid, and at said meeting, did further resolve and determine that a sinking fund should be created for the redemption and payment at maturity, of the bonds above authorized as follows :

and. That all contracts for the sale, delivery and disposal of water or water rights, now held and owned, and such as may be hereafter held or owned by said Stanislaus and San Joaquin Water Company, be and the same shall be in and by said first mortgage, assigned, transferred, conveyed and

delivered to the said California Safe Deposit and Trust Company, as Trustee as aforesaid, in special trust, until there shall be such interest bearing contracts for the sale, disposal and delivery of water for irrigation upon lands under the canals of the said Stanislaus and San Joaquin Water Company to an aggregate amount of not less than one thousand dollars, for each of said bonds which shall be certified to by said Trustee.

Secured by
Water
Contracts.

That said water contracts shall bear interest at not less than six (6) per cent. per annum and shall contain covenants that said contracts shall have the force and effect of a covenant running to and with the land of the person or persons purchasing such water or water rights.

Interest on
Contracts.

That the principal sum expressed in said contracts to be paid shall not exceed fifty (50) per cent. of the fair appraised value of the land described therein.

Value of Lands
Under
Contracts.

That bonds shall not be issued by this corporation nor be certified to by said Trustee until interest bearing contracts of the character above set forth for the sale, disposal and delivery of water, shall be assigned by this Company, and delivered to the said Trustee, to the aggregate amount of not less than one thousand (\$1000) dollars for each of said bonds to be so certified or issued.

That the said Trustee shall be entitled to, and authorized to collect, all sums of money that may grow due on such contracts so assigned and delivered to it for both principal and interest, and that any and all sums that may be, by said Trustee, collected for and on account of the principal of such contracts, shall be held and retained by said Trustee as and for a sinking fund for the payment of the said bonds at maturity and shall not be used for any other purpose except as provided herein.

Revenue
Collected by
Trustee.

Retain
Sinking Fund.

That any and all sums that may be so received and collected by said Trustee, for and on account of the interest on such contracts, shall be held by it for the following purposes:

Expenses of
Trust, Taxes,
Etc.

1st. To pay any and all expenses of the trust or trusts created by said Trust Deed or Mortgage, and for compensation to the said Trustee for its services and disbursements in making such collections, and in the payment of the taxes and assessments that may be levied or imposed by law for which this Company is or may become liable under the Constitution and Laws of the State of California.

Retain Interest.

2d. That the rest, residue and remainder of such collections, for and on account of the interest on such water contracts shall be held, used and employed by the said Trustee for the payment of the interest that may grow due on said bonds as evidenced by the interest coupons.

Water Rental
Collected by
Trustee to
Cover
any Deficiency.

That said Trustee shall be entitled to, and authorized to collect, the annual water rental provided in said contracts so assigned and delivered, and shall retain of such rental, a sum sufficient to pay the expenses of said trust and also such other and further sums as may or might be required for the payment of the interest that may grow due upon said bonds. In the event of any default in the payment of the principal or interest on any of said water contracts, the said Trustee shall be further authorized by said Trust Deed or Mortgage to retain a sum or sums, from the collection for the annual rental of water, sufficient to make good any deficiency occasioned by such default.

Current
Expenses.

The remaining sums in the hands of the said Trustee, received from the collection of the said annual rental of water, shall be paid by it to the Treasurer of the Stanislaus and San Joaquin Water Company, for the purpose of maintaining and operating the canals and works of the said Company, and of paying its current expenses.

That all sums of money in said sinking fund and every part thereof, shall be used and employed by the said Trustee by investing or loaning the same upon good security or by the purchase of bonds and securities of approved standing, including the bonds of this corporation, and any bonds or securities so purchased may be sold, and the proceeds thereof re-invested by said Trustee in other bonds and securities of approved standing, and that all sums of money paid into said sinking fund with the interest, dividends or profits arising therefrom, shall be and remain irrevocably pledged for the redemption and payment of said bonds at maturity.

Investment of
Sinking Fund.

Provided, however, that when there shall be in the possession of said Trustee, and so determined by it, contracts for the sale or disposal of water or water rights, upon none of which any default exists, either in the payment of principal or interest, together with the moneys collected or received by said Trustee from said contracts on which payment in full or in part has been made, together with all interest and income received from the investments in said sinking fund, equal in amount to the said bonds remaining issued, unpaid and uncanceled, then and in that case, no other or further transfers or assignments of contracts for the sale or disposal of water or water rights, shall be made to the said Trustee.

Now therefore, this indenture witnesseth: That the said Stanislaus and San Joaquin Water Company, the party of the first part, for the better securing of the payment of the principal and interest of said bonds, and in consideration of the premises and the sum of ten (\$10) dollars to it paid, the receipt whereof is hereby acknowledged, hath granted, bargained, sold, aliened, transferred, conveyed and confirmed, and by these presents doth grant, bargain, sell, alien,

Party of First
Part Grants.

transfer, convey and confirm, unto the California Safe Deposit and Trust Company, said party of the second part, and its successors in the trust hereby created, all the following described property, to wit:

1st. All those certain lots, pieces or parcels of land, situate, lying and being in the Counties of Calaveras and Tuolumne, State of California, and bounded and described as follows, to wit:

Land.

Beginning at the northeast corner of the claim, a post in stone mound, the same being corner No. 14, of lot No. 37, patented to F. Rico et al., with their claim upon the Rancheria del Rio Estanislao claim, and running thence along the southeasterly boundary of said lot No. 37 south $70^{\circ} 45'$ west 77.00 chains to a post in stone mound marked No. 15; thence south $42^{\circ} 45'$ west 20.00 chains to a post in stone mound marked No. 16; thence south $56^{\circ} 15'$ west 16.40 chains to the northwest corner of the claim, a post in stone mound; thence south 9.00 chains to Stanislaus River; 13.50 chains to the southwest corner of the claim, a post in stone mound being also the quarter section corner on west line of Section 11, Township 1 south, Range 12 east, Mount Diablo Meridian, from which an oak tree bears south 88° east 1.40 chains; thence from said southwest corner north $51^{\circ} 30'$ east 10.00 chains to a post in stone mound; thence north 53° east 16.00 chains to post in stone mound; thence north $41^{\circ} 30'$ east 11.50 chains to post in stone mound; thence north $67^{\circ} 20'$ east 4.00 chains to post in stone mound; thence north 58° east 18.00 chains to post in stone mound; thence north 68° east 10.00 chains to post in stone mound; thence north 60° east 3.10 chains to a post with mound of stones situated on the north line of said Section 11; thence north 55° east 1.50 chains; thence north

64° east 10.00 chains; thence north 68° 30' east 4.50 chains; thence north 66° east 8.55 chains to a post on west line of Section 1 in said township from which an oak tree bears south 27° east 33 links, and a buckeye tree bears south 30° 30' west 80 links; thence from said post north 75° east 2.50 chains to a post in stone mound; thence north 77° east 12.00 chains to a post in stone mound; thence south 86° east 4.30 chains to the southeast corner of the claim, a post in stone mound; thence north 3.50 chains to the place of beginning, save and except that portion of the above described real estate that lies below a point on said river commencing 500 feet above a dam on said river known and commonly called the Keppleman or Temple Dam.

2d. That certain ditch heretofore commonly known and called the "San Joaquin County Water Company's Ditch," situate, lying and being in the Counties of Calaveras and Stanislaus, State of California, together with its dams, reservoirs, flumes, laterals, rights of way and appurtenances of every character, nature, name and description; said ditch having been also sometimes heretofore known and called "The Schell Ditch," and being the same ditch and property heretofore conveyed by A. Schell and others to L. U. Shippee and James A. Morrisey, and by the said L. U. Shippee, James A. Morrisey and M. F. Tarpey conveyed to the San Joaquin Land and Water Company, and by the said San Joaquin Land and Water Company conveyed to H. W. Cowell, and by the said H. W. Cowell and N. S. Harrold conveyed to said party of the first part, said ditch and property being more particularly bounded and described as follows, to wit:

Ditch and
Rights of Way.

The dam formerly owned by the said San Joaquin County Water Company, situate on the Stanislaus River at Six

Mountain
Division of
Canal.

Mile Bar in the Counties of Calaveras and Tuolumne; the ditch leading from said dam, down the north bank of said Stanislaus River to the western extremity of Goat Hill in Stanislaus County; thence in a northwesterly direction crossing Dent's Gulch near its head; thence in a southerly and westerly direction to the Company's big reservoir in Fred Hoffman's field, about three miles below the town of Knights Ferry in said County of Stanislaus, State of California, together with a strip of land ten feet wide on each side of the ditches, flumes, reservoirs and dams of said property, the said ditch having been, by said party of the first part, enlarged into a canal, and increased in size and strength, and the same now constituting what is known as "The Mountain Division" of the main canal of said party of the first part.

Water Rights.

Tarpey and
Gambetta.

Shippee and
Morrisey.

3d. All the rights to the waters of the Stanislaus River appropriated by filings for water rights by M. F. Tarpey and John Gambetta, notices of the appropriation of said water having been duly filed and recorded in the office of the County Recorder of Calaveras County, State of California, on the 11th day of June, 1887, in Book K of Mining Claims, on pages 93, 94 and 95; and by filings for water rights by L. U. Shippee and James A. Morrisey, notices of the appropriation of said water having been duly filed and recorded in the office of the County Recorder of the County of Calaveras, State of California, on the 12th day of July, 1887, in Book K of Mining Claims, on pages 109, 110, 179 and 180; and by filings for water rights by A. Schell, notice of the appropriation of said water having been duly filed and recorded in the office of the County Recorder of the County of Calaveras, State of California, on October 14th, 1887, in Book K of Mining Claims, on page 182;

also the rights to the waters of Little John Creek, appropriated by filings for said waters by M. F. Tarpey and John Gambetta, notice of the appropriation of said waters having been duly filed and recorded in the office of the County Recorder of the County of San Joaquin, State of California, on August 8th, 1887, in Book G, Vol. 7 of Miscellaneous, pages 188 and 189; also the rights to the waters of French Camp Slough, appropriated by filings for said water by M. F. Tarpey, notice of the appropriation of said waters having been duly filed and recorded in the office of the County Recorder of the County of San Joaquin, State of California, on October 10th, 1887, in Book G, Vol. 7 of Miscellaneous, page 294, together with all and singular all the rights and privileges connected with or appertaining to the said water rights; all of said water rights having been, by *mesne* conveyance, heretofore conveyed to said party of the first part.

4th. All the rights to the waters of the Stanislaus River, appropriated by said San Joaquin Land and Water Company by change in the location of said above described water rights on said Stanislaus River, by it made on the 17th day of April, 1888, notice of which said change of location was duly recorded on the 18th day of April, 1888, in Book K of Mining Claims, on pages 385, 386, 387, 388 and 389 of Calaveras County records.

Water Rights
San Joaquin
Land and
Water Co.

5th. The new dam constructed by said San Joaquin Land and Water Company, situate in Calaveras County, State of California, about six miles above Knights Ferry at Six Mile Bar, together with all tunnels, ditches, canals and rights of way therewith connected.

New Dam.

6th. The right of way conveyed by deed made, executed, acknowledged and delivered to the said San

Right of Way
from
Abraham Schell

Joaquin Land and Water Company by Abraham Schell of the County of Stanislaus, State of California, on the 14th day of September, 1888, and of record in the office of the County Recorder of the County of Stanislaus, State of California, in Liber 49 of Deeds, on page 357, said right of way affecting and covering the following lands, to wit: Any lands which the said Schell owned and possessed lying, being and situate in the Middle Subdivision of the Rancheria del Rio Estanislao, originally confirmed by the United States Government to Francisco Rico and Jose Antonio Castro, and being in the County of Stanislaus, State of California, according to Albert Packard's Private Survey made by A. G. Stakes, United States Deputy Surveyor of said subdivision; the said conveyance including a tunnel said to be 900 feet long, which brings the water from the San Joaquin County Water Company's Ditch to Red Mountain Vineyard; said conveyance also conveying so much of the creek as runs through the said vineyard; the land on each side of said creek being excepted from sale and conveyance in said right of way, the foregoing land being in Township 1 south, Range 11 east, and in Township 1 south, Range 12 east, Mount Diablo Base and Meridian, in Stanislaus County, State of California.

Main Canal
and Laterals.

7th. All the main lines and laterals of the canals of the said party of the first part situate, lying and being in the said Counties of Calaveras, Stanislaus and San Joaquin, State of California, now constructed and in the course of construction, running in a general westerly direction for the main canal through Township 1 south, Range 12 east; Township 1 south, Range 11 east; Township 1 south, Range 10 east; Township 1 south, Range 9 east; Township 1 south, Range 8 east, and Township 1 south, Range 7

east, Mount Diablo Base and Meridian; a main lateral running in a general northwesterly direction through Township 1 south, Range 12 east; Township 1 south, Range 11 east; Township 1 north, Range 11 east; Township 1 north, Range 10 east, and Township 1 north, Range 9 east, Mount Diablo Base and Meridian.

8th. All rights of way owned, held or acquired along the entire length of the main canals and laterals of the said party of the first part, together with all tunnels, ditches, flumes, aqueducts, reservoirs, head-gates, dams and conduits, and all other property, of every kind and description whatsoever, appertaining to and owned by and used in connection with the said canals, and all the branches and laterals thereof, in the said Counties of Calaveras, Stanislaus and San Joaquin.

9th. All and singular the property and estate of the said party of the first part, of every kind, nature and description, real, personal and mixed; also all grants, licenses, easements, privileges and franchises, leases, endowments and advantages, and all revenues, rates, tolls or income arising, or to arise, from said real estate, water, water rights, canals, branches, laterals and all extensions thereof, and all property and estate, real, personal and mixed, of every character, kind and description, now claimed or possessed by the said party of the first part, together with all and singular the tenements, hereditaments, rights, privileges, easements and appurtenances thereunto belonging, or in anywise appertaining, or at any time held or enjoyed therewith, and the reversion and reversions, remainder and remainders, tolls, incomes, revenues, rents, issues and profits thereof, and also all the rights, titles, interests, estates, properties, possession, claim and demand, as well in law as in equity, of

Rights of Way.

Remainder of
Property.
Privileges.
Revenue.

the said party of the first part of, in and to the same, and every part and portion thereof.

Party of Second
Part Holds.

To have and to hold, all and singular, the above granted and described premises, property, rights and franchises, with the appurtenances, unto the said party of the second part, and to its successors duly appointed, upon trust, and for the equal pro rata benefit and security of the person or persons, co-partnership firms, body or bodies, politic or corporate, who shall become or be, from time to time, owners or holders of the said mortgage bonds, or any or either of them, without any preference or priority of any one of said bonds over the residue or remainder thereof, and subject to the trusts, uses, purposes, agreements and conditions in this indenture contained, and subject to all of which conditions and agreements the bonds secured by this indenture are to be issued and are to be received and held by each and every holder of said bonds, or any of them.

Provided, always, and these presents are upon the express condition that, if the party of the first part, or its successors, shall well and truly pay, or cause to be paid, unto the owners or holders, from time to time, of said bonds, and of each and every one of them, the said sums of money secured to be paid by the said bonds and the interest coupons attached thereto, or to grow due thereon, at the place and time, and in the manner set forth in said bonds, according to the true intent and meaning thereof, then these presents and all the property, estate, rights, franchises and privileges herein and hereby granted and conveyed, shall cease and determine, and this indenture shall be void.

ARTICLE I.

Until default shall be made by said party of the first part in the payment of the principal and interest of said bonds, or some one or any of them, according to the tenor thereof, or of the coupons thereto annexed, or some one or any of them, at the time or in the manner named for the payment thereof, or shall make default or breach in the performance or observance of any condition, obligation or requirement contained in said bonds, or in this mortgage, the said party of the first part may possess, manage, operate and enjoy all of the said lands, canals, premises, property, rights and franchises hereinbefore described, and receive and take the rents, issues and profits thereof, subject only to the provisions herein contained respecting the creation and maintenance of the sinking fund.

Possession and
Management.

ARTICLE II.

In case default shall be made in the payment of said sums of money specified in said bonds, at the several times and dates therein mentioned, or any or either of them, or in the payment of interest coupons, or any or either of them, or any part thereof, and if the same shall remain unpaid for the period of four (4) months after demand, and from and after the time when the same should have been paid, according to the terms of said bonds, the same having been presented for payment at the place provided therefor, then the principal of said bonds and all of them shall, at the option of the said Trustee, or of the holder or holders of a majority in interest of said bonds then outstanding, forthwith become and be immediately due and payable, and the lien or incumbrance hereby created may be at once enforced; and in such case the party of the

In Case of
Default for
Four Months,
Trustee or
Bondholders
Take
Possession.

second part may, at its option, or at the option and on the request of the holder or holders of a majority in interest in said bonds then outstanding, enter into and upon and take possession of all, or any part of the said premises and property herein described, and manage and operate the same and receive the income, receipts, rents, issues and profits thereof, and out of the same pay:

Expenses. 1st. The necessary expenses of properly managing and operating the same, including therein such reasonable compensation as it may allow to the several persons employed or engaged in such management, and a reasonable compensation to the party of the second part, or its successors, for care, diligence and responsibility in the premises, and all other reasonable and proper charges and expenses in the care and management of said property; and,

Interest and Principal. 2d. As far as the same will suffice, the interest and principal, if any, which may be due on said bonds, pro rata and without preference, and the over-plus, if any, to the party of the first part, its successors or assigns; and in case of any deficiency, to apply said receipts, after payment of all of said charges and expenses, to the payment thereof rateably, without preference of any kind; or the said party of the second part may, in such case and at its option, foreclose this mortgage and sell and dispose of all the property, canals, branches, laterals, water, water rights, privileges and franchises, real and personal, with the appurtenances herein and hereby granted, or so much thereof as may be necessary, according to law, and out of the money arising from such sale to pay:

May Sell.

1st. The costs, charges and expenses of the foreclosure and sale, including therein reasonable counsel fees for con-

ducting said proceedings, to be allowed and fixed by the court, and

2d. Any expenses, costs and charges for the execution of the trust, previously incurred and remaining unpaid, and

3d. A reasonable compensation to the Trustee acting in the premises, for its or his care, trouble and services in completing the execution of this trust and the distribution of the proceeds of the sale, to be fixed by the court; and

4th. To distribute the residue of said proceeds among the holders of said bonds, in proportion to their several interests, until all have been paid in full, principal and accrued interest; and the over-plus, if any, to the party of the first part, its successors or assigns.

ARTICLE III.

The party of the first part hereby covenants, promises and agrees to and with the said party of the second part, that it, said party of the first part will, from time to time, and at all times hereafter, so long as any of said bonds shall remain outstanding and unpaid, pay and discharge all taxes and assessments, ordinary and extraordinary, and all and every lien and incumbrance of any kind, name and nature, which may be assessed or levied upon the property herein described and hereby conveyed, and which may in any way, either in law or in equity, be or become in effect a charge or lien thereon prior to these presents, or to which this mortgage may be subject or subordinate.

Taxes.

And in case default shall be made by the party of the first part in paying such taxes or assessments, liens or incumbrances, for so long a time as to cause a penalty by law to attach to said tax or assessment, by reason of the delay in the payment thereof, then and in that case the said

Trustee shall be authorized to pay such taxes or assessments from any money that may be received and collected by it for and on account of the interest on the said water contracts, and in accordance with the provisions hereinafter set forth in Article V of this mortgage.

Non-Payment
of Taxes
Equivalent to
Default.

And in the event that there shall be no funds in the hands of the said Trustee, pursuant to the said provisions of said Article V, from which such payment may be made of such taxes and assessments, then and in that case the said bonds which may be outstanding shall, at the option of the holder or holders of a majority in interest of said bonds then outstanding, or at the option of the party of the second part, immediately become due and payable, and the party of the second part may enter upon and sell and convey the property hereby conveyed, upon the same terms and conditions, and in the same manner as hereinbefore expressed and provided, or, at its option, may institute an action or actions, and sell and convey the same as hereinbefore expressed and provided for in respect to a default in the payment of the principal or interest of said bonds.

ARTICLE IV.

The party of the first part hereby covenants, promises and agrees, to and with the said party of the second part, that it, said party of the first part, will, from time to time, and at all times hereafter, so long as any of said bonds shall remain outstanding and unpaid, do and perform each and every act or thing which it is required to do or perform, either by the laws of the State of California or the ordinances, laws or regulations of the Counties of Calaveras, Tuolumne, Stanislaus and San Joaquin, or any other city, town or county wherein any of its property may be situated,

or that may be required by its own By-Laws, resolutions or regulations; and that it will maintain and keep its said canals, branches, laterals, ditches, flumes, aqueducts, reservoirs, head-gates, dams, conduits and property of every kind and nature in connection therewith, in good and complete order and condition, and fully supplied with all proper and reasonable machinery and equipments; and that it will, from time to time, make all needful and proper repairs and replacements, and will preserve and keep the same and every part thereof, and all the property above described, and hereby conveyed or intended so to be, free and clear of and from all laborers' and mechanics' liens, judgments or other incumbrances, which may or might, in any way, be superior or prior to the lien of these presents; and it will apply the proceeds received from the sale of the said bonds to the construction and completion of its canals, reservoirs, dams, laterals, ditches and other property, and to the payment of all indebtedness incurred, or to be hereafter incurred, in purchasing, developing, extending and improving its system of irrigation.

ARTICLE V.

The party of the first part hereby covenants, promises and agrees to and with the said party of the second part, that it, said party of the first part, will, for the purpose of creating a sinking fund for the retirement and payment of said bonds at maturity, and at the times and dates when the same shall become due and payable, as in said bonds specified, assign, transfer, convey and deliver, and does hereby assign, transfer, convey and deliver, to the said party of the second part all contracts, agreements or other obligations for the purchase and sale of water now held or

owned by said party of the first part, and does further covenant that all contracts, agreements or other obligations for the purchase and sale of water that may be by it, said party of the first part, hereafter made and entered into, shall and will be assigned, transferred, conveyed and delivered by it, the said party of the first part, to the said party of the second part, as provided herein, and upon the terms and conditions hereinafter expressed in Article VII of this instrument.

And provided further, that contracts for the sale, delivery and disposal of water and water rights that may be hereafter acquired, shall be so assigned, transferred, conveyed and delivered by the said party of the first part, to the said party of the second part, until there shall be such interest bearing contracts for the sale, disposal and delivery of water for irrigation upon lands under the canals of the said party of the first part to an aggregate amount of not less than one thousand (\$1000) dollars, for each of said bonds which shall be certified by the said party of the second part, its successors or assigns.

That said water contracts shall bear interest at not less than six (6) per cent per annum, and shall contain covenants that said contracts shall have the force and effect of a covenant running to and with the land of the person or persons purchasing such water or water rights.

That the principal sum expressed in said contracts to be paid shall not exceed fifty (50) per cent. of the fair appraised value of the land described therein. That, to ascertain such value, such lands shall be appraised by a competent, disinterested appraiser or grader, to be selected by the said party of the second part, whose compensation shall be paid by the said party of the first part.

That the said party of the second part, its successors or assigns, shall be entitled to, and authorized to collect, all sums of money that may grow due on such contracts so assigned and delivered to it, for both principal and interest; and that any and all sums that may be by said Trustee, the said party of the second part, collected for and on account of the principal of such contracts, shall be held and retained by said party of the second part as a sinking fund for the payment of said bonds at maturity, and shall not be used for any other purpose except as provided herein.

That any and all sums that may be so received and collected by the said party of the second part, for and on account of the interest on such contracts, shall be held by it for the following purposes:

1st. To pay any and all expenses of the trust or trusts created by said trust deed or mortgage, and for compensation to the said Trustee for its services and disbursements in making such collections, and in payment of the taxes and assessments that may be levied or imposed by law upon the property herein described and hereby conveyed.

2d. The rest, residue, and remainder of such collections for and on account of the interest on such water contracts shall be held, used, and employed by the said party of the second part for the payment of the interest that may grow due on said bonds, as evidenced by the interest coupons.

It is further covenanted and agreed, that the said party of the second part shall be entitled to, and authorized to collect, the annual water rental provided in said contracts, so assigned and delivered, and shall retain of such rental a sum sufficient to pay the expenses of such trust; and also such other and further sums as may or might be required

for the payment of the interest that may grow due upon said bonds.

In the event of any default in the payment of the principal or interest on any of said water contracts, it is further covenanted and agreed that the said party of the second part shall be authorized to retain a sum or sums from the collection for the annual rental of water sufficient to make good any deficiency occasioned by such default.

It is further agreed, that the remaining sums in the hands of said party of the second part, received from the collection of the said annual rental of water, shall be paid by it to the Treasurer of the said party of the first part, to be used by the said party of the first part in maintaining and operating the canals and works of said corporation, and to pay its current expenses.

It is further agreed, that all sums of money that may be paid into said sinking fund, including any accumulations thereof, shall be used and employed by the said party of the second part, its successors and assigns, by investing or loaning the same upon good security, or in the purchase of bonds and securities of approved standing, including the bonds of the said Stanislaus and San Joaquin Water Company, party of the first part, and any bonds or securities so purchased may be sold, and the proceeds thereof reinvested by the said party of the second part in other bonds or securities of approved standing; and that all the sums of money paid into said sinking fund, together with all interest, income, dividends, or profits arising therefrom, and the principal sum of all contracts, agreements, or other obligations for the payment of the purchase price or water rights as heretofore specified, and every part thereof, shall be and remain irrevocably pledged for the retirement and payment

of said bonds at their maturity, and at and when the same shall become due and payable, as in said bonds and each of them specified.

Provided, however, that when there shall be in the possession of the said party of the second part, as such Trustee, and so determined by it, contracts for the sale or disposal of water or water rights, upon none of which any default exists, either in the payment of the principal or interest, and bonds and securities, and also moneys collected or received by the said party of the second part in payment of the principal sums expressed in said contracts or agreements, or other obligations, for the purchase price of water as heretofore specified, and also all interest, dividends, and income received from the investment in said sinking fund, equal to the full amount of the bonded indebtedness of said party of the first part, to wit: Three hundred and fifty thousand dollars, or equal to the amount of said bonds remaining issued, unpaid, and uncanceled, then, and in that case, no other or further transfers or assignments of contracts or agreements for the purchase and sale of water and water rights shall be made to the said party of the second part, unless by reason of the failure of any purchaser or purchasers of water to promptly pay at maturity, or within ninety (90) days thereafter, any sum of money specified in said contracts, agreement, or other obligation, so held by the party of the second part as aforesaid; in which case additional transfers and assignments of contracts, agreements, or mortgages as aforesaid, upon request of the party of the second part, shall be made by the said party of the first part, and the said party of the first part may withdraw such defaulted contracts from said sinking fund, with the consent of the said party of the second part; it being distinctly understood and

agreed, however, that at all times there shall be and remain in the possession of the said Trustee, full and sufficient sums of money, bonds, securities, and good and valid contracts and agreements for the purchase and sale of water or water rights, or other obligations which are not in default, and equal in amount to the full issue of said bonds secured hereby, or to the full amount of said bonds remaining issued, unpaid, and uncanceled.

It is further expressly understood and agreed, that in case of failure or neglect on the part of said party of the first part to assign, transfer, convey, and deliver to said party of the second part any and all contracts and other obligations for the purchase and sale of water, as hereinbefore set forth, and as provided for in Article VII, as and for said sinking fund, at the time or times or in the manner herein specified, and such default shall continue for the period of six (6) months from and after the times said sums of money should have been paid, or from and after the time said contracts, agreements, or other obligations should have been assigned, transferred, conveyed, and delivered, as aforesaid, and which time is hereby declared and agreed to be the date of such request in writing, by said party of the second part, upon the said party of the first part, then, and in that case, the said bonds which may be outstanding shall, at the option of the holder or holders of a majority in interest thereof, or at the option of the said party of the second part, immediately become due and payable; and the party of the second part, its successors or assigns, may enter upon and sell and convey the property hereby conveyed upon the same terms and conditions, and in the same manner as hereinbefore expressed and provided, or may institute suits and sell and convey the same, as hereinbefore

expressed and provided for, in respect to a default in the payment of the principal or interest of said bonds.

ARTICLE VI.

And the party of the first part hereby covenants and agrees to and with the party of the second part, and its successors in said trust, that it will, at any time, and at all times hereafter, upon request of the said party of the second part, make, execute, acknowledge, and deliver to the said party of the second part, or to its successors in said trust, all such other and further mortgages, conveyances, assignments, and transfers of said premises and property, or any part thereof, and of any property, water appropriations, rights, and franchises that may be hereafter acquired by it, as may by the said party of the second part be reasonably required for more fully carrying into effect the objects of this conveyance.

ARTICLE VII.

The party of the second part shall release from this mortgage and permit the said party of the first part, upon its written request therefor, to sell and dispose of, from time to time, such portion of the machinery, tools, instruments and material and personal property herein described or that may hereafter be acquired, as may become unfit for use, or such as may be deemed by said party of the first part to be unnecessary for the uses of the corporation, and upon such sale the proceeds thereof shall be used by the said party of the first part in the purchase of property of like character, or in permanent plant or betterment of equal value, and any property so acquired shall become and be subject to the lien of these presents.

Also, any real estate that the Board of Directors of the said party of the first part may, by a unanimous resolution, decide to sell, the said party of the second part shall release from the lien of this mortgage or trust deed, provided it shall deem the price for which said property is to be sold adequate; and upon such sale or sales of said real estate, the proceeds thereof shall be paid by the said party of the first part into the sinking fund, or, at its option, in the purchase of property of like character, or in permanent plant or betterment of equal value, and any property so acquired, whether in substitution of property so sold or otherwise, shall become and be subject to the lien of these presents. The said party of the second part shall be authorized and empowered to cause to be made an appraisalment of any such real property, at the expense of the said party of the first part, before executing any such release, if it shall deem such appraisalment necessary.

The party of the first part also reserves the right to sell permanent water rights for the use of water from the canals of the said corporation, and to execute contracts or deeds for the same, without a release from the party of the second part; *but*,

It is further expressly understood, covenanted and agreed, that no water or water rights shall be sold by the said party of the first part which will, in any manner or form, vitiate or affect any of the contracts referred to in Article V of this mortgage, which may be transferred, assigned or delivered to the said party of the second part as such Trustee.

The said party of the first part further reserves the right and privilege to sell and convey, free from the lien of this instrument, water rights for the sale of water from the canals of said corporation, in consideration of and upon its

receiving good and sufficient deeds conveying to it, the said party of the first part, such number of acres of land as it may agree to accept for the said water rights, and any land so acquired shall thereupon be subject to the lien of these presents, and may be sold only under a release from the party of the second part, as provided in this article; *but,*

It is expressly understood and agreed, that said party of the first part shall not sell or convey, nor shall said party of the second part release from the lien of this mortgage, any of the canals, branches, laterals, ditches, reservoirs, or reservoir sites, dams, rights of way, easements, franchises, or privileges belonging to said party of the first part, and hereby conveyed or intended so to be, or any that it may hereafter acquire, so long as any of said bonds remain outstanding or unpaid, except as in this mortgage expressly provided.

And it is expressly understood and agreed, that all the annual water rentals, as hereinbefore set forth, and all tolls, incomes, revenues, rents, issues, and profits arising from any and all sources from the property hereby mortgaged, is hereby set apart, so far as the same shall be needed, to pay the interest upon any and all bonds issued hereunder, as the same may become due and payable, unless the interest shall be fully met by the collections made pursuant to the provisions of Article V of this instrument, and any deficit arising from any default or lack of collection thereon shall be made good from the before-mentioned rentals, tolls, incomes, revenues, rents, issues, and profits, before any other claim shall be paid therefrom.

ARTICLE VIII.

It is further provided and agreed, that no action shall be commenced or prosecuted against the Stanislaus and San

Joaquin Water Company, party of the first part, upon any of the coupons annexed to said bonds or otherwise, except by the said Trustee, unless the said Trustee, after having been duly requested in writing and having been fully indemnified, as hereinafter provided, shall fail or neglect for three (3) months so to do; and, in case any suit or other proceeding be brought against the said Trustee, by reason of any matter or thing connected with the trusts hereby created, or by reason of its being such Trustee, it shall be under no obligation to enter any appearance by counsel, or in any way to appear or defend such suit or proceeding, until fully indemnified, as hereinafter provided.

ARTICLE IX.

It is further provided and agreed that, in any action or suit brought by the said Trustee, as hereinbefore provided, a receiver may be appointed by the court, upon the application of the said Trustee, without any affidavit, undertaking, or notice of any kind being previously given, whose duties shall be such as the exigencies of the case may demand and as shall be prescribed by the court in regard thereto; and such receiver shall have and receive such compensation as the court may award him.

ARTICLE X.

It is further provided and agreed, and the party of the first part, for itself, its successors and assigns, doth hereby absolutely and irrevocably waive the benefit and advantage of any and all valuation, stay, appraisement, or redemption law or laws, respecting liens or mortgages to be foreclosed by action or suit, and all other laws now existing, or hereafter passed, and which, but for this provision, would

prevent the absolute and unconditional sale of the premises hereby conveyed, by a court, or by the Trustee, without suit, and on any such sale said Company, for itself, its successors and assigns, covenants to join in and confirm the conveyance to the purchaser.

ARTICLE XI.

It is further provided and agreed that, at any sale or sales of the aforesaid property, real and personal, water filings, water rights, appropriations, canals, laterals, branches, ditches, flumes, aqueducts, reservoirs, dams, rights of way, and any and all other property in said mortgage specified, or of any part thereof, the said party of the second part, as Trustee, may, at its option, bid for and purchase, or cause to be bid for and purchased, the same for and on behalf of all the holders of the bonds hereby secured and then outstanding, in the proportion of the respective interests of such bondholders, at such a price as to it, said Trustee, may seem reasonable, if but a portion thereof be sold, or, in case all of said property be sold, at a price not exceeding the whole amount of said bonds then outstanding, with the accrued interest thereon, the costs of the execution of the trusts remaining unpaid and the expenses of such sale or sales.

ARTICLE XII.

The party of the second part shall be under no obligation to recognize any person, firm, or corporation as holder or holders, owner or owners of any of said bonds secured hereby, or to do any act pursuant to the demand or request of any person, firm, or corporation professing or claiming to be such holder or holders, until such supposed holder or

holders shall produce the said bonds, and deposit the same with the party of the second part, and shall indemnify and save harmless the said party of the second part to its entire satisfaction, from any and all costs or expenses, outlay and counsel fees, and such other disbursements for which it may become liable or responsible on proceeding to carry out such request or demand;

It being understood that all requests or demands made, pursuant to any of the provisions herein contained, upon said party of the second part, shall be in writing, and that in no case the said party of the second part shall be compelled to appear in court, or otherwise, except upon full and proper indemnity, and by counsel of its own selection.

ARTICLE XIII.

The trusts and duties by this instrument and mortgage declared, created and imposed, are accepted by the said California Safe Deposit and Trust Company, of the City and County of San Francisco, State of California, the party of the second part hereto, but such acceptance is made by it upon the express condition, understanding and agreement that it, said party of the second part, shall not incur any liability or responsibility whatsoever, in consequence of the permitting or suffering the Stanislaus and San Joaquin Water Company, the party of the first part, to retain or be in possession of the property, real and personal, water, water rights, canals, laterals and branches, ditches, dams, reservoirs, and all the property or premises hereby mortgaged; nor for any destruction, deterioration, loss or damage which may be done to or incurred by said property or estates hereby mortgaged, by the act or default of the said party of the first part, or its agents or servants, or any person

or persons whomsoever, nor for the consequence of any breach of the part of the said Stanislaus and San Joaquin Water Company, its agents or servants, nor for the mis-application or non-application of any moneys that may be received by it, the Stanislaus and San Joaquin Water Company, from the sale of any property, or otherwise, to purposes other than those herein by it agreed to be applied, nor for any other matter or thing, except for its own gross negligence or willful default in the discharge of the trusts and duties herein created, declared and imposed.

ARTICLE XIV.

The party of the second part, as Trustee, may select and employ, for the collection of the principal and interest becoming due upon any of the contracts or other obligations for the sale of water or water rights, set forth in said Article V, suitable agents and attorneys, whose reasonable compensation shall be paid to the said Trustee by the said party of the first part, or in default of such payment, or any payment, shall be a lien upon the properties hereby conveyed, and

Provided that the said Trustee shall have exercised reasonable prudence and care in the selection of such agents and attorneys, it shall not be responsible for any loss or damage caused by any act, neglect or default, willful or otherwise, of such agents or attorneys, or any of them.

ARTICLE XV.

It is further agreed, that all of the bonds issued hereunder, and for which this mortgage is made, executed and delivered, shall be signed and executed by the party of the first part and deposited with the Trustee, and may be, by

the said party of the second part, authenticated, certified and delivered to the said party of the first part, or to its order, as follows:

Whenever there shall have been assigned, transferred, conveyed, and delivered to said Trustee, interest-bearing contracts for the sale, delivery, or disposal of water upon land under the canals of the party of the first part, or interest-bearing notes or other obligations, on each and all of which contracts, notes, or other obligations no default shall exist in the payment of the principal or any installment thereof, or any interest becoming due thereon, to the extent and amount of at least the sum of twenty thousand (\$20,000) dollars; then, and in that case, the party of the second part shall authenticate, certify, and deliver to the said party of the first part, or to its order, bonds as issued hereunder and secured hereby, to the amount of twenty thousand (\$20,000) dollars; and thereafter, from time to time, whenever there shall have been assigned, transferred, conveyed, and delivered to said Trustee, additional interest-bearing contracts for the sale, delivery, or disposal of water under the canals of the party of the first part, or interest-bearing notes or other obligations, on each and all of which contracts, notes, or other obligations no default shall exist in the payment of the principal or any installment thereof, or any interest becoming due thereon, to the extent and amount in the aggregate of at least twenty thousand (\$20,000) dollars, then, and in that case, said party of the second part shall authenticate, certify, and deliver to the said party of the first part, or to its order, additional bonds to the amount of twenty thousand (\$20,000) dollars, as aforesaid; provided, that at all times there shall be and remain duly assigned, transferred, and conveyed to and in the possession of said

Trustee, such interest-bearing contracts or other obligations in writing, as aforesaid, equal to the extent and amount of at least twenty thousand (\$20,000) dollars for each twenty thousand (\$20,000) dollars of bonds, and that an official order, authorized by the Board of Directors of said party of the first part, signed by the President of said party of the first part, specifying from time to time the numbers of the bonds and the amount thereof, so requested and desired to be certified, as aforesaid, and authorizing such certification and delivery, shall be full and sufficient authority to said party of the second part therefor; it being understood and agreed, that said Trustee shall not be required to certify and deliver bonds aggregating less than twenty thousand (\$20,000) dollars at any one time; it being further distinctly understood and agreed, that said party of the second part, as such Trustee, shall not so authenticate or deliver bonds at any time that shall exceed the amount of interest-bearing contracts, notes, or other obligations for the sale, disposal, and delivery of water in the hands of said Trustee; and, in no case, shall bonds in excess of three hundred and fifty (350) in number, and three hundred and fifty thousand (\$350,000) dollars in amount, be issued, authenticated, certified, or delivered as issued hereunder; and that, upon any certification or delivery of such bonds, or any part of them, said party of the second part shall not, in any way or manner, be held liable or responsible for the negotiation or sale of such bonds, or any of them, or for the failure of the party of the first part to use or apply said bonds, or the proceeds thereof, to the objects or purposes agreed or understood to be by it applied.

ARTICLE XVI.

It shall be the duty of the party of the first part to properly record this instrument as a mortgage of real estate, and also as a mortgage of personal property, in the Counties of Tuolumne, Calaveras, Stanislaus, and San Joaquin, State of California, for protecting, perpetuating, or keeping good the lien of these presents upon the above-described and mortgaged property, real and personal, water, water rights, canals, reservoirs, dams, laterals, flumes, rights, privileges, or franchises, or any portion thereof, and from time to time to do all things needful in that behalf, and the Trustee has no responsibility therefor. All the recitals in this instrument contained are made on behalf of the Stanislaus and San Joaquin Water Company, and the said party of the second part assumes no responsibility therefor, nor for any portion thereof; and it is further agreed and understood, that said party of the second part, and its successors in the said trust, shall be entitled to receive just and proper compensation for all services rendered by it and them in the discharge of the said trust, and the same shall be deemed to be and shall be secured hereby.

ARTICLE XVII.

It is hereby mutually covenanted, agreed and declared, that the said party of the second part may resign, as such Trustee, at any time, by an instrument duly executed and acknowledged, so as to entitle the same to be recorded and delivered to the party of the first part; and in case of a vacancy, whether by resignation of said Trustee or otherwise, a successor or successors shall be appointed to fill such vacancy by the Board of Directors of the said Stanislaus and San Joaquin Water Company. If such vacancy is not

filled within sixty (60) days after it shall occur, any competent court may appoint a successor or successors in this trust to fill such vacancy, on the application of either of the parties hereto, or on the written application of the holders of the bonds hereby secured, to the aggregate amount of ten (10) per centum of the bonds then outstanding; and the said successor or successors so appointed shall thereupon be vested with the same powers, rights and interests and charged with the same duties and responsibilities as if he, it, or they, had been made and referred to in this instrument, in the place and stead of the said California Safe Deposit and Trust Company.

In witness whereof, the said Stanislaus and San Joaquin Water Company, party of the first part, has caused these presents to be executed by its President and its Secretary, and its corporate name and seal to be hereunto affixed; and the said party of the second part, to evidence its acceptance of the trust hereby created, has also caused these presents to be executed by its Vice-President and its Secretary, and its corporate seal to be hereunto affixed, the day and year first above written.

STANISLAUS AND SAN JOAQUIN WATER CO.,

By H. W. COWELL, President.

By C. H. LEADBETTER, JR., Secretary.

CALIFORNIA SAFE DEPOSIT AND TRUST CO.,

By HENRY WILLIAMS, Vice-President.

By J. DALZELL BROWN, Secretary.

STATE OF CALIFORNIA, }
CITY AND COUNTY OF SAN FRANCISCO. } ss.

.....being first duly sworn,
deposes and says:

That he is the President of the Stanislaus and San Joaquin Water Company, a corporation duly organized and existing under and by virtue of the laws of the State of California. That the annexed and preceding mortgage is made by said Stanislaus and San Joaquin Water Company in good faith and without any design to hinder, delay or defraud creditors.

This affidavit is made so as to comply with the form of mortgages required in cases of mortgages of personal property in the State of California.

.....
President.

Subscribed and sworn to before me }
this.....day of July, A.D. 1895. }

.....
Notary Public in and for the City and
County of San Francisco, State of California.

STATE OF CALIFORNIA,
CITY AND COUNTY OF SAN FRANCISCO. } ss.

HENRY WILLIAMS, being first duly sworn, deposes and says:

That he is the Vice-President of the California Safe Deposit and Trust Company, a corporation duly organized and existing under and by virtue of the laws of the State of California. That the annexed and preceding mortgage is made by the said California Safe Deposit and Trust Company in good faith, and without any design to hinder, delay or defraud creditors.

This affidavit is made so as to comply with the form of mortgages required in cases of mortgages of personal property in the State of California.

.....
Vice-President.

Subscribed and sworn to before me }
this day of July, A.D. 1895. }

.....
Notary Public in and for the City and
County of San Francisco, State of California.

WATER CONTRACT.

—

THIS AGREEMENT, made in duplicate, between the
STANISLAUS AND SAN JOAQUIN WATER COMPANY, a corporation duly organized under the laws of the State of California, party of the first part, and party of the second part.

Witnesseth:

1. That the party of the first part agrees to furnish through its canal from the Stanislaus River to the party of the second part, his heirs or assigns, during each and every year, for the term hereinafter mentioned, for the purpose of irrigating a tract of acres of land, situated in county, State of California, a flow of water sufficient to fully irrigate said land as often as necessary during each year of said term.

The said tract of land is described as follows:

.....
.....

2. Said water shall be used for irrigating purposes only on said land, except as hereinafter provided, and is to be delivered at the most available point on the tract of which the above described land is a part, and it shall be furnished in such manner and at such times and as often as necessary to make it available for use upon said land for agricultural purposes. The head-gates, wiers and other arrangements or devices through which the water shall be drawn from said canal, shall be made and placed in position by said

party of the first part at its own expense; and the manner of withdrawing and supplying said water from said canal shall be determined by it, and shall be under its absolute control.

3. The party of the first part reserves the right to shut off the water in said canal at any time in order to repair or clean out said canal, or to preserve it; and it also reserves the right to shut off the water in said canal, to enlarge or extend the same; provided that the same be done at such a time as to do no material injury to the crops growing upon the lands irrigated from it.

4. The party of the second part, in consideration of the premises, agrees as follows: That he will pay to the party of the first part the sum of ten dollars per acre for each and every acre of said land for which said party of the first part herein agrees to deliver water to irrigate, as follows, to wit: Ten dollars per acre, with interest thereon at the rate of six per cent. per annum, principal and interest apportioned and commuted as follows, to wit: On the first day of November, after the delivery of water under this contract (it being understood that the first delivery of water is not to be later than the April preceding the November when the payment is to be made), the sum of eighty cents for each and every acre of said land, and on the first day of each November thereafter for the period of twenty years thereafter, a like sum, making in all twenty payments on each and every acre of said land aforesaid, which shall be in full payment of the amount provided to be paid herein; or the party of the second part may, at any time, make a cash settlement in whole or in part of the amount unpaid, by paying the principal sum still unpaid and the interest accrued up to the time of said settlement upon said sum, interest to be reckoned at

said rate from the time that water was ready to be delivered by the party of the first part to the party of the second part.

5. And the party of the second part further agrees to pay to the party of the first part, one dollar and fifty cents per year upon each acre of said land, in addition to the sum hereinbefore mentioned, as a water rental therefor, which shall be paid as follows: The first payment shall be made on the first day of November after the water is ready to deliver for irrigation for that season, and one dollar and fifty cents per acre, upon each acre of said land on the first day of each November thereafter. It is hereby agreed, however, that said party of the second part, if he so elects, may use said water and pay said water rental for the first four seasons as follows: During the first season, on one-fourth only of said land; during the second season, on one-half only of said land; during the third season, on three-fourths only of said land, and during the fourth season and thereafter, on all of said land, making annual payments at the time as above provided.

6. All payments herein provided for are to be made at the office of the party of the first part.

7. The party of the second part hereby grants to the party of the first part a permanent right of way over lands owned by said party of the second part, free of cost, for the canal of said party of the first part, with the right of entry for all purposes connected with said canal, and said party of the first part grants to said party of the second part and to his tenants, the right to use water from said canal on said lands for domestic purposes and to water stock therefrom, and to plant trees along the border thereof; provided, that the planting and maintaining of said trees shall not interfere with the maintenance or free use of said canal.

8. It is hereby agreed that if, at any time, by reason of accident to the dams or canal of the party of the first part, or from any other cause not within the control of said party of the first part, the party of the first part shall not be able to furnish said water, it shall not be liable for failure to supply water under this contract, and in such case the party of the second part shall only pay of said water rental for such water as he actually receives benefit from.

9. It is further agreed that neither party assumes any liability under this contract until such time as there has been an actual delivery or tender of delivery of water to the party of the second part; and the said parties agree to and with each other, that this contract shall have the force and effect of a covenant running to and with the said land of the party of the second part, and the canal of the party of the first part.

In Witness Whereof, the said party of the first part has caused its corporate name and seal to be hereto affixed by its President and Secretary, duly authorized by its Board of Directors so to do, and the said party of the second part has affixed his name hereto, upon this day of, 189...

STANISLAUS AND SAN JOAQUIN WATER COMPANY,

By President.

By Secretary.

.....

IRRIGATING ENTERPRISE.

THE STANISLAUS AND SAN JOAQUIN CANAL SYSTEM.

THOUSANDS OF ACRES OF LAND PUT UNDER WATER AND
FITTED FOR THE PRODUCTION OF ALL
KINDS OF CROPS.

[From *Stockton Mail*, January 4, 1896.]

THE intelligent labor of the human family furnishes the foundation for wealth and all the pleasures of life. The cultivation of the soil provides the most certain and extensive field for their labor, and affords the best guarantee of prosperity. In the ratio that nature furnishes conditions favorable to the successful cultivation of or labor upon the soil, the acquirement of wealth is promoted. Perfection in production by the cultivation of the soil is attainable only where the soil is richest, the sunshine constant and temperate, the rainfall abundant and properly distributed, and the drainage perfect. Few places furnish all these conditions in perfection, and one or more of them must be artificially supplied. There is a large area of land upon the Pacific Coast where all these conditions but one, rainfall, are found, and this section is known as the arid region. All these conditions are supplied artificially in hot-houses, but seldom does nature vouchsafe them all to man to any very great extent.

The most uncertain and difficult of all these requirements to control at exactly the right time, and in the proper proportion, is water. Yet, while nature is less generous in the regulation of the water supply than any other, it is only necessary for intelligent labor and art to be invoked to unite all of the elements conducive to perfect cultivation of the soil over vast areas of the so-called "arid west."

We have, given by nature, virgin soils of great variety and unsurpassed richness, with almost perpetual sunshine—of from temperate to torrid heat. Adjacent to and rising from the plains and valleys of this "arid west" are the great mountains and peaks which form a never-failing, natural reservoir for the storage of the winter rainfall for the summer requirements of man.

The great work to be accomplished is to bring land and water together, and this done, there is no danger that nature will ever cheat the husbandman of the results of his labor. To bring about this great desideratum, large investments of capital have been made, vast irrigation works have been built, and the most arid portion of the State has been converted into the most fertile and beautiful.

Foremost among these enterprises stands the Stanislaus and San Joaquin Water Company's works. The water supply for this enterprise is derived from the Stanislaus River, one of the largest and most reliable in flow in the State, rising in the highest altitudes of the Sierra Nevada Mountains in fields of perpetual snow, ever-flowing springs and meadow valleys. The catchment area of the Stanislaus embraces 1051 square miles, the rainfall over which ranges from 20 to 40 inches per annum.

The present dam in this system is located at a point upon the Stanislaus River, about six miles above Knights

Ferry. It is a crib dam, 300 feet long and 25 feet high from bedrock. This dam was constructed about thirty years ago for the purpose of diverting the water into a ditch for mining purposes, and was known as the San Joaquin County Ditch. A line of rocks projecting above the water at a point where the dam is located forms an absolutely indestructible abutment for it.

In 1874 the Farmington Water Company attempted to utilize this dam and transform the ditch into an irrigating canal, but, owing to the cost of the work, it was abandoned. A second attempt in the same direction was made by the San Joaquin Land and Water Company, but it came to naught.

The fact that this dam has successfully withstood the furious floods of thirty winters attests its stability. However, the Stanislaus and San Joaquin Water Company regard it as a temporary expedient, and intend to replace it at an early date with one of solid masonry, which is already constructed above low-water mark at a point some 4000 feet below the present one. This new dam is built of hard basalt blocks laid in the best Portland cement, the base being let well into the bedrock and braced against huge natural granite abutments. A better natural location for a stable structure could not be found, and better work than that done in the dam as constructed could not be executed.

The head-gate now used is one constructed simultaneously with the old crib dam. It is of timber and well preserved, but will be abandoned for a new one of the most approved modern construction upon the completion of the new dam.

The main canal has a capacity of 200 cubic feet per second, or 10,000 miner's inches, sufficient to supply ample

water for irrigating 40,000 acres. The tunnels, flumes, and other permanent works, however, are constructed with double this capacity, and, by increasing the carrying capacity of the canals, enough water could be run in them to cover 100,000 acres. This is less than half the area irrigable under the system, so that at best not over one-half of the land within reach of the canal can be supplied with water.

From the head-gate to Knights Ferry the canal is an enlargement of the old mining ditch, and for its whole length is clear cut. The embankment is well soaked and settled, and as permanent as such work can be.

There are two tunnels, excellently constructed and of much greater capacity than the flumes. They were very expensive and difficult of construction, being cut through hard porphyritic rock.

The flumes are ample in capacity, splendidly constructed, of the best clear lumber and of unusually massive timbers, and so put together as to long withstand the ravages of time and the elements.

The main laterals from Knights Ferry to Farmington, and that westward to Lathrop and Ripon, are all well constructed.

A large portion of the San Joaquin Valley, lying between the foothills on the east, the Southern Pacific line on the west, the Stanislaus River on the south, and the Calaveras River on the north, is irrigable under the system planned by this corporation, and embraces some 250,000 acres.

The soil embraced in this area is all alluvial, but greatly diversified in its character, ranging from the very sandy loam of the foothills to the rich, dark, clay loam near the City of Stockton. For the past thirty or forty years these

lands have been continuously cropped to cereals, at first with great profit, but constant cropping of the soil, without the application of fertilizers, has largely reduced its fertility, and in many cases made it unprofitable for such tillage.

And this opens another important branch of the irrigation subject, that of the fertilizing qualities of water. It is a well-known fact that regions subject to the annual overflow of great rivers will retain their productive qualities for unknown periods. The delta of the Nile has been successively cropped year after year, further back than history extends, and yet it is as productive to-day as it was thousands of years ago. The soil of the Lower Danube, the Ganges, and the Mississippi, all bear witness to the fertilizing powers of water. And it is the history of all irrigated countries that the soil is not exhausted of its fertile elements as is that which is dependent upon rainfall for its moisture.

The reason for this is that in many cases a rich silt is deposited on the land, bearing all the elements of fertility, and all rivers and streams draining a large water-shed become charged with the fertilizing elements required by growing crops. These are especially phosphoric acid, potash, and nitrogen. The rain and snow falling on our mountains trickles over the soil, finding continually a new source of supply, and carrying to the main stream their load of fertilizing material, held in solution, and drawn from hundreds of square miles of virgin soil. Here is an unlimited storehouse upon which to draw, and no means are so easy and cheap by which to apply these fertilizers to our soil and renew its productiveness as are offered by irrigation.

The Stanislaus River carries large quantities of this silt, which, when deposited upon our exhausted wheat lands, will renew their richness and productiveness.

H. Barton, an eminent civil engineer, writing of the enriching properties of the silt, says:

“ It is well known that for ages the fertility of Egypt has been preserved by the silt-laden waters of the Nile. The silt annually deposited is a powerful fertilizer, replacing that which is consumed in bringing crops to maturity. This furnishes a solution of the richness and productiveness of the lands along the Nile for fully 2000 years. Sir Ben. Baker, C. E., states: ‘ The fertility of the Nile is due to the organic matter and salts of potash and phosphoric acid dissolved and held in suspension in it.’ W. Willcutts, C. E., in his accounts of irrigation in Egypt, states: ‘ In upper Egypt, where the old Pharonic system of basin irrigation exists, every acre of land is cultivated, and yields revenue, the soil being as rich to-day as it was thousands of years ago. The percentage of sediments carried by the principal rivers is: Nile, 1.19; Mississippi, 1.15; Danube, 1.30.’ ”

It is estimated that the rivers debouching into the San Joaquin Valley, in proportion to their flood-waters, carry more silt than those mentioned: especially is this true of the Stanislaus. If only two per cent. of water is silt, one acre-foot of water would distribute a layer of nature's richest fertilizers one-fifth of a foot deep, which, being by cultivation well mixed with the soil, would soon restore it to almost its virgin condition of richness.

Professor Davidson, writing of the fertilizing properties of irrigation, says:

“ The Nile overflow has enriched its valley for a long period, and is doing so to-day, under the old inundation system and the newer irrigation methods. The silt is a very fine material, with more clay than sand, and carries also

comminuted vegetable matter. The soil upon which it is deposited has been formed by earlier deposits of similar material, and no other fertilizer is used in the production of crops. The Mississippi carries its silt in a very comminuted form, and I have seen reclaimed and overflowed areas that are very productive without additional fertilization. On the Po, I found the soil of the silt deposit to be rankly rich, and to be used for a first crop in the production of hemp. On the Lower Ganges, the soil is extremely rich. And so of all the other rivers I examined.

“ In California, every stream should be examined on its own merits as to capacity of flow and character and quantity of silt carried at all seasons. If the detritus comes from a surface abraded by cultivation, or by animals on the range, or by exposure through the denudations of the forest, to the quick and positive action of rain-storms, the deposit is likely to be of advantage to the soil irrigated. If it comes from the operation of the mines, in addition to any or all of the above sources, the character and quantity must be examined for each case specifically, for it may benefit some soils and do harm to others.”

In California, nearly all the rainfall is precipitated during the months between November and May, the volume falling during the five months between May and November being of comparatively small benefit. The supply of water during the months of May, June, July, and August is of vastly greater importance than at any other period during the year; hence, however abundant may be the rainfall any year, nature would never supply the water at just the right time and exactly in proper quantities during these months. The more searching the investigation the more conclusive are the evidences of the necessity for irrigation, in order to assure profitable cultivation.

May, June, July, and August are the warmest, and hence the best growing months of the year. The flow of water in the Stanislaus River is greatest during these months. This is caused by the rapid melting of the snow in the higher mountain regions, which, deposited by the winter storms, is preserved through the cooler seasons and melts more rapidly during the hotter portions of the year, hence the high-water period of the Stanislaus is coincident with the time at which the greatest amount of water is required. These conditions combined forcibly illustrate the necessity of irrigation for the San Joaquin Valley. When the water is most needed the supply is at its maximum. When sunshine or heat is most needed it is most constant and at a maximum, whereas of rainfall there is practically none, thus giving to the tiller of the soil almost perfect conditions where irrigation is possible.

Another important factor in connection with irrigation is drainage. Crops will not grow in standing or stagnant water. There must be a constant flow and a constant renewal of the supply. The section covered by the system of The Stanislaus and San Joaquin Water Company offers perfect conditions in this respect. The general trend or slope of the valley from the foothills westward is from five to twelve feet per mile, ample for complete natural drainage.

The question of drainage is as important a consideration as irrigation, because it is not the application of water to, or the saturation of, the soil which produces the desired benefit, but the uniformity and speed with which the water percolates through the soil, conveying moisture and the plant food which it holds in suspension to the plants. Supersaturation is very disastrous to plant life, and in alkaline soils is worse than no water in its effects upon vegeta-

tion, except where water is run onto the land purposely to take up the alkali in solution and then drawn off, this operation being often repeated until the alkaline salts are diminished.

The San Joaquin Land and Water Company, predecessors to the Stanislaus and San Joaquin Water Company, expended for water rights, dams, tunnels, riparian rights, purchase of Schell Dam, ditch, etc., about \$230,000. All of these rights, etc., were purchased by the present Company for the sum of \$65,000. They have since expended about \$180,000, which would make the total sum so far expended about \$475,000.

About 20,000 acres of contracts for use of water have already been appraised and accepted by the Trustees. Other contracts will be obtained until 35,000 acres are brought under irrigation.

The Directors and Officers of the Company are men of means and large experience in such work. The works are built to last, every part of them being constructed in the most substantial manner. In a report made by a committee of the Stockton Commercial Association they say, among other favorable statements: "Your committee feels perfectly justified in saying that no enterprise ever projected and carried forward in the County of San Joaquin exceeds in value the one in question, and we recommend it to the most favorable consideration of this Association."