Reports

State of Colorado

of the

State Engineer

(E. S. NETTLETON)

for

1883, 1884

REPORT

OF THE

STATE ENGINEER

TO THE

GOVERNOR OF COLORADO

FOR THE YEARS 1883 AND 1884.

DENVER, COLO.:
THE TIMES COMPANY, STATE PRINTERS.
1885.

1883 - 1884

DENVER, COLO., Dec. 1, 1884.

To His Excellency,

JAMES B. GRANT,

Governor of Colorado:

SIR: I have the honor to submit to you the following report of the operations of this Department during the two fiscal years ending November 30, 1884, together with such observations and discussions of subjects connected with irrigation as may tend to advance the agricultural interests of the State.

I have the honor to be, Sir,

Yours Very Respectfully,

E. S. NETTLETON,

State Engineer.

RESUMÉ OF WORK

For the two Years ending November 30, 1884.

Upon taking charge of this Department, in March, 1883, I found that my predecessor (who was the first incumbent under the act creating the office of State Engineer) had not been able to accomplish much towards getting the Department into working condition, owing to a misunderstanding of the law regarding appropriations, and, as a consequence, no record was left in the office of the work done, except one field note book and two profile books, from which but little information was obtainable; nor was there any plan of operations for the future. The labor of establishing a plan to properly carry out the provisions of the law relating to the duties of the State Engineer, and his connection with the irrigation system, has fallen entirely upon me, without any established precedent for a guide.

The first work was to plan for the future operations of this Department, so as to be able to do as much in the right direction as was possible with the means available. The Legislature of 1883 fixed the amount to be allowed for assistance at quite a small sum compared to the work required by law, and I found that only sixty per cent of this was available, owing to an error made in the engrossment of the act, thus crippling the usefulness of this office in that proportion. It was, therefore, deemed prudent to act cautiously the first year of my incumbency; to thoroughly digest all of the best plans and methods for carrying out the requirements of the law, and to acquire as much information for the benefit of the people of the State as was possible with the means at my command. For the

reasons given, operations were confined to such as were clearly necessary, or defined by law, keeping a proper record of all work and transactions.

The act requires the State Engineer "to make careful measurements and calculations of the maximum and minimum flow in cubic feet per second of water in each stream from which water shall be drawn for irrigation, as may be best for affording information for irrigating purposes, *commencing with those streams most used for irrigation*," and in accordance with this the Cache la Poudre, Big Thompson and St. Vrain rivers were selected as being the best entitled under the last quoted sentence of the act. Work was begun toward the end of March on the Cache la Poudre, Big Thompson and St. Vrain rivers, the field work of the year being confined to the water districts in which these rivers lie. When assistants were required, they were generally hired in the locality of the work, and only employed for the specific work on hand there, and were discharged on the completion of each job, the endeavor being made to keep within the limits of the small appropriation.

On the Big Thompson, the first work done was to have a straight length of the river dressed, so that gaugings and ratings could be made of the amount of discharge of the river. This was done at a point about two hundred yards above the head of the upper ditch, twelve miles from Loveland. The work consisted in removing drift and putting the channel into uniform shape. On completion, accurate measurements of cross-sections of the prepared length were made and a gauge rod erected; tri-daily observations of the height of water on this rod were made by a local observer.

During the progress of the work on the Big Thompson, operations were commenced on the Cache la Poudre, the site selected being on McBride's pre-emption, about half a mile above the mouth of the cañon, and twelve miles above Fort Collins. Here boulders had to be removed by blasting, and the channel prepared as in the Big Thompson. At both places the work was completed in time to make gaugings during the irrigating season of that year.

At the several stages of water, observations, to determine the velocity of the current, through the prepared sections were made in both rivers with an eight-vaned, double pivoted, Fteley current meter, made by Messrs. Buff & Berger, of Boston, the instrument being provided with an electrical registering apparatus. These observations were made from a boat attached by a line to a ferry cable which was stretched across the stream. Detailed accounts of the methods of rating and gauging will be given elsewhere. The gauge readings were continued during the irrigation season, those having charge of the readings being required to send a report to this office by mail each week. On completion of preparations of the river stations, all the ditches on the Cache la Poudre, in which measuring flumes had been built, were rated at various heads of water, and this work occupied the whole season of high water, that being the only time when such work can be done efficiently, as it is necessary to establish the rate when the ditch is running to nearly its full capacity. On the subsidence of the rivers, in the fall of 1883, an inspection and remeasurement of cross-sections of the prepared river channels were made. The complete change of forms of the channels was such as to vitiate all the computations made, reducing them to the level of approximations. Thereupon a proposition was made to the ditch owners of the Cache la Poudre, viz: that they furnish the necessary funds to build a gauging station and permanent measuring flume, at, or near, the site of the prepared cross-section of the stream, where a continuous self recording gauge could be used, and trustworthy ratings of the flow, at all stages of the river, could be made, thus securing data which could be used directly by the Water Commissioner of the district to divide the waters equitably at all stages. With the enterprise characteristic of the energetic settlers of this irrigation district, they promptly responded to the above proposition, and by an assessment on themselves, according to the size of their ditches, they raised the money to construct a measuring flume and gauge house at an expense of about $1,650. This flume was erected in the fall of 1883, at the place originally selected for the prepared section for gauging, and was completed in November, ready for use during the following season.

This closed the field work of the year, and the winter was occupied in reducing the data obtained, and compiling it for analysis and record.

In January, 1884, an assistant was employed, who was assigned to the duty of Office Engineer. He has been employed since then on estimates, working up field notes, and keeping the records of the office.

The field work of the year was begun in March. A self-recording gauge was placed in position in the house constructed for it at the measuring flume on the Cache la Poudre, and many measurements were made of the velocity of the current, so that a rate of discharge might be determined due to all stages of the river. At first, the Fteley meter was used for measuring current velocity, but it was soon apparent that this instrument was entirely too delicate for the rough torrents, filled with drift of all sorts, in which it was necessary to use it. An instrument was designed by me, more suitable to the work (named the "Colorado" Current Meter) a description of which is given elsewhere. The main object kept in view in designing this instrument, was to make it self-clearing, the great defect of the Fteley meter being its liability to error from clogging with grass, weeds, etc., which, at times, would vitiate many hours' work, and make the readings so diverse that doubts would arise as to the value of a whole day's work. A secondary object was to reduce the speed of revolution, the high speed of the Fteley instrument necessitating expensive jewelled bearings, and a delicacy of construction, incompatible with the rough work which is required to be done. Three "Colorado" Meters, having been made for this department by W. E. Scott & Co., of Denver; these instruments have since been in continuous use in gauging rivers and ditches giving entire satisfaction.

During April, I made a trip to Utah and California for the purpose of comparing and studying the system of irrigation, as practiced in those countries. The observations made during this tour will be given elsewhere.

The measurements and ratings of the canals and ditches in Water Districts Nos. 3, 4, 5 and 9, were resumed in June and continued during the high water season, in which time

all the canals and ditches in these districts, which had measuring flumes, were rated, and a record made of the same. The work of rating was also begun during the month of July in Districts Nos. 2 and 6, but the rivers went down so suddenly that it was not possible to fill the ditches, and consequently the work done was valueless.

Local engineers were employed as assistants during the season, and their field notes were forwarded weekly to this office where they were reduced and the results recorded.

A hurried tour of inspection was made during the month of August through the mountains in compliance with the law, which requires report to be made of the present reservoir system of the State, but, in the financial condition of this Department, it was not possible to carry out the investigation as thoroughly as the importance of the subject demands. To make a thorough survey of, and search for sites, it would be necessary to send out a properly equipped party for the purpose, giving them a whole season to pursue the investigation. This subject is further discussed in memoranda made during the journey.

In October, another assistant engineer was engaged to assist in collecting data, and make preparation for this report. Since then, the whole force has been engaged in the collection and preparation of statistics given in this report, in the writing and preparation of the same, and putting the office in such order that all the data contained herein can be instantly referred to.

TOPOGRAPHICAL AND METEOROLOGICAL FEATURES OF COLORADO.

FACILITIES FOR AND PROGRESS OF IRRIGATION IN THE STATE.

The State of Colorado lies between 37° and 41° north latitude, and 102° and 109° longitude west of Greenwich, containing 104,500 square miles. The main range of the Rocky Mountains, or great Continental Divide, having a general north and south trend, passes through the State near its middle, forking towards the south, thus forming three great drainage divisions: one draining eastwardly towards the Missouri river, one draining westwardly into the Colorado river and the third draining southwardly via the Rio Grande. The main, or Continental Divide, is but a short distance (from twenty to forty miles) from the high table lands formerly known as the "Great American Desert," through which passes the two main eastern drainage arteries—the South Platte and Arkansas rivers. On the west of the Divide the country is very mountainous, the valleys narrow, and all the streams are tributaries of the Colorado river. The drainage into the Rio Grande is limited to the area lying between the Sangre de Christo and the San Juan ranges, the main agricultural portion of which area is comprised within the San Luis Park.

The altitudes of the farming lands of the State range from 3,500 feet, in the extreme eastern portion, to 7,500 feet, in the upper valleys of the Rio Grande; but the largest bulk of the land at present cultivated, lies near the foothills, on the eastern slope of the main Divide, at an average altitude of about 5,000 feet. In a general description of the irrigation of the State, it will be better to describe each of these districts separately, as the general configuration differs greatly. On the eastern slope of the mountains and compris-

ing nearly one-half of the total area of the State, lies the "plains," or once called "Great American Desert." This is only a desert when deprived of water, the soil being generally productive when irrigated, and the amount of land capable of being brought under cultivation is only limited by the water supply which can be brought on to it from the mountain streams, flowing eastwardly, which combine to form the South Platte and Arkansas rivers. The South Platte passes out of the State at its northeast corner and the Arkansas at latitude 38° north. After leaving the mountains these streams receive numerous tributaries on both banks, but these are all of one character, deep floods after heavy rainfalls, quickly subsiding to muddy streams during the wet season, and drying up entirely for three-fourths of the year.

Except where a few springs supply the heads of the tributaries of the plains nearest to the mountains, no irrigation is possible from the waters of these creeks, unless artificial reservoirs are constructed to impound the flood waters. All the supply for direct irrigation from the main rivers must be supplied by the *mountain* tributaries, and of these, the streams that last longest, and give the most trustworthy supply, are those which head in the high ranges of perpetual snow.

The divide between the Arkansas and South Platte rivers is known in the State as the Colorado Divide, and the summit between the two valleys may be stated in general terms to be from 1,000 to 2,000 feet higher than the rivers, the distance between them varying from 120 to 210 miles. It is safe to say that all the water available, even if the flood waters were all impounded for use in irrigation, is sufficient to cultivate but a fraction of this area, and that the great bulk of the cultivation will be concentrated on the most available land nearest the foothills, with tongues extending eastwardly along the streams as far as the water supply will extend.

In the valley of the Rio Grande, the irrigated lands lie in and around the San Luis Park, and in the narrow tributary valleys, more especially the Saguache, and the upper

valley of the main river. On the western slope, the situation is the reverse of that on the eastern slope, there being an excess of water and but little irrigable land. Of course there are local exceptions to this generalization on both slopes. Broadly stated, the amount of irrigable lands in Colorado is limited by the supply of water, and this supply cannot be definitely determined until a complete system of gauging of all streams has been completed, and estimates made of the extent and storage capacity of possible reservoirs for impounding the surplus flood and winter waters of all the streams available for irrigation. Although it is generally conceded that the rainfall and humidity of the States west of, and contiguous to, the Mississippi, has increased with the settlement, and operations of husbandry, all attempts have failed to show, *by record*, that a similar increase has occurred with the settlement of the States and Territories of the Rocky Mountain region. I was strongly impressed with the probability of this increase, but have to acknowledge that all my researches for proof by record have failed. On the contrary, in the Salt Lake district, the oldest settled district in the mountains, and the one in which is the greatest and oldest area of irrigated land, the records kept by the Fort Douglas garrison from 1863 to 1874, inclusive, and since then by the Signal Service, show, that in the group of five years, from 1864 to 1868, inclusive, the mean annual precipitation was 19.22 inches, and in the group of five years, from 1877 to 1881, inclusive, the annual mean is only 15.41 inches; the annual mean for the whole time of observation being 18.92 inches. In this comparison, the record for 1863 is thrown out as abnormal, and probably defective. As the record of each of these groups of years was kept in different localities, it is as well to state that Major Powell, in a comparison of average precipitation between Fort Douglas and Salt Lake City, shows that the greater precipitation, in a term of years, was in Salt Lake City. It would thus appear that the advantage of locality was in favor of a greater precipitation during the five years, from 1877 to 1881. The great rise in the level of Salt Lake after the first settlement of the country is ably discussed by Major Powell, and satisfactorily accounted for otherwise than by an increase of rainfall, to which it was at first very naturally ascribed.

The record at Cheyenne and Denver is to the same effect, but is for such a comparatively short series of years no certain deduction can be made. Tables of this precipitation are here given.

Rainfall—Mean Barometer—Mean Temperature—Direction of Prevailing Wind and Humidity at Denver, from 1872 inclusive.

YEAR.	RAINFALL IN INCHES.												Actual Barom. Mean of year	TEMPERATURE.				Prevailing Wind.	Humidity.
	Jan.	Feb	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total of year		Maximum and date.		Minimum and date	Mean of yr.		
1872	0.55	0.22	17.1	2.09	3.74	2.07	2.69	1.65	1.57	0.68	0.69	0.29	17.95	24.796	95°	29 July 5 Aug.	—22° 28 Jan.	47.6	South	53
1873	0.13	0.24	0.22	2.43	0.75	2.24	2.00	1.41	0.89	0.73	0.16	0.53	11.73	24.780	99°	18 June 15 July	—17° 28 Jan.	48.0	"	46
1874	0.84	0.5	0 49	1.70	2.43	1.21	3.35	0.68	1.34	0.64	0.08	0.17	13.45	24.779	102.3°	4 July	—11° 25 Feb.	49.9	"	49
1875	0.38	0.60	0.39	2.24	1.94	0.43	4.32	1.97	2.89	0.22	1.28	0.59	17.25	24.767	97°	20 June	—29° 9 Jan.	48.6	"	46
1876	0.21	0.11	1.80	1.22	8.57	1.10	1.16	2.03	0.60	0.12	1.50	1.70	20.12	24.767	101°	6 July	—25° 24 Dec.	49.7	"	43
1877	1.90	0.40	1.40	2.77	2.39	1.93	0.33	1 30	0.38	2.15	0.73	0.79	16.38	24.762	99°	3-14 July 5-29 Aug.	—18° 29 Nov.	49 1	"	48
1878	0.10	0.48	1.82	0.05	2.90	2.78	1.38	2.25	1.23	0.80	0.67	1.05	15.51	24.747	105°	8 Aug.	—12° 5 Jan. 14-29 Dec	49.5	"	46
1879	0.40	0.39	1.00	2.62	3.36	0.32	0.64	1.38	0.02	0.19	0.21	0.33	10.86	24.759	58°	13 July	—17° 24 Dec.	50.8	"	47.2
1880	0 38	0.32	0.21	0.31	1.11	1 22	1.38	1.46	0.89	1.37	0.83	0.10	9.58	24.760	96°	19 June	—13-5 17 Nov.	47.4	"	48.4
1881	0 49	1.22	0.87	0 56	2.21	0.09	2.50	2.33	0.57	0.32	1.68	0.00	12.78	24.763	99°	15 June	—20° 15 Feb.	50.8	"	51
1882	0.57	0.20	0.20	1 47	2.9	4.96	0.66	1.20	0.06	0.75	0.71	0.73	14.49	24 713	94°	17 Aug.	—4° 12 Nov.	50.3	"	49 2
1883	2.35	0.45	0.21	3.10	4.30	0.85	2.27	0.75	1.08	1.49	0.32	2.32	19.49	24.730	95°	19 July	—22° 4 Feb.	48.8	"	54.4
1884	0.22	0.86	0.93	3.33	4.61	1.47	0.65	1.71	0.13	0.21	0.19				96.5°	6 July				
Mean of Years	0.66	0.46	0.87	1.83	3.17	1.59	1.79	1.55	0 90	0.74	0.70	0.75	15.00	24 76025				49.2	South	48.4
Mean per ct yearly fall.	4.37	3.06	5.77	12.22	21.13	10.60	11 96	10.32	5.97	4.96	4.64	5.00	100.00							

Rainfall, Mean Temperature, Direction of Prevailing Winds, and Humidity, at Cheyenne, Wyoming, from 1872 to 1881.

YEAR.	RAINFALL IN INCHES.													TEMPERATURE.					Prevailing Wind.	Humidity.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total of Year.	Maximum and date.		Minimum and date.		Mean of Year.		
1872	0.02	0.27	0.38	1.61	1.99	1.84	3.90	2.05	1.03	0.33	0.03	0.03	13 48	.....	.....	—14°	21 Dec.	43.3	W	51.8
1873	0.03	0 02	0.38	0.92	2.41	1.77	1.10	2.07	0.36	0.70	0.17	0.80	10.73	94°	5 July.	—17°	27 Jan.	44.7	W	48.3
1874	0.11	0.11	0.74	0.61	1.50	1.34	1.87	0.44	0 93	1.86	0.04	0.16	9.71	98°	4 July.	—24°	24 Feb.	45.5	W	48.1
1875	0 42	0.06	0.23	0.50	1.20	0.29	4.47	2.12	1.34	0.60	0.84	0.03	12.10	93°	21 June.	—38°	9 Jan.	42.7	NW	54.7
1876	0.02	0.06	0.54	0.23	2.50	0.10	0.79	0.26	0.00	0.00	0.32	0.21	5.03	96°	6 July.	—14°	24 Dec.	44.3	NW	49.7
1877	0.20	0.14	0.98	1 11	2.24	1.27	0.43	0.83	2.02	1.99	0.17	0.33	11.71	96°	5 July.	—14°	22 Jan.	44.2	NW	55 2
1878	0.08	0.13	1.16	0.19	4.46	1.71	1.43	2.50	0.75	co 4	0.00	0 19	12.64	92°	14 July.	—12°	25 Dec.	44.2	NW	57.4
1879	0.32	0.20	0.44	1.66	1.30	0.07	1.04	1.26	0 00	0.65	0.23	0.17	7.34	95°	12 July.	—24°	24 Dec.	46.3	W	45.4
1880	0.20	0.09	0.06	0.17	0 44	1.06	1.88	2.23	1.05	0.76	0.36	0.08	8 38	97°	19 June.	—24°	28 Dec.	42.9	NW	44.5
1881	0.36	0.22	0.32	2 32	1.14	1.19	1.40	1.97	1.75	0.88	0.29	0.01	11.85	100.5°	14 July.	—12°	14 Feb.	45.8	NW	52.5
1882	0.14	0.05	0.06	0.46	2.73	1.85								96°	1 Aug.	—15½	12 Nov.	43.9	NW	47.9
														94°	1 July.	—31.3	20 Jan.	42.4	NW	52.6
Mean of years.	0,16	0.12	0.48	0.89	1.99	1.14	1.83	1.57	0.93	0.78	0.25	0.20	10.34							
Mean per centage of yearly fall.	1.58	1.19	4.66	8.60	19.27	10.98	17.71	15.21	8.93	7.56	2.37	1.94	100.00							

Rainfall at Pike's Peak, Colorado, from 1874 to 1881 inclusive.

YEAR.	RAINFALL IN INCHES.												
	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	TOTAL OF YEAR.
1874	1.32	1.16	1.21	5.20	2.98	0.58	6.00	3.72	2.31	1.80	0.36	0.22	26.86
1875	0.76	0.50	1.03	0.92	2.08	1.70	8.13	3.52	3.20	0.38	1.54	0.98	24.74
1876	0.85	0.61	2.03	1.04	4.73	2.88	2.20	4.63	1.60	1.45	1.06	0.79	23.87
1877	1.49	1.29	1.53	2.91	2.82	3.36	2.70	2.10	2.69	3.74	0.54	0.41	25.58
1878	0.29	1.45	2.95	3.77	4.32	3.49	5.46	6.12	2.42	0.24	7.81	4.55	42.87
1879	3.71	2.66	2.20	12.15	3.26	0.68	4.21	4.40	0.68	0.76	2.40	2.71	39.82
1880	4.26	3.34	2.79	2.04	2.17	0.79	6.69	4.30	3.87	4.64	4.07	1.69	40.65
1881	2.58	1.47	4.44	4.64	3.71	0.87	6.55	11.29	1.85	1.77	4.76	0.56	44.49
1882	1.78	0.36	2.65	1.79	12.34	3.10	.....	.....	.....	.....	.....	.....	.....
Mean of years	1.89	1.43	2.31	3.83	4.27	1.94	5.24	5.01	2.33	1.85	2.82	1.49	34.41
Mean percentage of yearly fall	5.49	4.16	6.71	11.13	12.41	5 64	15.23	14.56	6.77	5.38	8.19	4.33	100.00

It is reasonably certain that the rainfall has not increased in the Rocky Mountain districts, and yet I am satisfied that from my own knowledge of the country the *Autumn* discharge of the streams within the irrigated area of Colorado is greater than it was fourteen years ago. This is confirmatory of the deductions of Powell and Gilbert in the Salt Lake district, viz: that the effect of the operations of white settlers is to remove obstacles to the rapid drainage of the districts settled. An evidence of the *decrease* of rainfall is the existence of old *dried-up* water holes on the prairie, to which buffalo trails are still plainly traceable, but in which, of late years, no water has been impounded.

The occurrence of an increase of precipitation with the progress of settlement from the Mississippi westward is a demonstrated fact; but it must be remembered that this settlement presents a solid front, occupying all or nearly all the land east of the front line, and subjecting a large percentage of it to the plow shortly after settlement. Orchards and forest trees are planted and the *whole* face of the country changed, while the settlements in the Rocky Mountain region are isolated strips along the foothills, and tongues along the valleys, extending into the plains, and altogether but a very small percentage of the total. If all the "farm lands," returned by the County Assessors of Colorado, are assumed to be *really* farm lands (a strong assumption) they do not amount to six per cent of the total area of the State, and this is surrounded on the north, west and south by territory, in which the cultivated area is not one-half of one per cent of the whole. On this account it is very improbable that any increase of rainfall will be caused by the operations of the settlers here, and the greatest probability of an increase will be from the march across the plains of the eastwardly settlements, plowing the surface, planting trees, and by other operations increasing the humidity.

"The wish is father to the thought," and this was certainly the case with me, and the thought was only given up after a diligent search for facts to support it, which were not forthcoming. The idea of the rainfall having increased appears to be general, and can only be accounted for in the absence of all trustworthy data corroborating the belief, on

the hypothesis of others being influenced, as I was, by the *desire* to have it so. This belief is not confined to Colorado, but is generally held in Utah, although all the Signal Service and private gauges tell another story, and, in that territory, the belief has certainly *prima facie* support by the great and permanent rise of the surface level of the great Salt Lake. This is a fact which is within the positive knowledge of all who have lived long enough on its margin, and certainly seems convincing to a superficial observer. The similar phenomenon in Colorado which has previously been alluded to is not so obvious, and in the absence of positive gauge record cannot be positively proved, but the increase of discharge of the rivers, in the settled districts, has doubtless been noticed by many, and compared to the well known phenomenon observable throughout the newly settled districts of Kansas, Nebraska, Dakota, etc., viz; the outburst of springs where none existed on first settlement, and the constant running of streams down courses that were formerly dry most of the year. The increase of humidity within the boundaries of the larger settlements is also marked; for instance, in Greeley, dew is often seen, something unknown on the unirrigated uplands. This, however, is entirely local and confined to small areas, and the effect on the general climate is not observable.

The meteorological data obtained in Colorado is very meagre, the only regular observations being on Pike's Peak and a high building in Denver. Doubtless many other observations have been made, but the records are not accessible. Owing to the great variability of climate in the State, and the local character of many of the rain storms, it is to be expected that great differences would be found to exist between the records of even contiguous localities, and in view of the possibilities of the valleys of the State for agriculture and horticulture, it would seem desirable that efforts be made to conserve the meteorological data already obtained, and gather fresh data from numerous points of observation throughout the State.

PROGRESS OF IRRIGATION.

Prior to the year 1860, the practice of irrigation in Colorado was confined to the few scattered Mexican settlements in the southern part of the Territory, and to an imitation, but little improved, of their practice, by the few American settlers in other parts of the Territory, on the bottom lands lying immediately alongside the streams. The ditches were small and short, set out by the fall of the water itself, or, where better work was required, with the triangle, each ditch being generally constructed by the water user to suit his own requirements. These ditches had usually excessive grades, falling with the surface of the country, along the toe of the slope of the table lands, bounding the valleys, and the irrigation was in consequence confined to irregular areas, often to very small patches of ground, scattered along the sides of the stream, as the valleys would permit. The agricultural settlements were in the valleys, close to the banks of the streams. The uplands, locally known as "mesa," or table lands (now considered the best farming ground) were not, at that time, thought to be productive, even if water was put upon them, and were considered to be fit only for the grazing of cattle and sheep. The land taken up by the early American agricultural settlers, was "first bottom," and a farm, or "ranch," of 160 acres of cultivated land, was thought to be immense. This style of farming was gradually improved upon during the next ten years, but was still confined to the bottom lands, in wider valleys, and irrigated by individual ditches.

The late Horace Greeley, during his tour through Colorado in 1859, was impressed with the belief that the higher lands were best adapted for cultivation, if they could be irrigated, and that if this were accomplished, the homes and fields of the American farmers would extend from the Missouri river to the Rocky Mountains. On Mr. Greeley's return to New York, he had many conversations on this

subject with the late N. C. Meeker, at that time Agricultural Editor of the New York *Tribune*, which culminated in a proposition for a colony, first propounded, in 1869, through the *Tribune*. This was brought to a successful issue, in 1870, by the formation of the Union Colony, which settled in the valley of the Cache la Poudre, naming the town in their settlement, "Greeley." In the same year the colony began work on the first canal, which had for its object the conveyance of water to the table lands, such as constituted the so called "Great American Desert." The success of this colony was due to the substitution of the combined effort of a community for the isolated efforts of individuals, and a large block of land was brought under cultivation. Their example led to the adoption of the present system of large canals, laid out by professional engineers, to "cover" the high lands, which include some of the best lands in the State, needing only water under the control of the irrigator to produce magnificent crops. While this colony was demonstrating the feasibility of irrigating the uplands, other successful efforts were made to combine labor and small individual capital, the object in view being the rapid building up of a country, and acquiring, in a comparatively short time, the advantages usually found in old settlements only, thereby greatly shortening the long term of privations, commonly incident to the settlement of a new country, by the one-at-a-time process. Since that time the construction of irrigating canals has progressed under the protection of the laws of the Territory, and constitution, and laws of the State, until, at the present day, in some districts, the appropriation of water has reached the limit of supply.

The period of years, 1870 to 1874, may be termed the colony era, many such having been founded in all parts of the State, but more especially on the eastern slopes of the main divide. From 1878 to the present time, but few colonizing schemes have been organized, but in their place corporations and associations of individuals have come in to build canals, each watering many thousand acres. These corporations and associations have, in many cases, brought in large amounts of capital from outside the State, and have revolutionized the process of settlement. The

analogy of these canal schemes to the development of the railroad system in new countries, is complete. At first, roads were built to accommodate settlements already in existence, but now, the roads are built into the wilderness inviting the settlements to follow, trusting that the facilities offered, will induce immigration and settlement, and looking for reimbursement in the future. So with the later irrigation schemes in Colorado: survey is made of the lands available for irrigation by a suitable water supply, a plan of irrigation is conceived as an entirety, the work is done at a minimum of cost, and when completed, the lands under the canal are ready for cultivation by the settlers who have been invited by advertisement.

It is impossible to give any trustworthy data as to the area of irrigated land in Colorado, and the best estimate that can be made is based on the returns of the County Assessors of the area of farm lands in the State (given as 3,265,218 acres in 1883 and as 3,834,619 in 1884.) Assuming that three tenths of this is irrigated land, the area of this land would be 979,565 acres in 1883, and 1,150,386 acres in 1884.

During the session of the Legislature in 1881, an Act was passed providing for the adjudication by the courts of priority of rights, and amounts of appropriations of water, taken from all public waters of the State. This was a great stride onward in the right direction, as is now acknowledged, even by those who most strenuously opposed the law during its passage through the Legislature; and the order and security now enjoyed by the Colorado irrigator excites the admiration and emulation of the irrigators of the much older State of California.

COMPARISON

Of the Progress of Construction of Canals and Ditches with the Demand for Public Land Within the State.

The following table and diagrams exhibit the sales of public lands within the State, from the time of the establishment of the first United States Land Office, at Golden, in 1864, to the present time. The sales of United States lands are for the official years ending June 30th, in each year. The sales of Railroad lands are for the calendar year, the sales for 1880 being estimated on December 10th. The sales of State lands were reported every two years ending November 30th, the end of the State official year. The amount so returned is divided equally between each of the two years covered. Facing the diagram which exhibits, the sale of public lands, is another diagram, exhibiting the canal construction in the State, and covering the same term of years.

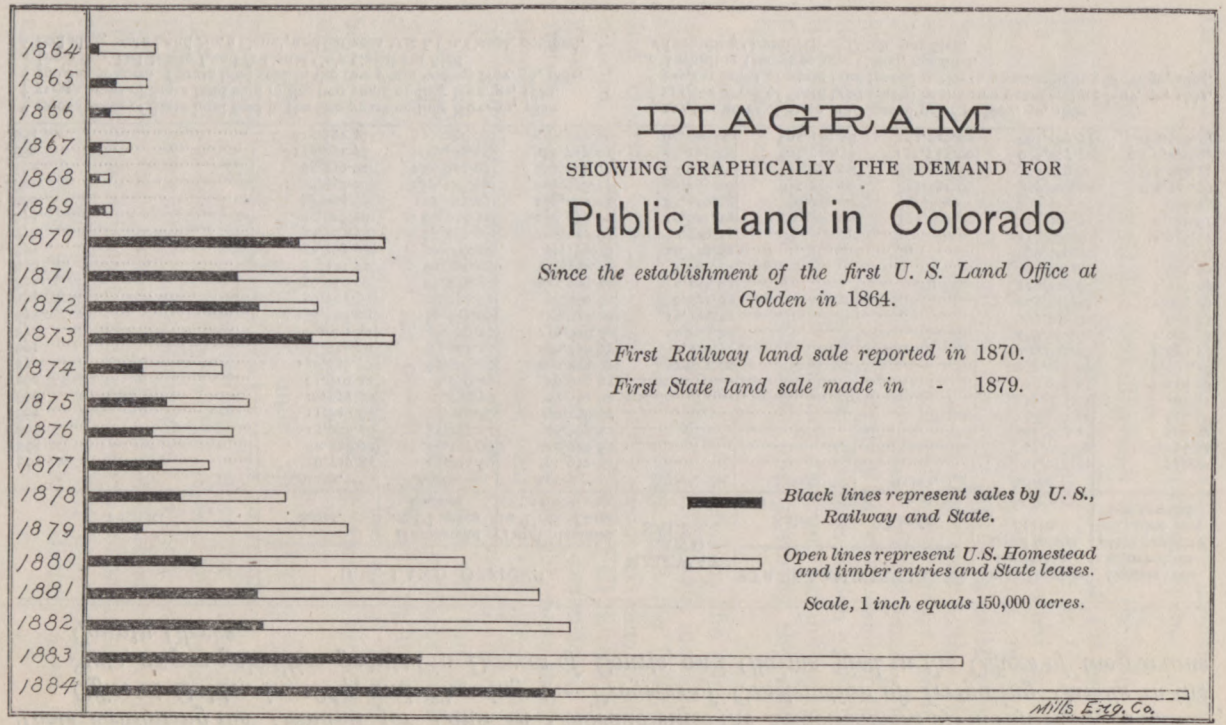
The canal construction is represented by the *amount of water decreed to the several ditches and canals*, including also the amounts claimed in the filings with the County and District Court Clerks. The *number* of canals and ditches, or their *lengths*, is not considered at all in this diagram. There being several large canals constructed in 1881–2–3–4, of which no record has, as yet, been made, they have been included in those years, as the sizes have been published in the report of the Denver Chamber of Commerce. There are many more ditches and canals in the State than those filed, but until claim is made, or established by their owners, for priority of water right, it is impossible to give data as to size, etc. On the Arkansas, below Canon City, no claims have yet been made, although there are many canals and ditches.

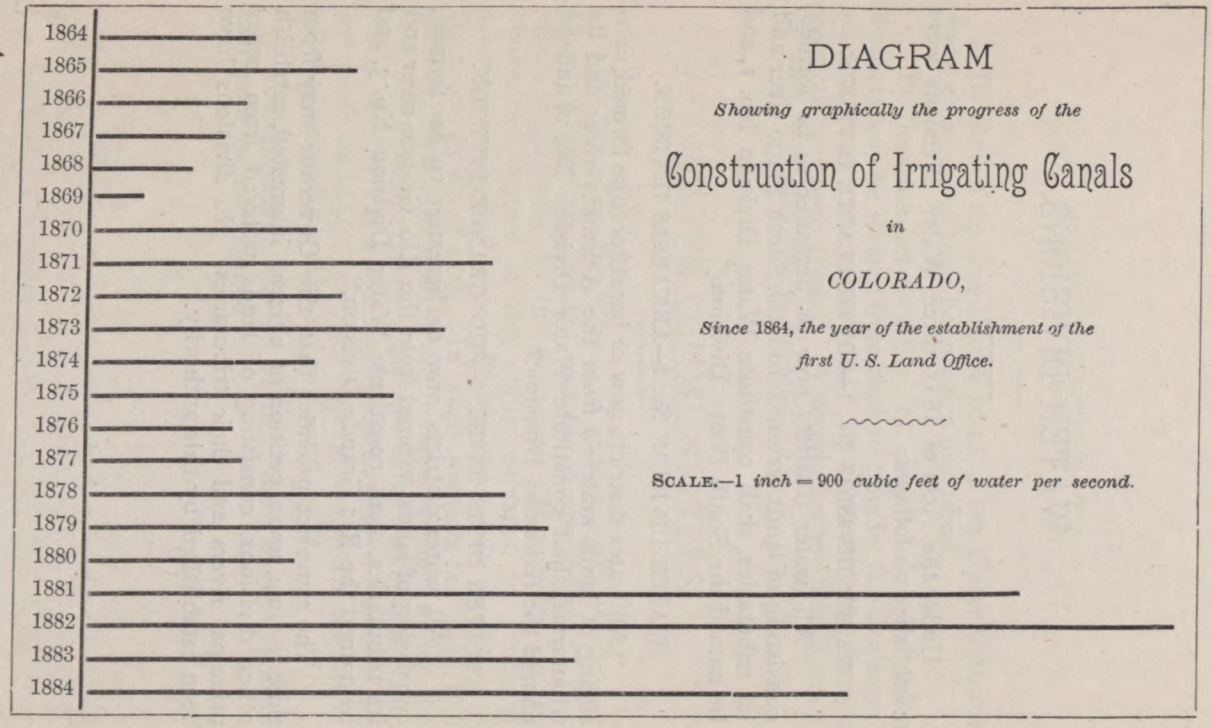
The first table exhibits, under the heading "Sales," all the transfers of United States land as returned by the United States Land Commissioner, under the same heading. The second column shows the *original* homestead and timber claim entries. Doubtless, many of these entries were never completed, but as the object of these tables is to exhibit the *demand* for land as it occurred, this was deemed better than the *final* homestead entries which occur years after the land has been settled upon. The other columns need no explanation.

Table Exhibiting the Demand for Land in Colorado since the Establishment of the first U. S. Land Office at Golden in 1864, and Showing the Progress of Construction of Irrigating Canals in the State, as per priorities granted in Decrees of Courts, and Claims filed in the Offices of the various County Clerks.

YEAR.	U. S. LAND OFFICE.			RAILWAY LAND SALES.	STATE LAND BUSINESS.		Total Demand for Public Land in the State.	Canals constructed, in total capacity of cubic feet per second.
	Sales.	Homestead and Timber Entries.	Total demand in U. S. Land Office.		Sales.	Leases.		
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	
1864	6,747.54	45,224.80	51,972.34	.....	.....	.....	51,972.34	747.32
1865	22,828.90	24,197.99	47,026 89	.....	.....	.....	47,026.89	1,23 94
1866	17,038.28	31,265.14	48,303.42	.....	.....	.....	48,303.42	718.52
1867	11,840 68	18,315.86	30,156.54	.....	.....	.....	30,156.54	625.56
1868	10,579.32	6,754.70	17,334.02	.....	.....	.....	17,334.02	485.51
1869	13,310 44	6,609.49	19,919 93	.....	.....	.....	19,919.93	216.50
1870	130,436.78	69,986.59	200,423.37	32,613 00	.....	.....	233,036 37	1,073.46
1871	83,519 58	93,301.39	176,820.97	32,818.71	.....	.....	209,639.68	1,873.73
1872	113,029.41	46.579.39	159,608.80	20,403.80	.....	.....	180,012.60	1,090.58
1873	158,128.93	65,641.07	223,770.00	15,734.80	.....	.....	239.504.80	1,646.83
1874	56,794.90	39,874.93	96,669.83	8,878.75	.....	.....	105,548.58	1,053 29
1875	56,010.09	67,955.35	123,965.44	5,155.24	.....	.....	129,120.68	1,417.09
1876	50,431.02	63,351.05	113,782.07	1,840.40	.....	.....	115,622.47	661.59
1877	32,493.94	37,686 52	70,179.56	26,129.84	.....	.....	96,309.40	702.04
1878	38,787.75	85,469.92	124,257.67	32,729.15	.....	.....	156,986.82	1,948.07
1879	29,646.16	81,324.45	110,970.61	10,021.13	*6,000.00	‡78,800.00	205,791.74	2,140.61
1880	59,074.65	127,127.49	186,202.14	25,419.02	*6,000.00	‡78,804.00	296,425 16	966.23
1881	57,452.28	167,226.49	224,678.77	59,555.16	†35,656.00	§57,131.00	357,020.93	*a* 4,340.79
1882	85,573.04	183,844.93	269,417.97	18,658.39	†35,657.00	§57,131.00	380,763.36	*b* 5,049.74
1883	119,251.78	269,485.45	388,737,23	48,945.15	¶95,.40.38	°152,745.00	685,867.78	*c* 2,276.92
1884	213,351.46	339,951.89	553,303.35	60,000.00	¶95,440.38	°152,746.00	861,489.73	*d* 3,528.51

* 12,000 acres of State land sold in the two years ending Nov. 30, 1880.
† 71,313 acres of State land sold in the two years ending Nov. 30, 1882.
¶ 190,880.76 acres of State land sold in the two years ending Nov. 30, 1884.
a Including Del Norte Land & Canal Co's Canal not filed.
b Including State Land No. 2 Canal, and Citizens D & L Co. Canal, not filed.
‡ 157,604 acres of State land leased prior to Nov. 30, 1880.
§ 114,262 acres of State land leased in the two years ending Nov. 30, 1882.
° 305,491 acres of State land leased in the two years ending Nov. 30, 1884.
c Including Uncompahgre Canal, not filed.
d Including Grand River Ditch, not filed.


1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
DIAGRAM
SHOWING GRAPHICALLY THE DEMAND FOR
Public Land in Colorado
Since the establishment of the first U. S. Land Office at Golden in 1864.
First Railway land sale reported in 1870.
First State land sale made in - 1879.
Black lines represent sales by U. S., Railway and State.
Open lines represent U.S. Homestead and timber entries and State leases.
Scale, 1 inch equals 150,000 acres.
Mills Eng. Co.



DIAGRAM

Showing graphically the progress of the

Construction of Irrigating Canals

in

COLORADO,

Since 1864, the year of the establishment of the first U. S. Land Office.

SCALE.—1 *inch* = 900 *cubic feet of water per second.*

WATER DIVISIONS.

Under the Acts of 1881 three Water Divisions were established as follows:

WATER DIVISION No. 1—SOUTH PLATTE DIVISION.

"All water districts now or hereafter to be formed, consisting of lands watered from the South Platte river and its tributaries, shall constitute Water Division No. 1, and be named the South Platte Division."

WATER DIVISION No. 2—ARKANSAS DIVISION.

"All water districts now or hereafter to be formed, consisting of lands watered from the Arkansas river and its tributaries, shall constitute Water Division No. 2, and be named the Arkansas Division."

WATER DIVISION No. 3—RIO GRANDE DIVISION.

"All water districts now or hereafter to be formed, consisting of lands watered from the Rio Grande river and its tributaries, shall constitute Water Division No. 3, and be named the Rio Grande Division."

The same act provides that the Governor may from time to time, upon petition of citizens interested, establish other divisions, consisting of lands watered from other principal rivers and their tributaries. No divisions have been established by this authority.

WATER DISTRICTS.

By Act of the Legislature of 1879, ten Water Districts were created and their boundaries described.

By the same act (see Sec. 15, p. 98) other irrigation districts may be formed from time to time by the Governor, on petition of parties interested. By this authority, sixteen districts have been created. A description and brief history of each will be found hereafter.

WATER COMMISSIONERS.

By Act of the Legislature of 1879, the office of Water Commissioner was created and his duties defined. This officer is appointed by the Governor. His duties are to divide the waters of the public streams, in times of scarcity, among the several ditches and canals, according to the prior rights of each. In such districts as have had their rights adjudicated by the courts, he has, under the law, but little discretion of his own in the matter of dividing water. In districts where no decrees have been rendered, he has more authority, but often experiences much trouble in ascertaining which ditches have prior rights.

The following is a list of the Water Commissioners that have been appointed:

WATER COMMISSIONERS.

No. of District.	Name of Commissioner.	Postoffice Address.	Date of Appointment.	Date of Resignation.	Remarks.
2	James M. Bailey	Evans, Colo.	9 July, 1880		Failed to qualify.
2	Edwin D. Baldwin	" "	15 April, 1882		No record of resignation.
2	A. C. Todd	" "	18 March, 1884		
3	B. S. LaGrange	Greeley, Colo.	9 July, 1880		
3	" "	" "	10 March, 1883		Reappointed.
4	Lucas Brandt	Loveland, Colo.	21 June, 1882	12 July, 1883	
4	Wm. Roper.	" "	12 July, 1883		Failed to qualify.
4	" "	" "	21 November, 1883		
5	John Reese	Longmont, Colo.	6 June, 1879		Failed to qualify.
5	John Kitely	" "	19 May, 1880		No record of resignation.
5	D. L. Tracy	" "	13 May, 1882	15 January, 1883.	
5	Sylvanus Budd	" "	22 June, 1883	28 January, 1884.	
6	Wm. A. Davidson	Canfield	20 August, 1879		No record of resignation.
6	Hiram Prince	"	4 June, 1880		
7	G. W. Siegler	Denver	10 July, 1880		No record of resignation.
7	J. W. T. McKay	"	3 May, 1882		
8	A. A. Curtis	Sedalia	20 October, 1881		No record of resignation.
8	J. A. Johnston	Denver	16 May, 1884	26 August, 1884	

9	John T. Steer	Littleton	28 June, 1879		No record of resignation.
9	Lewis B. Ames	"	22 March, 1884		
10	Robert Finley	Colorado City	15 April, 1882	28 August, 1882	
10	Wm. Sweetland	Fountain	7 April, 1883	22 May, 1883	
10	Wm. A. Richards		29 April, 1884		
11	Geo. H. Boon	Maysfield	15 April, 1880		
12	S. H. Tucker	Saguache	16 January, 1880		
13	Frank Ross		27 May, 1880		
14	J. Sabino Espinosa		27 May, 1880		
15	J. H. McCandless	Canon City	4 May, 1880		No record of resignation.
15	Thos. Barker	Coal Creek	26 April, 1883		
16	Robert L. Marshall		19 May, 1880		
18	B. K. Witherall	Parrott City	16 April, 1881		
19	S. W. De Busk		7 July, 1881	23 February, 1884	
20	Chas. Ydren		26 August, 1881		
21	C. M. Perin		4 May, 1882		
25	Lafayette Head	Conejos	19 May, 1882		
26	John Pritchard	Pueblo	23 February, 1884		

DESCRIPTION OF WATER DISTRICTS.

District No. 1—South Platte Division.

This District comprises the lands irrigated from ditches and canals taking water from the South Platte river, between its intersection with the State line of Colorado and Nebraska, and the mouth of the Cache la Poudre river.

The rights of claimants to the waters of the Platte river have not been established by the courts in this District, and no Water Commissioner has been appointed. There has been filed in the office of the County Clerk a statement of seventeen ditches and canals which have been tabulated. (See Appendix A, Table I.) The total amount of water claimed by all of the ditches on record, is 5404.78 cubic feet per second. Since 1882, several large canals have been constructed. It is claimed that the flow of water in the Platte river through this district is much more uniform than formerly, which is undoubtebly true, and is due to the effect of the irrigating canals on the stream above, by reducing its flow in the flood season. After high water, its natural flow is increased by the return into the stream of a portion of the water, which is commonly called "seepage."

District No. 2—South Platte Division.

This district comprises all lands that can be irrigated from the South Platte river and its tributaries, between the mouth of the Cache la Poudre and Cherry Creek, except the Big Thompson, St. Vrain's and Clear Creek.

There are thirty-five ditches and canals in this District, most of which have their rights of appropriations established by a decree of court, dated April 28, 1883. The total amount of water appropriated in this District, includ-

ing the amount decreed and claimed by statements filed in the office of the County Clerk, is 3,642 cubic feet per second.

Water Commissioners were appointed for this District, both before and after the adjudication of the rights of appropriators. The necessity of a division of the waters of the Platte river, according to law, has occurred each year since the office of Water Commissioner has been established. The Commissioners have failed to report their official acts till 1884, in District No. 2. In this year, the present incumbent reports that he was employed six days in August, in the lower part of the District, with an assistant employed eight days in the upper part of the District, both engaged in dividing the water. The "complaint" came from the appropriators near the lower part of the District. The Commissioner also says that it was necessary for him to make extra trips, in order to readjust the head gates, which, iu a few instances, were raised without permission. Measuring flumes have been built in some of the ditches in District No. 2, but none of them have been rated yet. It is quite probable that in ordinary years no serious lack of water will occur in this District, when a proper distribution is made, but, on the contrary, the water supply is ample for a much larger acreage of agricultural lands.

Water District No. 3—South Platte Division.

This District comprises all land irrigated from waters of the Cache la Poudre and its tributaries.

Decrees were rendered in this District dated April 11, 1882, which established the priority of appropriations of fifty-three ditches and canals. (See Table III. Appendix A.)

Since 1882, two or three canals have been constructed, the owners of which have filed their statements of claims with the County Clerk. All the ditches and canals in this District claim an appropriation of 4,558 cubic feet per second. The division of water in this District has been necessary each year since the creation of the office of Water Commissioner. The complaints generally come from the appropriators, far down on the stream, in the latter part of July. If the Commissioner begins in time to adjust the head

gates of the canals and ditches, but little complaint is heard afterwards. A necessary number of trips is generally made over the District by the Commissioner in person, and afterwards an assistant is put on duty to see that the orders of the Commissioner are obeyed, and to change the gates according to the fluctuations of the river. The assistant is required to visit the gauging station on the river, at least twice each week, and report the amount of water in the stream to the Commissioner, who, by aid of the decrees and the rating tables of the several canals, is able to direct the assistant how much water each canal is entitled to. The Commissioner often finds it necessary to depart somewhat from a strict adherence to the decrees, in giving to the canals the amount of water decreed, and is governed by his judgment, according to the beneficial use made of it by the different canals. It very often happens that a ditch, which has the better right to the use of a quantity of water, can not use the whole of it advantageously, or as much so as another ditch, which may not have any right to it, by virtue of the decree. A division of water under this rule is necessary, and it is perplexing, because there is no law to govern the Commissioner in the discretionary use of the power conferred on him.

Nearly all of the ditches and canal owners, in this District, have complied with the law requiring them to put measuring flumes in their ditches, and this Department has rated and tabulated the discharge of all such canals, for each tenth of a foot in depth, up to the maximum carrying capacity of the canal. By the aid of these tables the Commissioner knows the amount of water in any ditch or canal due to any depth on the flume. It may here be stated that the full intent of the Irrigation Law of 1881 is better carried out in this District than in any other in the State, up to the present time. The rights of the appropriators of water have been established the longest of any in District No. 3, and the duties of Commissioner have been intelligently and satisfactorily discharged.

In 1876, the greater portion of the residents in the lower part of the Cache la Poudre valley declared that no more new canals should be built, or more water taken from the river.

It is a very noticeable fact that new appropriations for canals every year, have been made since 1876, from the Cache la Poudre, and yet no greater alarm exists at present about the scarcity of water than was felt eight years ago. The subsidence of this cry of alarm is also noticeable in other Districts.

There can be no doubt as to the effect the present irrigation law will have, when thoroughly and properly carried out, in increasing the value and extent of the water supply.

In a report to this Department, the Water Commissioner says that he has been called on to divide the water every year since 1880. The priority of appropriations of ditches and canals was not established in this District till 1882, and therefore, the Commissioner had no legal guide for his acts, during 1880 and 1881. The division of water in these years was made as best it could be, and the work of the Commissioner was gratuitously given.

In 1882, the Commissioner was engaged in his duties considerably over the time prescribed by law. During this year, the water in the Cache la Poudre was exceedingly low. Its maximum discharge, which occurred on June 28, was estimated by J. S. Green, Civil Engineer, to be 1,727 cubic feet per second.

In 1883, the Commissioner and his assistant were employed the full time allowed by law, in dividing the water, both before and after the Summer floods. The principal complaints came in July and August from the lower part of the District.

In 1884, the Commissioner was employed twenty-nine days, and an assistant twenty-five days, in the distribution and regulation of the water. The first "call" was in May, but the main work was done from July 20 to the close of the irrigating season.

WATER DISTRICT NO. 4—SOUTH PLATTE DIVISION.

This District includes all lands irrigated from the waters of the Big Thompson and its tributaries.

The rights of claimants to water in this District were established by decree of the Court of the First Judicial District, dated May 28, 1883. There are twenty-eight ditches and canals in this District, having a total appropriation of 2,397 cubic feet per second. (See Table IV., Appendix A.)

The Water Commissioner reports that in 1883, he was employed only three days in dividing the water, not having been appointed till late in that year. In 1884, he was employed twelve days, five complaints having been made, all coming from the lower end of the District. The first one, coming about August 1, found some of the ditches in the upper end of the District running full, while those in the lower part of the District had not enough to irrigate their crops. The Commissioner also says, that he had great difficulty in dividing the water before the measuring flumes were put in the ditches, since which time, by using the rating tables, he has been able to divide the water to the satisfaction of all concerned. Measuring flumes have been put in nearly all of the ditches in this District, and nearly all of these have been rated, and their discharges tabulated. The division of water in times of scarcity is giving general satisfaction under the law of 1881, although it has hardly been put in full working condition yet.

Water District No. 5—South Platte Division.

This District comprises all lands irrigated from the waters of the St. Vrain creek and its tributaries, except the Boulder, its tributaries, and Coal Creek.

The rights of claimants to the use of water, and the order of priority of such claims were established in this District by decree of Court. There are seventy-three ditches and canals in this District, having by decree a total appropriation of 80,486 "customary inches," or about 2,096 cubic feet per second, (see Table V., Appendix A), the customary inch being assumed equal to the statutory inch, which is .026 of a cubic foot. To preserve a uniformity in the tabulation of the decree, the customary inches have been reduced to cubic feet per second. Measuring flumes have been put into a few of the ditches, and a partial gauging and rating of these has been made.

No report of the Water Commissioner has been received at this office, no Commissioner having been appointed since the resignation of the last incumbent, which took place January 28, 1884. The division of water in this District, according to law, is very important, as much so, perhaps, as in any other in the State. The area cultivated under the canals is estimated to be larger, in proportion to the water supply, than in any other District in Northern Colorado, with one exception. It is to be hoped that the appropriators in this District will see the necessity of coming to a mutual understanding and agreement, in regard to the water question, and of building flumes in their canals, so that the discharge of each can be computed and tabulated. By this means, a system can be inaugurated which will render satisfaction to all, and work hardships to none.

A good man should be selected for Water Commissioner, who can attend to his duties when called upon. If he has the confidence of the appropriators, and is furnished with the necessary data to guide him, his acts should not be questioned. A great deal of contention has existed in this District over the division of water, but there can be no reason why it should not have as equitable and satisfactory an administration of the law as other Districts.

Water District No. 6—South Platte Division.

This District comprises all lands watered from the Boulder and its tributaries, and Coal Creek.

Decrees have been rendered in this District, establishing the priority and amount of appropriation of sixty-two ditches and canals, which claim a total appropriation of 180,405 "customary inches," or 4,698 cubic feet per second. (See Table VI., Appendix A.)

Reports from the Commissioner state that he was engaged thirty days in 1883, dividing the water, principally before the irrigating season. The complaints came from the lower end of the District, and from those claimants residing in Weld County. Two days were required in the fall of 1883 to divide the water for domestic use.

In 1884, the Commissioner reports that he was called upon to divide the water, by parties residing on the lower Coal Creek. He was thus employed twelve days on Coal Creek and the South Boulder, before the main irrigation season, and four days on the South Boulder after the summer floods. Measuring flumes have been built in a few of the ditches in this District, but none of them have been rated.

Water District No. 7—South Platte Division.

This District includes all lands watered from Clear Creek and its tributaries.

The priority of appropriation of the ditches and canals in this District were established by decree of the Court of the Second Judicial District, dated October 4, 1884. This District has about sixty ditches, which claim an appropriation of 1,180 cubic feet per second. (See Table VII., Appendix A.)

The division of water in this District has been necessary each year since the office of Water Commissioner was created. The rights of claimants to water from Clear Creek were not established under the present law till October 4, 1884, yet the Commissioner has heretofore been able from his personal knowledge of the rights of ditches on the stream, to divide the water quite satisfactorily to all. In his report to this office, the Commissioner says that he was "called on" to divide the water on August 17, 1882, and was thus engaged for five days, partly in regulating the ditches in the upper end of the District. The "complaints" came from farmers and ditch owners in the lower part of the District.

In 1883, he was engaged eight days in regulating the ditches, the "complaints" coming, as in 1882, from the lower part of the District.

In 1884, the Commissioner was engaged thirteen days in regulating the supply of water, and in dividing it among the different canals. In 1884, Clear Creek has been unusually low. No measuring flumes have been built in any ditches in this District, and consequently none have been rated.

WATER DISTRICT NO. 8—SOUTH PLATTE DIVISION.

This District comprises lands watered from Cherry Creek, Plum Creek and South Platte river, and their tributaries, except Bear Creek, above Water District No. 2, and below the forks of the north and south branches of the South Platte river.

The rights of appropriators have been established in this District by decree of the Court of the Fourth Judicial District. There are about one hundred and ten ditches and canals, which claim the right to the use of 2,481 cubic feet of water per second. (See Table VIII., Appendix A.)

The abstract of the decree, furnished this office by the referee, failed to give the name of the stream from which the appropriations were made. It will be noticed that the orders of priority are numbered in consecutive order, to correspond with dates, without regard to the streams from which the appropriations were made. Reference to this method of numbering priorities is made in another part of this report.

Two Water Commissioners have been appointed in this District, but no report of their official acts has been made to this office. The office was first made vacant by the removal of the Commissioner from the District. The resignation of the second incumbent was accepted on August 26, 1884. No measuring flumes have been built in the ditches of this District, and in consequence none have been rated.

WATER DISTRICT NO. 9—SOUTH PLATTE DIVISION.

This District comprises all lands watered from Bear Creek and its tributaries.

The rights of the appropriators of the waters of this stream were established by decree of the Court of the Second Judicial District, dated February 4, 1884. There are twenty ditches and canals, which appropriate, by virtue of the decree, a total amount of 437 cubic feet per second, and six reservoirs, which appropriate an additional amount of 215 cubic feet per second. (See Table IX., Appendix A.)

Measuring flumes have been built in some of the ditches in this District, and these have been gauged and rated. It is estimated that there is a greater area of land irrigated from the streams in this District, and more private reservoirs built with larger holding capacities, according to the amount of water supply, than there is on any other stream in the State, Bear Creek is one of that class of Colorado streams which rises early in the spring, but does not hold out through the main irrigation season. The necessity of increasing the water supply, to tide over summer and fall emergencies, has led to the building and otherwise improving, of several private reservoirs, without which, many of the finest farms in District No. 9 would not be in existence to-day.

Reports from the Water Commissioner of District No. 9 show that he was on duty only two days in 1884. Complaints came from Turkey Creek, a tributary of Bear Creek. The Commissioner found reservoir owners filling their reservoirs during the main irrigating season, thereby depriving the earlier ditch claimants of their rights to water.

Recapitulation of Water Division No. 1.

The nine Water Districts, above described, include all that have been created in the South Platte Division.

The formation of other Districts in this Division is possible. These will naturally include the north and south branches of the South Platte river and their tributaries, which flow through the South Park from the mountains, and also the Box Elder, Kiowa and Bijou Creeks and their tributaries. The amount of water already claimed, by virtue of the decrees of the courts, and that claimed by the statements filed with the County Clerks, in Water Division No. 1, South Platte Division, is as follows:

District No.	1, Lower South Platte River	3,455.78
"	" 2, Lower Middle South Platte	3,480.84
"	" 3, Cache la Poudre River	4,442.73
"	" 4, Big Thompson Creek	2,397.45
"	" 5, St. Vrain's Creek	2,096.41
"	" 6, Boulder Creek	4,698.05

District No. 7, Clear Creek	1,180.45
" " 8, Upper Middle South Platte	2,481.84
" " 9, Bear Creek, ditches	437.55
" " 9, Bear Creek, reservoirs	214.98
Total	24,886.08

It must be remembered that the ditches and canals do not all, as yet, actually appropriate, from the public waters of the State, the amounts allotted to them in the decrees, and claimed in the statements recorded.

Water District No. 10—Arkansas Division.

This District comprises all lands in El Paso County that are watered from the Fountain Creek and its tributaries.

The rights of priority of appropriation of one hundred and four ditches and canals have been established by a decree of the Court of the Fourth Judicial District. The total capacity of all these ditches, as claimed by owners and decreed by the court, is 780 cubic feet per second. (See Table X., Appendix A.)

No report of the Water Commissioner of this District has been received at this office. No measuring flumes have been built, and in consequence, no ditches or canals have been gauged and rated. The best of success has not attended the efforts of the Commissioner in his attempts to divide the water, owing mainly to the absence of data concerning the amount of appropriations of ditches, and the lack of instructions pertaining to his duties. If it can be made a part of the instructions to the Commissioner to divide the water according to the quantities attached to the appropriations, all named in the decree, the most important one of his duties will then be completely defined. Thus, after the measuring flumes are built in the ditches, and all are gauged and rated, the Commissioner will be able to discharge his duty with intelligence, and not till then.

The uncertainty of the water supply, together with an unintelligent division, or no division at all, in times of scarcity, has done much to retard the progress and development of agriculture in this District, and to render farming

somewhat a precarious occupation. Probably no District in the State, at the present time, is in greater need of an increased water supply. There are a few questions in the solution of this problem, which the people may well consider at once; and the attention of the people of El Paso County is now being called to one of them by the agitation felt on the subject of storage reservoirs.

There is no doubt regarding the success of the efforts of the people in obtaining the necessary funds for a practicable reservoir scheme, of sufficient capacity to retain the surplus waters of the Fountain. One thing that the people of this District can do to help themselves, is to be content with nothing short of the best division of the public waters, according to law.

Water District No. 11—Arkansas Division.

This District comprises all the lands within the limits of Chaffee County, and contains about 1,130 square miles.

There are about fifty-one ditches and canals in this District that are recorded in the office of the Clerk of the District Court, and the office of the Clerk of Chaffee County, and these claim an appropriation of 2,366 cubic feet per second.

A Water Commissioner was appointed for this District in the spring of 1880. He reports that it has been necessary to divide the water every year since his appointment. The time of scarcity of water, and contention for the same, usually occurs during the months of April and May. The necessity for a division of water occurs on the small tributaries of the Arkansas river, viz; Cottonwood, Chalk, Trout, Pine and Clear Creeks. Without any decree of Court to guide him in his duties, the Commissioner was compelled to avail himself of the data furnished by the record of statements filed with the Clerk of the District Court. He was thus enabled, in his own way, to approximately determine the priorities of claimants to the water, and to divide it accordingly.

Water District No. 12—Rio Grande Division.

This District comprises all lands irrigated from ditches taking water from Saguache Creek and its tributaries.

From information furnished this office by the Clerk of the District Court in Saguache County, it appears that a large number of the appropriators of water in this District have filed their statements, and "proved up" the same before a referee, appointed by the Court to take testimony. The "findings" of the referee have not yet been confirmed by the judge, so that no legal adjudication of water rights exists in this District at the present time.

A Water Commissioner was appointed for this District in 1880, but he reports that he has never been called on, in an official way, to divide the waters of Saguache Creek or its tributaries.

Water District No. 13—Rio Grande Division.

Water District No. 13 comprises all lands irrigated by ditches taking water from San Luis Creek and its tributaries.

No decrees have yet been rendered in this District concerning the rights of appropriations of ditches and canals.

A Water Commissioner was appointed for this District in the Spring of 1880, but no report has been received from him.

Water District No. 14—Rio Grande Division.

Water District No. 14 comprises all lands irrigated from ditches, taking water from La Garita and Carnero Creeks, in Saguache County.

There are about fifty-one ditches and canals in this District, which, according to the decree of the Court of the Sixth Judicial District, appropriate 44.07 cubic feet of water per second.

No report from the Commissioner has been received at this office since his appointment in the Spring of 1880.

Water District No. 15—Arkansas Division.

This District comprises all lands in Custer County, and that portion of Fremont County south of the Arkansas river.

It was created in 1880, by Governor Pitkin, on the application of citizens of the District, and contains an area of about 1,398 square miles. The irrigable lands of this District lie mainly in the Wet Mountain Valley.

No report has been received by this Department from the Commissioner of the District, and, so far, no decree has been rendered, establishing the rights of claimants to the use of the public waters.

Water District No. 16—Arkansas Division.

This District comprises all lands irrigated by ditches taking water from the Greenhorn Creek and its tributaries.

This District was created by Governor Pitkin in 1880, and a Water Commissioner was appointed at the same time. No record of the adjudication of the rights of claimants in this District has been received by this Department, and no report of the Commissioner has been made.

District No. 16 is one of the smallest in area yet created. The waters of the Greenhorn Creek have their source in the low range of mountains of the same name. The supply of water from the Greenhorn mountains is very limited after the middle of June, and, hence, the area of irrigable lands is necessarily limited, there being no storage reservoirs of sufficient importance, yet constructed, to impound the surplus waters of this stream, and thereby increase the extent of the irrigable lands.

Water District No. 17—Rio Grande Division.

This District comprises all lands irrigated from ditches taking water from La Jara, Alamosa and Spring Creeks.

The waters of this District have their source in the low and extreme east end of the San Juan mountains. The supply of water, in District 17, is often very limited and is insufficient to meet the demands made by all the claimants during the main irrigating season.

No Water Commissioner has ever been appointed for this District, and no decrees have been rendered concerning the rights of claimants and the amount appropriated.

WATER DISTRICT NO. 18.

This District comprises lands in La Plata County, irrigated from the waters of the Rio Mancos river.

The source of the Rio Mancos is in the La Plata mountains; it is a tributary of the San Juan river, and joins the latter at the southwest corner of the State. There are no records in this office of the number of ditches in this District, or the amount of water appropriated. This District is not included in any Water Division yet created.

The Water Commissioner reports that he finds it necessary to divide the waters in June and July, but he has no decree of Court to guide and protect him in the discharge of his official duties.

WATER DISTRICT NO. 19—ARKANSAS DIVISION.

This District comprises the lands irrigated from the Purgatoire, above the head of the Purgatoire Cañon. A Water Commissioner has been appointed for this District, but this Department has received no report of his official acts. No decree of Court has been rendered, establishing the rights of claimants, and the amount of water appropriated.

WATER DISTRICT NO. 20—RIO GRANDE DIVISION.

This District comprises all that portion of Rio Grande County that lies east of the Main Range and between ranges and seven, New Mexico meridian, consisting of a tract of land twelve miles east and west by thirty miles north and south.

This District is a rectangular tract of land extending across the Rio Grande river, lying mainly on the south side. It is a difficult matter to determine the object of creating this District in the manner above described, regardless of the direction and extent of the drainage.

A Water Commissioner was appointed for this District, but no report of his acts has been received by this Department. As yet, no decrees have been rendered by the Court, establishing the rights of claimants to the use of the public waters.

WATER DISTRICT NO. 21.

This District comprises all lands in La Plata County, irrigated from waters of the Las Animas river and its tributaries.

No statement of the filings of ditches in this District has been recorded in this office.

A Water Commissioner has been appointed, but no report has been received from him. District No. 21 is not included in any Water Division yet created.

WATER DISTRICT NO. 22.

This District comprises all lands irrigated by ditches taking water from the Tomichi Creek and its tributaries.

District No. 22 is not included in any District yet created. It has no Water Commissioner, none ever having been appointed, and no decrees of the Court have been rendered, establishing the rights of claimants to the use of the public waters.

WATER DISTRICT NO. 23—RIO GRANDE DIVISION.

This District comprises all lands irrigated from ditches taking water from Ute Creek, Sangre de Christo Creek and Trinchera river and their tributaries.

There is recorded, in the office of the State Engineer, an abstract of statements of twenty-three ditches and canals, filed with the Clerk of the District Court of Costilla County. These ditches claim the right to the use of 85 cubic feet of water per second.

No Water Commissioner has been appointed for this District.

WATER DISTRICT NO. 24—RIO GRANDE DIVISION.

This District comprises all lands in Conejos and Costilla Counties irrigated from ditches taking water from the Rio Grande river.

No record of ditches has been filed, and no decree has been rendered by Court establishing the rights of priority, and the amount of water appropriated.

There has been no Water Commissioner appointed for this District.

Water District No. 25—Rio Grande Division.

This District comprises all lands irrigated by ditches taking water from the Conejos river and its tributaries.

Decrees of the Court have established the order of priority, and furnished the data from which the capacities, in cubic feet per second, of sixty-two ditches and canals have been computed in this office. These ditches and canals appropriate about 1,612 cubic feet of water per second.

A Water Commissioner was appointed for this District in 1882, who reports that he has never been called on to divide the water, although there is a great scarcity in some years, in the months of July and August, yet the appropriators have been able so far to settle the division among themselves.

Water District No. 26—Arkansas Division.

This District comprises all lands irrigated from ditches taking water from the St. Charles river and its tributaries, except the Greenhorn Creek.

This District was created by Governor J. B. Grant on the 19th day of January, 1884, and is the last District formed. The rights of claimants and the amount of water claimed, have not yet been adjudicated by any Court.

A Water Commissioner was appointed for this District on January 23, 1884, but he has made no report to this department.

THE COLORADO CURRENT METER, AND METHOD OF RATING THE SAME.

To compute the discharge of a river or canal, it is necessary to determine, with accuracy, the area of the cross-section at the point of measurement, and the average velocity of the current passing the point. When the stream to be measured is small, or as in a canal, manageable, the first measurement required, that of the cross-section, is made more easily, and the shape maintained with certainty, when the water is made to pass through a rectangular flume, built of masonry or wood. The *maintenance* of the same cross-section is also important, whenever it is necessary to keep a constant record of the flow, as at the head of an irrigating canal, or in a river, used extensively for irrigation. When the cross-section is taken on the natural bed, it is quite possible to measure the water passing, but there is no certainty that the conditions then determined will be constant for a week, or even for a day. After the cross-section area at the measuring point is determined, it is necessary to measure the speed of the current at all points of the cross-section, in order that the *average* speed may be known. There are many ways in use of doing this, more or less accurate, the most common being by means of floats, either surface or submerged, and the speed at which they are carried past a measured distance determines the velocity of the current. Without discussing the imperfections of this and other methods, more or less used in the absence of the accurate instruments employed where close measurement is necessary, a brief description of the instrument used by this Department, and the method of rating it, is here given: The first instrument used was a "Fteley" current-meter, which was very

accurate, provided the water was clear and free from weeds, grass, etc., conditions not always found in Colorado streams and ditches, and it was found necessary to have an instrument which would be self-clearing, and give accurate readings in torrents and foul water. To meet this requirement, the "Colorado" current-meter was designed, which acts on the same general principle as the "anemometer," or wind-gauge, the principal change being in the shape and number of the cups. It has five vanes or cups revolving horizontally on an axle, having bearings at the open end of a ⊂-shaped metal frame, the cups passing between the sides of the ⊂. On the upper arm of the frame is affixed a set of counting gears, so arranged, that they can be instantly thrown into, or out of connection, with the vanes, by means of a spring, and a cord passing up the metal rod, by which the instrument is held in the desired position in the water. The shape of the cups is such that floating weeds, etc., will not be retained longer than about three-eighths of a revolution.

These meters are each rated separately, by moving them at known velocities through still water, which has the same effect on the meter as holding it in running water, and determining the number of revolutions made by the meter, in a given time, at each velocity. Those used by this Department were rated in perfectly still water, in the reservoir of the Denver Water Company, kindly placed at my disposal for this purpose. To measure the velocity of the current at any given point, the meter is held at that point a certain time, usually 100 seconds, and the number of revolutions recorded. This operation can be repeated at each point of the cross-section as often as is deemed necessary, and by measuring a sufficient number of points in the current, the mean velocity of the water is determined. The velocity and cross-section being known, it is easy to determine the quantity of water passing the point in any given time, say one second. If the cross-section area is forty feet, and the average current velocity 2.35 feet per second, the quantity will be 40 multiplied by 2.35, equal to 94 cubic feet per second.

The result of the computation, last described, is termed the *gauging* of the canal or river, at the height of the water,

when the current velocity was measured. As the velocity increases with the increase of height of water in the flume, it is necessary to make a gauging for several stages of water between the bottom of the flume and its fullest capacity; and when this has been done, and the results tabulated, it is possible to determine the discharge for all intermediate points. This table is called the *rating* of the river or canal gauged. An example of the rating table of the Cache la Poudre, at the measuring flume, is given in Appendix B, Table 1.

DESCRIPTION OF THE METHOD

OF GAUGING AND RATING THE VELOCITY OF THE CURRENT OF THE CACHE LA POUDRE RIVER.

The site selected for the measuring flume, about half a mile above the mouth of the cañon, had the advantage of having a fairly regular cross-section for a considerable distance, both above and below, free from obstructions causing cross-currents and eddies.

The following is a short description of the method of construction :—Four rows of piles were driven across the bed of the stream, with spaces between them of eight, fourteen, and eight feet, the heads of the two middle, or flume rows, being driven to a level, about fifteen inches under the deepest part of the natural bed, which here consisted of boulder gravel. These rows were capped with heavy timbers, drift-bolted to the pile heads, and a string of heavy timbers was laid parallel to the rows of piles, and midway between them, the tops of these timbers being leveled with the top of the pile caps. A smooth flooring of three-inch planks was spiked on these caps and timbers, measuring thirty-two feet in the line of the stream. On both banks perpendicular walls were erected, eight feet high, of smoothed two-inch planks. These walls were well supported behind, and packed with thoroughly tamped clay and gravel. The floor of the flume was carefully leveled throughout. On the up-stream side the flume is protected by a pitched apron of smoothed three-inch planks, eight feet long, having a slope of eight inches in that length. Down-stream, the water leaves the flume by a fall of eight inches on to a level apron, eight feet long, which rests at its upper end on a string of timbers, spiked to the lower row of flume piles, and at its lower end on the lower pile row, the lower end being level

with the natural bed of the stream. The flume is 103.16 feet wide between the smooth perpendicular sides, which are protected, above and below, by dry stone wing walls. On the left bank, and opposite the middle of the flume, is an instrument house, eight by ten, in which, on a table, the self-recording water gauge is placed. The gauging apparatus consists of a stand-pipe, connected with the flume by a horizontal pipe level with its floor. A galvanized-iron, hollow cylinder, having conical ends, floats on the water in the stand-pipe, and is connected by a line with the self-recording machinery, which stands on a table, placed above the stand-pipe. This consists of a cylinder turned by a clock, so that one revolution is made in a week. On this cylinder a sheet of profile paper is wound, and this paper is divided by heavy lines into seven equal parts, each part representing one day, and these parts are sub-divided into twelve equal parts, each representing two hours. A pencil is held to the cylinder by a light weight, and this pencil is connected with the float in such a manner that the rise and fall of the float causes a proportional horizontal motion of the pencil. By use of this instrument a continuous record of the height of water passing through the flume, was kept from March 14 to October 16, 1884, which, with an accurate measurement of the velocities at all heights of water in the flume, gives the means of determining the discharge for the period covered, with a high degree of accuracy.

Observations for determining the velocity of the current were made at intervals of ten feet across the river, beginning five feet from the north side of the measuring flume. The assistant stood in a boat, which was held in position by a head line sliding on a ferry cable, and by side lines to both shores. The meter was placed in the water, with the counting gear disconnected. Another assistant, with a stop watch, gives a signal, and at the same instant the counting gear is connected, and the assistant using the meter commences to move it slowly from surface of water to bottom, returning to surface, repeating the operation two or three times with as nearly a uniform motion as possible, in order to obtain the average velocity at that point, the usual time for an observation being 100 seconds.

The counting gear was thrown out and the stop watch stopped at the same instant. Both the time occupied, and the revolutions of the meter, were recorded, and at least two observations taken at each point. When the work at one point was completed satisfactorily, an assistant on shore moved the boat ten feet, and the operations were repeated every ten feet across the stream. In this manner the average velocity of the meter in the stream was ascertained. The meter rate having been previously accurately determined, the record gives the data for computing the exact average velocity of the stream at the height of observation. These operations were repeated when the river changed, one foot higher or lower, and five gaugings were made, at as nearly equal points as possible, between the lowest and highest stages of water. This gave the data for computing the discharge of the river at the point rated.

By a method of platting, exhibited by a plate in Appendix "B," the discharge for every intermediate point was obtained. The operation, above described, is termed the *rating* of the gauging station. Hereafter when the height of water in the river at the flume is given, the discharge, in cubic feet per second, can be taken from the table.

THE IMPORTANCE OF A UNIFORM UNIT OF MEASURE.

The necessity for a practical standard, or unit, of measure of water is very urgent; one that is simple, positive and adapted to all classes of ditches and canals, and readily understood by all agriculturists, whether small gardener or large farmer. At present we have no unit of measure in universal use throughout the State. All recent legislation regarding irrigation water requires measurements to be expressed in cubic feet per second. This is a correct system, being definite, but the "inch" system is probably more extensively used than any other; and it is astonishing how many ways there are of delivering water under this method, and of estimating its real volume. This unit of measure, known throughout the State as the "statutory inch," is defined in Section 3472 of the General Statutes of Colorado, as follows, viz; "Every inch shall be considered equal to an inch square orifice under a five-inch pressure, and a five-inch pressure shall be from the top of the orifice of the box put into the banks of the ditch to the surface of the water; said boxes or any slot or aperture through which such water shall be measured shall in all cases be six inches perpendicular, inside measurement, except boxes delivering less than twelve inches, which may be square, with or without slides; all slides for the same shall move horizontally, and not otherwise; and said box put into the banks of ditch shall have a descending grade from the water in ditch of not less than one-eighth of an inch to the foot." Section 3478 in same chapter makes it a misdemeanor for a person to sell water by the inch, and measure it by any other device than by the one described above, with a penalty attached, viz: "Upon conviction thereof may be imprisoned not exceeding one year, or fined not exceeding one thousand dollars, at the discretion of the court." According to

this law, where water is sold by the inch, no box can be over six inches perpendicular height. Although the inch method of measuring has been in use since the first irrigation in the State, yet scarcely two people measure it alike, or understand what an inch of water really is; and many a good citizen has inadvertently subjected himself to the penalty of the law. The statutory inch answers very well as a unit of measure for small volumes of water, providing the legal pressure and all other requirements are maintained, but it is quite well understood by irrigators and others, that the legal box can be placed in a ditch, and so manipulated as to deliver quantities of water, differing over fifty per cent, either more or less, as suits the interest o the party controlling the box. At the present day, such large quantities are sometimes required to be measured, that the statutory inch is found to be impracticable, as well as inaccurate; for example, in Weld County, a canal company sells 92 cubic feet of water per second, delivered in one lateral ditch. If this amount of water was sold by the inch, and measured by a legal box, it would require to be 49 feet 1 inch long, with a height of 6 inches, and this is impracticable.

The Referees in some of the Water Districts, in making up their findings, have experienced much difficulty in reducing to one unit of measure the various statements of water appropriators, and this office has experienced a like difficulty. Most of the statements made in filings were made in perfect good faith, but the capacities of the ditches were, in many cases, given in inches of cross-section instead of statute inches. For example, a ditch five feet wide by twenty inches deep, would have an area of twelve hundred *square* inches instead of *statute* inches, claimed for it, without reference to velocity, or to fall per mile. This was done without any intention to claim more than was due. Many disputes and misunderstandings arise about the exact amount of water due for an "inch." To settle the matter, it would be well to have the flow of water through the legal orifice (as specified in existing contracts) defined in specific quantity, in specific time, and, for the future, cubic feet, per second of time, substituted for the inch system, which measures water through boxes of impracticable dimensions, unsuited to the modern practice of irrigation.

DUTY OF WATER.

At the present day, it is impossible to define the full duty of water in Colorado, as no trustworthy data can be had, and it is doubtful if this duty can ever be precisely established. There are very many factors of this subject to be considered, such as the nature of the soil, the "lay" of the land, subsoil, the kind of crop grown, the skill of the irrigator, climatic conditions during the crop season, etc. Although this duty cannot be clearly defined, it is very apparent that in almost every section of Colorado, the amount of water used in irrigation can be considerably reduced. Except in a few instances, where necessity has forced the practice of economy, it has not been necessary to restrict the use of water to anywhere near the minimum quantity required to raise a crop. When water becomes more valuable, and the labor of applying it costs less, we may look for a considerable increase in the duty of water. In California, the duty of water is, in some districts, as low, or even lower, than in Colorado, whilst in other districts where the supply is limited, and in some instances, where prescribed by contract, the duty is higher than it seems possible ever to make it in Colorado. In fact, the relation of the demand to the supply, is of great importance in determining the economical use of water.

Powell, in his "Lands of the Arid Region," says, "one second foot of water will irrigate 80 to 100 acres in Utah," but, "many of the farmers will not admit that so great a tract can be cultivated by this unit. In the early history of irrigation in this country, the lands were over-supplied with water, but experience has shown that irrigation is most successful when the least amount of water is used necessary to a vigorous growth of the crops, that is, a greater yield is obtained by avoiding both scanty and excessive watering; but the tendency to over-water the lands is corrected only by extended experience." Colonel

Baird Smith, in his report on Italian Irrigation, states that "the general average area irrigated by each cubic foot of water 'per second,' throughout Lombardy, amounts to 70.2 acres."

That the duty of water can be greatly increased, will be admitted in the abstract by a great majority of irrigators, but, when the subject of applying less water to raise any particular crop is suggested, more especially if the suggestion comes from anyone interested in the ownership of a canal, it is looked upon as coming from one who has a selfish and financial reason for advocating economy in this respect. On the other hand, when a man has a beneficiary right to the use of more water than he really needs, he is apt to act on the "I-paid-for-it-and-will-use-it" principle, applying water when he would be benefited by not doing so.

A very practical method of increasing the general duty of water throughout the State, is to convince the irrigator of the truth of the fact, (which has been established by the experience of some of the best and most experienced irrigating farmers), that a more sparing use of water, even at an increase of labor in its application, *will pay*, both in the quantity, and more especially the quality of the crops, and also that the profuse and constant watering of land tends to make it cold, washes out, drives away, or otherwise destroys the fertilizing elements of the soil. That the over-abundant watering of growing crops, not only reduces the yield and quality, but often damages the land, is certainly a question to be carefully considered, and is a strong argument in favor of reducing the amount of water used to a minimum. Whilst the building of storage reservoirs to hold the surplus waters during the flood season, is very desirable, and the benefit which would result to the State by the construction of a complete system, can hardly be over estimated, yet, increasing the duty of water to what it is possible to do, will, when reduced to a money value, be astonishing to those who have not considered the subject. This reduction can generally be made at an outlay which will scarcely be felt. As an example of benefit to be derived by a small increase of the duty of water, the following computation is made: In the Cache la Poudre valley, the average duty of water is about fifty acres per foot-sec-

ond. If this duty were raised to sixty-five acres, and if the value of a second-foot of water in perpetuity be estimated as worth $750.00, the saving on the 2,500 cubic feet per second (estimated as the amount used) will be worth $552,500 00, a very large sum to be saved in this one valley.

The proper preparation of the land is an important condition favoring the economical use of water, and this can be done at much less cost and labor than is generally supposed. When in California, I visited a farm where the work of leveling was in progress under the supervision of one of most experienced engineers on the Coast. This work consisted in preparing new ground for a permanent field of alfalfa, which was laid out on the "check," or bed system, so that each "check" area could be flooded as desired. All the labor required to irrigate a field thus prepared is simply that of opening and closing the supply gates. The "checks," when once properly built, are almost permanent improvements, needing no repairs for many years, and their form such as not to interfere with the gathering or harvesting of the crops, the crests being rounded and slopes gentle. Since my return a letter has been received from the engineer, in which he states that the work was done with a "Buck" scraper at a cost of four cents per cubic yard, the cost per acre, with gates, being $1.50 for 1,200 acres. On completion, it took four men nine days to give this new piece of land its first watering. The water used was equal to a total depth of twelve inches on the land, being 6,144 Colorado inches, or 160 cubic feet per seeond during working hours, and the cost of application was four cents per acre. The soil is an absorbent, sandy loam. This does not show any economy in the use of water over the average Colorado practice, but it shows great economy in the method of its application, a cost of four cents per acre to irrigate for the first time new land, being very low, and it was claimed that even this cost would be reduced in subsequent irrigations, as less water would be required, and the labor of applying it would be proportionately reduced.

Reference is made to this bit of actual practice to illustrate the fact that land can be prepared for irrigation at a moderate cost, which will be quickly repaid by the great

reduction of the cost of the application of water, below that of the common methods of flooding unprepared land, especially for use on perennial crops.

The increase of the duty of water is of great importtance to the State, and all efforts to obtain trustworthy data, throwing light upon the subject, should be encouraged by all proper State action, such as the encouragment of local and State irrigation conventions. Probably one of the main causes of the general ignorance of the duty of water, is the absence of a definite system of measurement that can be practically applied. In pioneer days, the "miner's inch" was the standard, and "an inch to the acre" was a common estimate of the duty of water.

If the statutory inch be considered equal to 45 cubic inches discharged per second, 38.4 of these inches are equal to one cubic foot per second, and this would be equal to 38.4 acres, per cubic foot, per second, which would be a very low duty. Since the building and operating of large canals on the co-operative system, some attention has been given to the question of the best methods of dividing the water of a canal, equitably, among shareholders; but this operation had the *division* only in view, without reference to actual quantity, and the owners of such canals have no direct interest in determining the exact quantity of water required to irrigate a stated area. The later organized canal companies, which dispose of water in perpetuity, or yearly, *by quantity*, or by the acre irrigated, have necessarily been compelled to make estimates of the duty of water. These estimates have been based on the experiences of the older irrigators, calculations being made of the discharge of their ditches or dividing boxes, expressed in either statutory inches or cubic feet per scond, and this quantity compared with the land culivated for a series of years. On these determinations have been based the first really practical estimates of the duty of water in Colorado, expressed in a tangible form. These estimates range from 50 to 55 acres per cubic foot per second, and this is the generally recognized duty at the preseut time.

Many of the canal companies formulate rules, and make contracts which are detrimental to the interests

of the State, inasmuch as no inducement is held out to the purchasers to use water with economy in irrigation. This is more especially so when water is furnished for a stipulated price per acre, and a maximum quantity agreed upon; also, when the water is sold in perpetuity, with the contract so worded that the benefits derived by the use of less than the maximum named quantity shall inure to the canal company. Contracts for water should be for absolute quantities, and then if the purchaser can farm with less, by skillful and careful use of his water, the value of his surplus, which he might use on other land, or sell to those who need it, will be a premium to strive for. If such contracts were in general use, we might look for a large and rapid increase of the duty of water.

RESERVOIRS.

In some parts of the State it is already of great importance that efforts be made to hold back and control the flow of some, or all, of the surplus waters, which now run off during the summer floods. That the volume of water so escaping in many streams is enormous, is evidenced by the guage-records of the Cache la Poudre, which shows that 82 per cent. of the total annual discharge of the river, passes down during the three months of May, June, and July;—41 per cent. passing in June; only 6.6 per cent. in August, and 2.6 per cent. in September. The importance of saving the waste waters, is manifest at once to anyone conversant with the value of water for irrigation, especially in valleys like those of Bear Creek, the Fountain, and many others in the State, where the amount of water is limited at seasons, when most needed. The great benefits which would inure to the State, and to the people of these valleys, by a successful solution of the storage problem, and the actual construction of reservoirs, needs no amplification.

Major Powell, in his "Lands of the Arid Regions," writes so appropriately on this subject, that I cannot do better than to quote his words here:—"It cannot be very definately stated to what extent irrigation can be increased by the storage of water. The rainfall is much greater in the mountain than in the valley district. Much of this precipitation in the mountain districts falls as snow. The great snowbanks are the reservoirs which hold the water for the growing seasons. Then the streams are at flood tide; many go dry after the snow has been melted by the midsummer sun; hence, they supply during the irrigating time much more water than during the remainder of the year. During the fall and winter, the streams are small; in late spring and early summer they are very large. A day's flow at flood time is greater than a month's flow at

low water time. During the first part of the irrigating season less water is needed, but during that same time the supply is greatest."

"The chief increase will come from the storage of this excess of water in the early part of the irrigating season. The amount to be stored will then be great, and the time of this storage will be so short that it will be but little diminished by evaporation. The waters of the fall and winter are so small in amount that they will not furnish a great supply, and the time for their storage will be so great that much will be lost by evaporation. The increase by storage will eventually be important, and it would be wise to anticipate the time when it will be needed *by reserving sites* for principal reservoirs and larger ponds."

To realize the great benefits to be derived by systematic impounding of waste water, ample provision should be made to make such preliminary surveys and estimates, as may be necessary to initiate enterprises in this direction, and such laws enacted, as will invite and protect the capital necessary, as well as foster the best interests of the State, and of the individual. In such localities as are now in really great need of a system of storage, say, as is the Fountain Valley, where there are thousands of acres of fine land lying unimproved, close to towns like Pueblo, Colorado Springs, and Manitou, it might be well for the State to do some detail work, such as making thorough surveys and examinations of such available sites as can be found, and prepare careful estimates of their utility and cost. This might be the means of inducing the organization of companies with the necessary capital, to at once push to a successful completion, a system of irrigation which might otherwise be undeveloped for years. There are numerous favorable natural sites, scattered over the State, mostly outside the foot-hills. The most available of these are situated on the Divides, between the streams issuing from the mountains. These are probably depressions caused by ancient glacial action, or eddying currents, and judging from the experience with those that have been already utilized, these natural sites offer the most advantageous location for impounding water for irrigation

purposes, they being generally situated near the land to be irrigated, and are capable of holding water, with a minimum loss by absorbtion. Most of the reservoirs already constructed are of this class, and range from six to thirty-five feet deep, and from ten to five hundred acres in area, into which ditches have been led for supply, and trenches cut, as deep as possible, to lead off all the water for irrigation. The largest of these reservoirs now utilized, of which I have knowledge, is the "Home Supply," south-west of Loveland, which takes water by a ditch of the same name, from the Big Thompson. This reservoir has an area of 427.35 acres at high water level and the greatest depth is 33.8 feet. Of this 21.8 feet can be drawn off for irrigation. The low-water area is not known. The water is drawn from it by a tunnel excavated through the bank. This reservoir is estimated by its owners to be capable of irrigating eleven to twelve thousand acres. It is calculated probably to refill it several times during the season.

The question is often asked if it is practicable to construct reservoirs in a level country, on top of the ground, by excavation and embankment; and also, if water can be pumped by steam at a cost permissible for irrigation purposes. Before these questions can be answered, it is necessary to fix the value of a defined volume of water for irrigation purposes. For convenience take a volume of water of one million cubic feet. If this amount is applied without loss in transportation, (as through pipes), it will irrigate, on an average, twenty acres of land for one season, when used very carefully. Assuming one half of this area (to allow for unavoidable loss by absorbtion, evaporation, and the loss by the ordinary practice of irrigation) the *area-value* of one million cubic feet of water will be considered as ten acres. On this basis of ten acres per million cubic feet, the cost of a reservoir built entirely on the surface of nearly level ground, from excavation made within the area enclosed, without borrowing or wasting material, has been calculated. The price assumed for earth work was 20 cents per cubic yard, which for banks twenty feet high, and a long haul, is about the cost at present prices. The size calculated was 1283 feet by 641.5 feet, holding twenty-three and one-half million cubic feet of water. The cost is

$37,617; which at 7 per cent. per annum interest, would be equal to an annual charge of $2,633, or $112.21 per million cubic feet, without any allowance for maintenance. This, at the area value of ten acres per million cubic feet, would irrigate 235 acres, at a cost of $11.22 per acre, which cost would be prohibitory. This estimate is based on a reservoir of the most economical proportions. On the other hand, an estimate has been made of the cost of construction in Colorado, of a reservoir similar to one built in Central India, an account of which was recently given in a paper read before the London Institute of Civil Engineers. This reservoir is a large one and of a type common in India, viz.: An embankment 60 to 100 feet high, thrown across a wide valley, and forming a lake having a water surface of several square miles.

For the quantities given by Mr. Burke, the Engineer of the work, the cost at Colorado prices is estimated at	$361946
Add for contingencies, engineering etc., 10 per cent	36195
Total	398141

The net supply of water available, delivered into the canals, after deduction was made for absorbtion, evaporation, etc., is reported as 1115 million cubic feet, which would irrigate 11150 acres, on the basis of ten acres per million cubic feet, and the annual charge, per acre, would be $2 50, at the rate of 7 per cent. per annum.

Only an abstract estimate can be made of an abstract proposition, but the last of these estimates shows that if an equally favorable site exists in Colorado, it could be improved to commercial advantage, more especially when it is remembered, that here the reservoir could probably be refilled, at least once, during the irrigating season, which would double the supply of water and reduce the interest charge of cost per acre to one-half of the above estimate.

At some sites it might be necessary to pump water, and under the conditions likely to be met in practice, where the work will be done in isolated localities and confined to 90 or 120 days' work in the year, whilst the interest on cost

of plant will have to be charged for a whole year, the cost will average about fifteen cents per million cubic feet per foot raised, or about $15 to raise that amount of water 100 feet. This estimate is made on the basis of coal costing $5 per ton, and an average engine of 50-horse power. If the water is pumped during the whole year, the cost will be reduced to about two-thirds of this amount.

In all probability, the cost of building reservoirs on a large scale, will be beyond the means of any one, or of a few persons, as is the present system of canal irrigation to cover large areas, and it is doubtful whether companies of sufficient financial strength can be induced to undertake the work, whilst the field is untried and the results unknown. The policy of the State in building, improving and controlling reservoirs is questionable; but the State might, by proper legislation, open the way for the people of the various local districts which would be benefited, to build these reservoirs, the State supervising the distribution of benefits and expenses; and still further, by liberal legislation, encourage capital, whether individual or combined, to build reservoirs, under proper restrictions as to prices charged or privileges to be granted. All of the reservoirs built for public use should be under the same State control as the public waters. The State should *supervise*, through the Department of the State Engineer, the construction of all embankments, on the safety of which many lives and large amounts of property may depend.

In August, last, a reconnoissance was made in the mountains, at the head of the Cache la Poudre, and in the vicinity of Grand Lake, primarily to search for suitable reservoir sites, and secondarily, to determine as to the feasibility of turning the waters of Grand Lake eastward into the St. Vrain and Boulder Creeks. It was originally planned to examine the head waters of other streams, but the unusual amount of fallen timber across roads and trails, made progress slow, and the deficiency of appropriation prevented further investigation.

Chambers Lake is one of the largest and most available storage reservoirs in the Cache la Poudre Valley. This is, in part, improved as such by a com-

pany, which has built a quite substantial embankment across the narrow outlet, provided with a discharge sluice and regulating gates. This lake in its natural condition covers an area of about 113 acres. The dam now built raises the water 16 feet, increasing the surface area to about 220 acres. The estimated holding capacity of this lake, as at present improved, is equal to 114 million cubic feet. This lake can be raised about twenty feet higher than at present, with safety, at little expense, which, it is estimated, will give it an additional holding capacity of 279 million cubic feet, making a total of 393 million cubic feet of water which can be drawn off.

Northeast of Chambers Lake, at a distance of less than two miles, is a chain of lakes and marsh land, in a small valley, constituting one of the heads of the Laramie River. The area of the water-shed which feeds these lakes, is very small, it being near the Divide between the Cache la Poudre and the Laramie River. It is estimated that 70 million cubic feet of water can be stored in these lakes, by an expenditure of about $12,000 in making embankments across the outlets and across one or two narrow places in the valley. The area of these reservoirs at high water level, would be about 150 acres, and depth about 10 feet, and this water could be led into the valley of the Cache la Poudre by cutting through a ridge about 1800 feet long and nowhere exceeding 20 feet in depth, which would turn the waters of the lakes into the Cache la Poudre Valley. From the small catchment area of these lakes, and the fact that they will receive the most of their water in the Winter and Spring, it will not be practicable to hold the water in them till mid-Summer to reinforce the stream after the Summer floods; so their value will lie in their capability to increase the flow of the stream for early irrigation, and as their combined holding capacity is small, and the distance from the nearest land to be benefited, is great (about 75 miles), it is considered that these lakes are of no utility at the present time. Of the availability of Chambers Lake for reservoir purposes, there is no reason for doubt; it can be filled in Winter and discharged in Spring for early irrigation, and again refilled in Summer for late irrigation.

The examination of Grand Lake was made to ascertain whether it were practicable to turn its waters eastwardly. This lake has an area of about 460 acres, and the outflow on August 12, 1884, was estimated to be 800 cubic feet per second. It is fed by two streams which enter it from the north, and the east, draining the country west of Long's Peak. The lake may be considered as the head of one branch of the Grand River, the waters of which flow westward into the Pacific Ocean. Not being able to make a detailed survey of the country lying between the lake and the head waters of the streams on the other side of the Continental Divide, the distances and elevations can only be given approximately; but enough work was done by triangulation and the ascertainment of heights by the barometer, to determine the impracticability of the proposition to lead the waters of the lake eastward.

A rough triangulation of the lake, and of the country across the Divide, was made, and when compared with the meanders of the United States Surveyors, was found to agree very closely. The following are the results:

Area of lake, about, ...	460 acres.
Elevation above sea level, about, ...	8150 feet.
Distance from lake to same level on eastern slope, measured on shortest line, . . .	14 miles.
Distance from lake to summit of range, . . .	8 miles.
Elevation of summit of range above lake, . .	4200 feet.

A tunnel of 14 to 17 miles (the estimated length) is entirely impracticable to construct, as it would cost millions of dollars; and its impracticability may be considered as a settlement of the question which was so earnestly pressed by a member of the last General Assembly.

Necessity for a More Diversified System of Agriculture in Colorado.

In this portion of the Report, it may be considered that the State Engineer is travelling outside of the strictly official duty of his office; but the intimate relationship which exists between the waters of the natural streams of the State, and the lands that may be irrigated by them, is convincing that this Report can be made more valuable, by showing, on trustworthy official information, that there exists a necessity, for not only a more diversified agriculture, but for greater attention to the production of several crops, of which there is at present a great deficiency in the State, and which can be grown with profit to our farmers; and, in addition, to show that to the cultivator of the soil, there is nowhere in the West, a State or Territory where capital can be invested in the operations of intelligent farming, with such a probability of profitable returns, as in Colorado.

Table showing the Importation of Farm Products into Colorado during the year ending Nov. 30, 1884.

ARTICLE.	Quantity.	Mean rate 1883 and 1884.	Value at mean rate of 1883 and 1884.	Mean rate 1884.	Value at mean rate of 1884.
Cut Meats	12,744,676 lbs.	9½	$1,210,735	9	$1,147,014
Lard	5,625,000 "	10¼	576,563	10	562,500
Wheat	13,297 bush.	82⅓	10,948	73	9,707
Flour	3,368,561 lbs.	$2.21 per 100	74,445	1.99½ per 100	67,203
Oats	807,200 bush.	49¾	401,582	44½	359,204
Corn	478,658 "	76½	366,173	71½	342,029
Chop	1,962,266 "	1 35 per 100	26,491	$1.23 per 100	24,136
Meal	1,478,193 "	1.74 per 100	25,721	$1 75 per 100	25,868
Barley	4,715 "	76⅔	3,615	67½	3,175
Malt	820,820 lbs.	2¾	22,573	2¾	22,573
Bran	145½ tons.	$17.16	2,497	$14.31	2,082
Beans	256,434 lbs.	4½	11,540	5	12,822
Hay	2,191 tons.	$12.78	28,001	$14.15	31,003
Vegetables	1,322,857 lbs.	$2.10 per 100	27,780	$1.90 per 100	25,135
Vegetables and Potatoes,	221,350 "	1.50 per 100	3,320	$1.45 per 100	3,210
Potatoes	622,328 "	92½c per 100	5,943	98c per 100	6,099
Butter	4,093,125 "	28⅜	1,161,464	28¾	1,176,745
Cheese	521,732 "	13½	70,434	13½	70,434
Eggs	1,127,911 doz.	23	259,420	22	248,140
Live and dressed chickens,	55,735 "	$5.33½	297,587	$5.07½	282,855
Apples	31,485 bbls.	$4.25	133,811	$4.25	133,811
Green fruit	5,358,236 lbs.	11	589,406	11	589,406
Dried fruit	1,574,796 "	10½	165,354	10½	165,354

A careful examination of the above table of shipments into the State, shows that, in 1884, we bought from outside, fully six millions of dollars' worth of the farm products of other States. This means that we paid that amount to the farmers of other States and Territories for grain, fruits, vegetables, butter, cheese, poultry, eggs, and meats, which might have been furnished by the farmers, gardeners, and graziers of our own State. This table shows, conclusively, that we have a home market in our mines, factories, shops, and cities, for many million dollars' worth of farm products, in excess of our present production; and furthermore, this table furnishes conclusive evidence that our farmers have a home market for *everything* they can raise, provided they give intelligent consideration to the demands of our consumers—a happy contrast to the farmers of Nebraska and Kansas, who can only hope to realize for their crops, the New York, Liverpool or Denver prices, less the cost of transportation. The Colorado farmer's market is at his own door, the market for the Iowa or Minnesota farmer is a thousand miles away.

It is proper in this Report to give credit to the sources from which the above information was obtained; in the first place, that I may acknowledge the courtesies and return the thanks of this office to the gentlemen who furnished the data at the expense of much time and trouble to themselves, and in the second place, for the information of those who may doubt the correctness of the table. The prices were obtained by a careful compilation of the wholesale market reports of Denver, for the years 1383–4, great care having been taken to be at all times *within* the truth, so that no false color be given to the deductions drawn therefrom. On an application from this office, Mr. Geo. H. Daniels, Commissioner of the Colorado Railroad Pool, requested the permission of the General Managers of the Pool Railroads, to give full returns of all farm products brought into the State. On the receipt of permission, the data was furnished by Mr. Daniels, fully and promptly. The returns from non-competitive stations, and of importations from the West, were furnished by the General Freight Agents of the Union Pacific, Denver & Rio Grande, and Atchison, Topeka & Santa Fe Railroads. To these

must be added the returns given by the Pacific, Denver & Rio Grande, and Wells, Fargo & Co. Express Companies, furnished by the superintendents.

With regard to the one item of lard, which, was unfortunately, omitted by oversight from the returns given by Mr. Daniels, an estimate has been made from the information furnished by leading Denver dealers in that article. Of this article, three Denver firms brought in seventy-four car loads; and immense as is the quantity of lard shown in the table, yet it is believed to be *under* the real importation, as it frequently comes in shipments of general groceries, of which no data can be obtained.

There are hundreds of thousands of dollars' worth of canned meats, poultry and vegetables brought into the State, of which no estimate is given, and of which it is impossible to get definite information; and rather than report anything for which official data could not be furnished, it is preferred to make no note of it whatever. The amounts specified, of each article, *have been imported*, and in all probability *more* of each article was brought in.

It is desired in this Report to draw attention to special articles which have been imported into Colorado, so that not only the farmers of the State, but the capitalists and business men, may learn a lesson, and see how they may profitably employ their capital and energy in developing the agricultural resources of the State, to the end that these millions of dollars, now sent abroad, be kept at home, to flow in the channels of *home* trade, benefiting not only themselves, but the State.

Taking wheat as the first article to illustrate from: This is the only Colorado product of which a surplus is raised. We make the boast that our wheat is the best grown anywhere, and for proof, we point to the large yield per acre, the superior quality of all varieties, and the incomparable excellency of special kinds, which has been attested by competition with three thousand varieties from all parts of the civilized world at the New York World's Exhibition, where the wheat of Prof. Blount, of the Colorado Agricultural College, carried off the first prize, the award

of the Commissioners being verified by the analysis of the Professor of Chemistry of the Smithsonian Institute. Of this article, we imported *this year*, as wheat and flour, $77,000 worth, or the product of 7,700 acres at the low market price now prevailing. This, to the careless observer, would seem to be an illustration of the folly of "carrying coals to Newcastle;" but careful examination of the subject shows that this bringing of wheat and flour into a State, with a surplus wheat crop, is a good business investment, because from the flour of Kansas winter wheat, the Colorado baker can make more bread, per 100 pounds, than he can from home-grown spring wheat. A lesson is to be learned from this. Professor Blount says that if the farmers of Colorado will try, they can raise as good winter wheat as can the farmers of Kansas, and it is only their inattention to the demand of the bakers for winter wheat flour which prevents their supplying them with the wheat required to make it. The winter wheat from which the flour demanded is made, can be grown at home if the farmer will only plant it in the place of spring wheat. The fact is, that the farmers of the State have been indifferent as to the kind of wheat planted, because in past years, any kind brought high prices and found a ready market; but now, when more wheat is raised than is needed at home, care should be taken to sow the kinds which will make the flour required by our bakers. The wheat importation, however, is but a small factor of the sum total, and it is the deficiency of other articles that is most astonishing.

The particular attention of farmers is called to oats, barley and corn. Oats can be raised in this State, with a yield per acre, equalling the general average of the whole country, and of a quality that is not surpassed anywhere in the world, and not equalled in a single Eastern State. Of this grain, the table shows that we shipped in 807,200 bushels, worth at the average Denver wholesale prices of 1883–4, $401,582. Probably 33 bushels, by weight, per acre, is a fair average yield for the State, although a much greater yield is claimed by the farmers of the San Luis valley, and those of the South. At 33 bushels per acre, the product of 24,460 acres was shipped into Colorado. Suppose this quantity of the land, which was last year sown in wheat, had been

planted in oats, then the quantity of wheat (estimating at 20 bushels per acre) would have been reduced 489,200 bushels; our surplus of wheat wiped out, and its price enhanced. Farmers need not say there is no profit in oats at fifty or even forty cents a bushel, as the farmers on the high priced lands of Pennsylvania do not get more than that, and they can see a profit in it.

The importation of corn, corn chop, and meal, was equal, in value, to $418,385, or what was equal to considerably over half a million of bushels; or, at an average of 30 bushels per acre, the product of about 17,000 acres of land. If the argument is made that corn cannot be grown profitably in the State, the reply is, that corn *was* grown with profit, when the price of labor was much higher than at present. In the Arkansas valley, I have seen large fields, and long cribs of the golden grain, that could not be surpassed in the cornfields of Missouri or Illinois. In Southwest Colorado, I *know* good corn can be raised, and in Northern Colorado, good corn *is* raised with profit, by farmers who know how, and who give attention to the preparation and cultivation of the land. Any one can do the same, if they will properly prepare the fields, and give the corn the same attention and care that is given on the corn farms of Iowa or Illinois.

Of barley, hay, beans and vegetables (not including canned vegetables) we imported the product of not less than 4,000 acres. The importation of barley ought to attract the attention and arouse the energies of Colorado farmers. Our barley is equal to that of California, from which State millions of bushels are shipped East. Colorado ought to raise thousands of bushels, if for no other purpose than to supply the present deficiency of horse feed. We have a large area of land in the higher parks, like the San Luis, which is admirably adapted for the production of barley, oats, rye, etc., of unsurpassable quality. It is a drawback to the State, that our people have to buy from any, but our own farmers, a single ton of farm products, which are capable of being grown in the State.

A consideration of the premises will demonstrate, that, had the farmers of the State stepped out of the beaten path of wheat culture, to grow a due proportion of other cereals,

they would have kept their production within the demand of our population, and so have maintained prices. When the statistics of the importation of dairy products is considered, the only possible deduction to be made, is, that our farmers are entirely blind to the necessities of the State and to their own interests.

In the year 1884, the 300,000 inhabitants of the State, imported $1,176,445 worth of butter, and $70,484 worth of cheese, a total of $1,246,929. This is equal to $4.15 for every man, woman and child in the State, sent abroad to the farmers and oleomargarine makers of other States. For the inhabitants of a State, which boasts of its cattle interests, and which was accorded prominent recognition in the late National Cattle Convention, the fact that they pay for the product of 23,000 cows, fed in other States, is, to state it mildly, humiliating.

The sum of money paid for butter and cheese is greater than the value of the entire wheat crop of the State at the prices which can be obtained for the crop of 1884, estimating the crop at two and one-fourth million of bushels, and the price at 54 cents.

If our farmers and dairymen would study the logic of these facts, and systematically make an application of them, they would put into their pockets this enormous sum of money; and not only that, but would compete with the Kansas, Nebraska and Iowa farmers in the butter markets of the East and Europe. We have a climate, water, grasses and other feed that is suitable to making the best of butter and cheese. One acre of our land, properly seeded to alfalfa or red clover, by reason of the superiority of artificial watering of the land, is equal in food production to two acres of the best blue grass land in the Ohio Valley. We have a market in the mines, towns and shops of New Mexico, Arizona and Colorado, far superior to that of the cities and workshops of the East, and it only needs the application of the most common principles of business to avail ourselves of the opportunities at our hands. The conclusive element of profit is in the business. The low price of all cereals is an inducement to our farmers to at once enter upon it. It is the

business that the farmers of northern Illinois, Iowa and Wisconsin were compelled to adopt, when continuous cropping of their land to grain had not only impoverished their land, but their bank account. The milking of cows has enhanced the price of farm lands in Fox and Rock River regions of Illinois, the last ten years, nearly one hundred per cent. Ten years ago, our farmers might have had some excuse for neglecting this business, for wheat, a certain crop in our State, then commanded one dollar and a quarter per bushel, and we had not then found out how easily we could raise alfalfa, red clover and other cultivated grasses. But this excuse no longer exists; the land that would then produce twenty-five to thirty dollars per acre in wheat, will now raise five tons of alfalfa, which, at ten dollars per ton, a low price for it if fed to milch cows, will produce fifty dollars per acre. This certainty of profit, alone, should induce our farmers to prepare to enter into the business.

In the language of an able ex-journalist of our State, "let us consider the chicken, how it grows"—in value as it travels from Kansas and Nebraska to the tables of our people. Of live and dressed poultry, $282,855 worth were imported in 1884, at the average value of $5.07½ per dozen. Of eggs we imported 1,127,911 dozen, valued at $248,140. These are large sums for the apparently insignificant side product of a farm, and in gross, amount to half the value of wheat, the staple Colorado crop.

Of apples, cider, vinegar, and green and dried fruit, we imported nearly $900,000 worth, a large proportion of which we should, and, without doubt, can raise. Within the boundaries of the State, localities are to be found suitable for the cultivation of all the fruits of this latitude—the lower and warmer valleys of the southern and southwestern part of the State being suitable for even peaches and apricots. It is only a few years since—not more than five—that the general belief of our people was that Colorado is not a fruit country. But few knew of the invariable success of a few orchards in the Arkansas Valley, and those of Jefferson and Boulder counties. Now it is known to many of us, and the wonderful display of orchard fruits, and grapes, at our last Exposition in this city, settled all doubt on this subject.

The importation of cut meats and lard into our cattle (?) State, amounts to the enormous sum of $1,710,000. As great numbers of live cattle and hogs were imported, this sum does not, in all probability, represent the amount paid by our people for imported meats, in exchange for live cattle, exported by our "Cattle Kings," who are too independent to slaughter their cattle where their flesh is required.

In view of the facts, of which this table is an exposition, the fallacy is apparent of the supposition (which is held by many) viz.; That Colorado is now producing a surplus of farm products. To raise the hogs that are yearly consumed by our people, it would require the product of at least 30,000 acres of land. For the beef which comes from abroad, at least 10,000 acres more.

In the table, the amounts in pounds, bushels, dozens and dollars of agriculture and meat products that we have bought the past year, is shown. It has been attempted to show, as conservatively as possible, the number of acres of land that would be necessary to produce these amounts. The following table shows at a glance the total amount:

Wheat,	acres	7,700
Oats,	"	24,460
Corn,	"	17,000
Barly, hay, beans, and vegetables,	"	4,000
Dairy,	"	25,000
Poultry and eggs,	"	5,000
Fruit,	"	10,000
Pork,	"	30,000
Beef,	"	10,000
Total		132,160

This will approximate to the amount of land that should to-day be in cultivation in the State, in addition to the amount we already have, and as population increases, the amount of land should correspondingly increase, until we make use of all the available land we have in the State.

To intelligently and profitably cultivate their farms, our husbandmen should study how to diversify their crops;

sowing two-thirds of their land in wheat will surely bring embaressment. The warehouses, elevators and graneries of the world are full of wheat. Wheat is lower in price everywhere to-day than it has been for fifty years, and it is likely to remain so for months to come. It is folly for Colorado farmers to continue their ruinous practice of relying upon wheat for their principal income. It has been shown by figures, that are trustworthy, the products that are needed by our people. It will be impossible, do what we may in diversifying our crops, to overtake the present deficiency in oats, corn, poultry, eggs and dairy products, in the next five years, but we can try, and in trying, our farmers can make money. In this Report I have labored to this end, and if it is possible to awaken our farmers to the necessity of diversifying their crops, to the extent that they put in practice, what they know to be the best thing for them to do, the labor will not have been in vain.

Colorado farmers should raise what we consume; Colorado farmers can raise what we need. The land is here for them to occupy; the irrigating canals are already constructed to carry the water to tens of thousands of acres of the most fertile lands in the world. Settlers can make a wide choice of selection. In the northern part of the State, land can be had on the Platte River and its tributaries; in the central portion of the State, in the Arkansas Valley; in the South, in the great and fertile San Luis Park; in the West, on the Grand River and its tributaries. To all these points railroads run; the lands do not lie in an untried nor an unexplored country, but in the midst of civilization, school houses, churches, cities and towns.

NOTE.—It is estimated that the value of the alfalfa, red clover, grass and bulk garden seeds imported into Colorado, is fully equal to $165,000, all of which could be profitably raised in the State.

UTAH AND CALIFORNIA.

Visiting Utah, in April last, at a time too early to see the actual operations of irrigation, my means of obtaining information was limited to the interrogation of practical men, as to the methods pursued in this interesting country. In Salt Lake City, I found many able and willing practical irrigators, ready to answer all inquiries made of them, and the various officials were very courteous and obliging, taking considerable trouble to supply me with the data and information I sought.

The general aspect of the country, due to surface, soil and climate, is similar to that of Colorado. The canals are, generally, much smaller than those of Colorado, and a majority of them are constructed with excessive grades. The system of controlling the diversion and division of the water is extended from the main stream to the smallest "laterals," and is under the control of a government peculiar to the people of Utah, and is directly administered by a "Water Master," to whom is delegated considerable arbitrary power.

It is well worth our while to carefully notice two very remarkable results which have been developed by the Utah method of dealing out water. These are: First, securing the greatest duty of a ditch, and second, the development of quite a high duty of the water carried by the ditch. The first is secured by the hour rotation or time method, which requires the users to take the water belonging to them, at such days and hours, as are designated by the Water Master, be it night or day. By the enforcement of this requirement, it is estimated that the effectual capacity of a ditch or canal is fully doubled over what it would be by the all-at-one-time-using system. This method of requiring users to take their water at stated times—be it night or

day, in rain or in sunshine—is only the revival in America of a practice of irrigation instituted in Northern Italy over two hundred years ago.

The following is an example of a table for the distribution of the water of a small ditch or lateral on the time system. This table also serves as a form of agreement when signed by the parties in interest. The same system can be used for the issue of water to laterals from principal ditches. This table is copied from Col. Baird Smith's "Italian Irrigation." A similar system is practiced in Utah. In times of scarcity a modification of this system might be used by the Water Commissioners in behalf of the appropriators of the public streams.

HOURLY DISTRIBUTION TABLE for the year . . . . of the water of the . . . . . Ditch, carrying . . . cubic feet per second, of which the period of rotation is eight natural days, or 192 hours:

No.	Names of Irrigators.	Numbers of hours for each.	COMMENCEMENT OF HORARY DISTRIBUTION.		TERMINATION OF HORARY DISTRIBUTION.	
			Hour.	Day.	Hour.	Day.
1	A	14	4 a.m.	1st April	6 p.m.	. . . . . 1st April.
2	B	16	6 p.m.	1st "	10 a.m.	. . . . . 2d "
3	C	24	10 a.m.	2d "	10 a.m.	. . . . . 3d "
4	D	18	10 a.m.	3d "	4 a.m.	. . . . . 4th "
5	E	2	4 a.m.	4th "	6 a.m.	. . . . . 4th "
6	F	25	6 a.m.	4th "	7 a.m.	. . . . . 5th "
7	G	30	7 a.m.	5th "	1 p.m.	. . . . . 6th "
8	H	23	1 p.m.	6th "	12 m.	. . . . . 7th "
9	I	19	12 m.	7th "	7 a.m.	. . . . . 8th "
10	K	21	7 a.m.	8th "	4 a.m.	. . . . . 9th "
Total of hours		192	The rotation again commences in the same order with A.			

This time method of dealing out water is only one of the numerous examples of a rigid and wise economy which is everywhere practiced by the people of Utah.

The second result secured as above stated, the development of a high duty of water, is due to the fact that when the time to take the water is prescribed and limited, every preparation is made beforehand to use the water to the best possible advantage in the time allowed. The general plan of irrigation in Utah is such that it has not been found necessary to attempt to establish any definite "duty of water," but it is now, as generally practiced, much higher than in Colorado. From data obtained, and the estimates of well-informed men, it is estimated that the present "duty of water" in Utah is about eighty acres, per cubic foot, per second. It is generally asserted that the amount of land now irrigated, by the same ditches, is very much greater than it formerly was. Different reasons were assigned for this increase, by those with whom the subject was discussed, such as increased rainfall, the increased humidity of the air surrounding irrigated districts, the saturation of the subsoil, and a better and more skillful use of the water. The first reason, increased rainfall, receives no confirmation from the records kept in the Territory. The second reason, increased humidity of the air, is insufficient to account for the great increase of duty which has been attained, and the other reasons generally given, viz.; The saturation of the subsoils, and a better and more skillful use of water, are undoubtedly the main causes of the increase of the "duty of water." The skill of the irrigators has been enhanced by the necessity of making the best possible use of the water during the limited time when the ditch is open to them.

A few years after irrigation was begun in the earlier settlements, many acres of good land were rendered too wet and swampy by infiltration from adjoining lands and ditches, locally termed "seepage," and also by the unskillful application of the water. For a time, these lands were abandoned as worthless, but subsequently, were very generally reclaimed, and are now considered amongst the most valuable lands of the country, being kept moist by the same causes which led to their temporary abandonment, and consequently, they require but little or no water to be used on them.

I am of the opinion that there is not much in the Utah system of irrigation, or in the laws of that territory, which is desirable for Colorado to adopt, except, in some instances, the "time method" can be advantageously applied to canals taking water from the main stream, in times of scarcity, and it can be equally as well applied to laterals taking water from canals which have a limited carrying capacity or water supply.

Owing to the great diversity of the products grown in the State of California, as well as to the widely different climatic conditions, it is somewhat difficult to compare that State with Colorado as to her agriculture and system of irrigation.

In California, the valleys adapted for agriculture lie but little above tide-water, as compared with the agricultural lands of Colorado. In the Sacramento and San Joaquin valleys, water for irrigation purposes is quite abundant, especially on their eastern sides. The Sierra Nevada mountains supply the principal portion of the water available for irrigation.

Alongside, and a short distance back from the base of the mountains, the topographical features of the country are not unlike those of Colorado in many respects, but in the central part of these valleys they are entirely different.

After the two great drainage rivers, the Sacramento and San Joaquin, reach well into the valleys, their waters move slowly, having a fall of less than a foot to the mile. It is, therefore, almost impracticable to construct canals taking water from these streams for irrigation.

Hundreds of thousands of acres of land, lying in the central line of these valleys, are so little above the water surface of the streams that they receive a sufficient amount of moisture, even during the dry season, as to render artificial watering unnecessary. Other large tracts of land are partially supplied in this way, so near to the surface as to require at times only a light irrigation, while the rolling lands, and those along the base of the mountains, require a complete system of irrigation to render farming certain and profitable.

These varying circumstances necessarily involve a wide difference in the duty of water, and also in the methods of irrigation, as pursued on the different character of lands.

There is a property in some of the soils of California which is very unlike anything in Colorado—this is the *capillary*, or the power to transmit moisture from one particle to another in all directions for long distances. I think nearly all of the California soils excel those of Colorado in this respect. A remarkable instance of this is in the valley of the Tulare lake, near Hanford. Here is a large area of country where it is a common practice to irrigate a farm of 160 acres by simply carrying the water in a ditch, built on the outside lines, with no laterals whatever leading from it.

The surface soil in the valleys of California, as a general thing, is very deep, and has, at frequent intervals, strata of clay so impervious to water as to prevent its rapid downward filtration. It, therefore, often occurs, during the very frequent and excessive droughts, that the surface is exceedingly dry, while the underlying earth contains sufficient moisture to support vegetable life; and perennial crops, and fruit trees, can thrive without the aid of surface irrigation.

In Southern California, some of the conditions of irrigation are very different from what they are in the San Joaquin and Sacramento valleys. Here the water supply is quite limited, and the value so great that it is applied to the irrigation of the lands with an economy not excelled on the continent. The sources of supply are small, natural streams, artesian wells, tunnels made in the hill-sides to intersect water-bearing strata, and common wells from which the water is pumped by windmills and steam engines. The water is often carried to the land in the most carefully constructed ditches, and by long lines of pipes. Where sub-irrigation is practiced it is distributed through the fields by pipes, no open ditches being used in that system. The amount of water required for irrigation in Southern California does not depend solely on the skill of the irrigator, the capacity of the soil to retain moisture being so great that the effects of a profuse watering or

heavy rainfall is felt for months, or even years. It was estimated that the benefit of the heavy rainfall during the season of 1883–4 would be plainly discernible for three or four years.

I will not attempt to estimate the duty of water in Southern California, as the people themselves are not able to do so. It can, however, be said that the scarcity of water has caused the best possible use to be made of it.

There are a few things, pertaining to the practice of irrigation in California, which might be profitably imitated in Colorado, but, in general, the conditions in the two countries are so unlike, that each must pursue the practices which experience teaches is best adapted to the conditions encountered.

California, as an agricultural and fruit growing country, is one of very great possibilities; and when her lands are divided into smaller holdings, and the great conflicts now impending between the mining, navigation and agricultural interests are permanently and amicably settled, it may be expected that this country will enjoy a period of prosperity far more solid and real than was ever the case in the traditional "good times" of the "Argonauts."

At present, great efforts are being made to establish a system of irrigation legislation, designed to settle the priority of rights of water appropriators, and to settle the controversy between the appropriators and the owners of riparian rights.

The State has made very liberal appropriations for investigation of the legal and physical obstacles to the settlement of these matters, and after six years of patient work, and the expenditure of large sums of money, the State Engineer has collected an immense amount of data and information on the subject, and, as one of the results, the late State Irrigation Convention, held at Fresno, recommended that California adopt a series of laws almost exactly like the present law of Colorado.

A late Californian newspaper, in commenting on the proceedings of the late State Irrigation Convention, writes as

follows, viz: "As States and governments wax older they take to reforms much slower than in their youth. California, in her youthful days, gave to the world the best Code of mining laws that it had ever possessed, and Colorado has given us the most enlightened and liberal Code of irrigation laws known to civilization. * * * * Colorado honored California by adopting her mining laws, and our State can hardly do a wiser thing than to return the compliment by adopting Colorado's Code of Irrigation laws."

EFFICIENCY OF THE PRESENT LAW.

The establishment of the office of Water Commissioner has had a most beneficial effect on the practice of water division of streams which were supposed to be entirely appropriated. The constant attendance, and intelligent supervision of the Water Commissioners has had a marked influence in reducing the number of water quarrels amongst irrigators.

Like smuggling in England, in the olden time, irrigation seems to have the singular power of turning honest, law-abiding citizens, in all other relations of life, into truculent, bellicose rioters, as soon as their real or fancied rights as water users are interfered with. Many men, whose word is their bond, who, in all other relations with their fellow-men are model neighbors and citizens, and who would not allow themselves to be guilty of stealing (as generally understood) will *deprive* their neighbor of water without a scruple. A reason for this may be found in the long held idea that air and water were the free gifts of God to all men, and the lack of a notion that there could be such a thing as a *right* to the water of a running stream. The present law has the great virtue of clearly and decisively providing for adjudicating priority of right to the use of the natural waters, and the full and complete enjoyment of the quantity; and the order of priority so adjudicated is secured to the beneficiary by the powers given to the Commissioner for the enforcement of the law. The mere fact that a man, in whom the neighborhood have confidence, is constantly attentive to the distribution of the water, has a great moral effect. Misunderstandings and disputes relative to water, are settled by him in their incipiency, and good feeling is maintained between appropriators.

But a few years ago, the march of the whole body of irrigators of a neighborhood, into the up-stream country to

shut down head gates, and compel the "up-streamers" to let water pass, was not an uncommon occurrence. But now the whole matter is regulated; the "shot-gun" power has given place to law and order; the decisions of the courts, when put into practical effect by the acts of the Water Commissioner, will be enforced by the whole power of the State.

The ill feeling and wrong notions, engendered by years of no law, takes time to eradicate; but it is confidently affirmed that the present irrigation law, as far as it goes, is certainly working wonders in most of the irrigation districts of the State. This is not only the opinion of this office, but that of many who strenuously opposed the law when first proposed, and the State is fortunate in having taken the first bold step forward in a direction, which the whole body of appropriators approve as *right*.

RECOMMENDATIONS.

I respectfully recommend the following legislation as necessary and beneficial to the irrigation interests of the State:

I. Water Commissioners—(1.) That the law be amended so that the time these officers and their assistants serve, and the salary that they be allowed, be fixed by the Commissioners of the county, or counties, in which the Water District may lie. (2.) That the law be amended so that the Water Commissioners be protected in the exercise of the discretionary power conferred on them. (3.) That police power be conferred on the Water Commissioners and their assistants to enable them to arrest persons violating sections 1734, 1754, 1755 and 1759 of the General Statutes of 1883. (4.) That Water Commissioners be placed under bonds to faithfully perform the duties of their office.

II. That *all* appropriators of the public waters be required to build measuring flumes when required to do so by the State Engineer, and in case of neglect or refusal, the State Engineer may direct the Water Commissioner to build such measuring flume, and collect the cost in the same manner as the cost of public bridges over irrigating canals is at present collected by law.

III. That *all* appropriators of the public waters, who have not yet done so, be required to "prove-up," or establish their claims, under the existing laws, within a reasonable time.

IV. That the office of the State Engineer be made the office of record of all appropriations of the public waters of the State, and provision be made for the forwarding thereto, and filing therein, certified copies of all the decrees of courts awarding priority within the various Water Districts; and that it be made incumbent on all officers with

whom filings are made under sections 1720 and 1763 of the General Statutes of 1883, to forward certified copies of such filings to the State Engineer.

V. That the boundaries of Water Districts in Water Divisions Nos. 2 and 3 be established by act of the Legislature.

VI. That additional Water Divisions be established, to include the San Juan, Dolores, Grand, White, Yampa and Green Rivers, and the necessary Water Districts established therein.

VII. That the State Engineer be authorized to erect measuring flumes in suitable positions in those rivers, whose waters have nearly all been appropriated, and make search for suitable sites for reservoirs in districts where most required; the cost of such constructions and search to be provided for out of the Internal Improvement Fund.

VIII. That the present Drainage Act be amended so that procedure under it may be simpler and less expensive.

IX. That the law establishing the "inch" as the legal unit of measure of water be repealed, and the "cubic foot per second" be made the legal unit of measure of water used for irrigation purposes; and that the relation between the statutory "inch" and the "cubic foot per second" be established, in order that the term "inch" in existing contracts, may be defined and expressed in an equivalent quantity of the proposed legal unit.

X. That a Board of Commissioners for Water Divisions be established by law.

The necessity for such a Board is apparent to all who have had practical acquaintance with the working of the present law. This Board, composed of two or three Commissioners from each Water Division of the State, and the State Engineer *ex officio*, should have the power to make rules and regulations, in conformity to law, for the guidance of Water Commissioners and appropriators in the various Water Districts.

There are many questions connected with the diversion, division, and the use of water, and the subject of irrigation generally, that are not, as yet, covered by statute or court ruling, and it would be of very great advantage to settle such questions promptly, as they arise; such settlement being *subsequently* open to review by the proper Court.

To this Board should be given the settlement of the questions growing out of the different methods of establishing the order of priorities of appropriations. If deemed desirable they might be invested with the power to grant or refuse water appropriation from a stream, all water of which is supposed to be fully appropriated, and to settle the order of priorities on the whole stream, when that stream is covered by two or more Water Districts.

Showing the amount and classification of expenses of the State Engineer's Department from April 1, 1882, to December 1, 1884.

Appropriation for 1883 and 1884	.....	$3,000 00
Salary of Office Engineers	$1,200 00	
Expense of preparing Gauging Station No. 1	175 29	
" " " " " 2	36 44	
" " " " " 3	5 00	
Expense of rating, maintaining and of observations at Gauging Station No. 1	139 56	
Expense of rating, maintaining, and of observations at Gauging Station No. 2	26 00	
Expense of Assistants in gauging ditches	357 65	
Expense of State Engineer incurred while enquiring into irrigation systems elsewhere	220 00	
Expense of rating current meters	51 44	
Expense of examining reservoir sites	169 00	
Expense of telegrams, expressage and repairing instruments	8 60	
Total	$2,388 98	
Balance unexpended December 1, 1884	.....	$611 02

APPENDIX.

APPENDIX A.

WATER DISTRICT No. 1.

TABLE I.

Giving the date and order of priority and amount of each appropriation, together with the total amount of preceding appropriations of ditches and canals, that are filed in the office of the County Clerk of Weld county:

Name of Ditch or Canal.	Name of stream from which water is diverted	Order of Priority.	Date of Appropriation claimed in Statement.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Sterling Ditch	South Platte.	1	15 April, 1875	140.40	140.40	0.00
The Pioneer Ditch	" "	2	30 May, 1875	61.24	61.24	140.40
The Corona Ditch	" "	3	30 August, 1875	39.20	39.20	201.64
The Schneider Ditch	" "	4	April, 1877	26.65	26.65	240.84
The Buffalo Ditch	" "	5	1878	88.20	88.20	267.49
The Platte and Beaver Main Ditch	" "	6	4 October, 1882	641.04	641.04	355.69
The Putnam Ditch	" "	7	6 October, 1882	106.20	106.20	996.73

The Weldon Valley Ditch	" "	8	14 October, 1882	299 52	299.52	1102.93
The Pawnee Ditch	" "	9	2 December, 1882	837.49	837.49	1402.45
The Beaver Dam Ditch	E. Beaver Creek.	10	5 February, 1883	67.72	67.72	2239.94
The Fort Morgan Irrigation Ditch	South Platte.	11	7 February, 1883	512.75	512.75	2307.66
South Platte Land and Irrigation Ditch	" "	12	5 June, 1884	295.00	295.00	2,820.41
The Hardin Ditch	" "	13	14 June, 1884	48.93	48.93	3,115.41
The Deuel and Snyder Ditch	" "	14	28 June, 1884	74.58	74.58	3,164.34
	Total			3,238.92		
			Date of Filing.			
The South Platte Ditch	South Platte.		11 March, 1876	58.08	58.08	
The Beaver Ditch	Beaver Creek.		10 March, 1882	47.00	47.00	
The Weld County Ditch	South Platte.		8 March, 1884	2060.78	2060.78	
Total				2165.86		
Total for District No. 1				5404.78		

The last three ditches have no date of appropriation, as yet, given them, and therefore no number of priority.

WATER DISTRICT No 2.

TABLE II.

Giving the date and order of priority and amount of each appropriation, together with the total amount of preceding appropriations, of ditches and canals in District No. 2, as they have been established by the Decree of Court of the Second Judicial District, dated April 28, 1883:

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Brantner Ditch	South Platte.	1	1 April, 1860	29.77	29.77	0.00
First enlargement	" "	4	1 May, 1863	5.93	35.70	91.37
Second enlargement	" "	27	1 July, 1872	12.18	47.88	1094.42
Third enlargement	" "	52	15 January, 1881.	63.30	111.18	2860.21
The Platteville Irrigating & Milling Co.'s D'h	" "	2	1 July, 1862	47.88	47.88	29.77
First enlargement	" "	19	1 January, 1870	5.25	53.13	667.20
Second enlargement	" "	33	15 October, 1873	94.25	147.38	1293.83
The Farmers & Gardeners' Ditch	" "	3	15 March, 1863	13.72	13.72	77.65
First enlargement	" "	34	1 April, 1874	10.28	24.00	1388.08
The Lupton Bottom Ditch	" "	5	15 March, 1863	47.70	47.70	97.30

First enlargement	South Platte.		31	15 September, 1873	92.87	140.57	1180.08
The Brighton Ditch	"	"	6	1 December, 1863	22.22	22.22	145.00
First enlargement	"	"	26	1 November, 1871	22.58	44 80	1071.84
The Duggan Ditch	"	"	7	1 April, 1864	56.85	56.85	167.22
Tne Fulton Ditch	"	"	8	1 May, 1865	79.70	79.70	224.07
First enlargement	"	"	43	8 July, 1876	74.25	153.95	1891.47
Second enlargement	"	"	51	5 November, 1879	50.23	204.18	2809 98
Third enlargement	"	"	56	1 November, 1882	244.62	448 80	3236 22
The Jay Thomas Ditch	"	"	9	1 June, 1865	104.35	303.77	303.77
The Farmers' Independent Ditch	"	"	10	20 November, 1865	61.60	61.60	408.12
First enlargement	"	"	45	20 November, 1876	85.40	147.00	1981.38
Second enlargement	"	"	50	1 November, 1879	373.00	520 00	2436.98
The Meadow Island Ditch	"	"	12	3 May, 1866	57.83	57.83	495.95
First enlargement	"	"	41	10 April, 1876	8.33	66.16	1861.72
The Meadow Island Ditch No. 1	"	"	11	1 May, 1866	26 23	26.23	469.72
The Hewes & Cook Ditch	"	"	13	5 May, 1866	27.45	27.45	553.78
First enlargement	"	"	23	10 August, 1871	71.12	98 57	759.25

TABLE II.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Hodgson Ditch	South Platte.	14	26 April, 1869	12.82	12.82	581.23
The Lower Latham Ditch	" "	15	12 May, 1869	20.40	20.40	594.05
First enlargement	" "	37	12 December, 1874	35.77	56.17	1511.81
Second enlargement	" "	46	14 November, 1877	97 70	153.87	2066.78
Third enlargement	" "	53	24 October, 1881	133.88	287.75	2923.51
The Getz Ditch	" "	16	15 May, 1869	5.17	5.17	614.45
The No. 3 Ditch	" "	17	10 March, 1870	26.88	26.88	619.62
First enlargement	" "	28	15 March, 1873	30 83	57.71	1106.60
The Loomis Ditch	" "	18	8 December, 1870	20.70	20.70	646.50
The Elwood Ditch	" "	20	10 March, 1871	37.60	37.60	672.45
First enlargement	" "	38	1 April, 1875	80.48	118.08	1547.58
The St. Louis Colony Ditch No. 1	" "	21	20 April, 1871	29.28	29 28	710 05
The Patterson Ditch	" "	22	1 May, 1871	19 92	19.92	739.33

The Highland Ditch	South Platte.		24	1 October, 1871	64 40	84.32	830 37
The Evans Ditch No. 2	"	"	25	5 October, 1871	177.07	177.07	894.77
First enlargement	"	"	40	20 November, 1875	226.98	404.05	1634.74
The Clear Springs Ditch	"	"	29	15 April, 1873	26.33	26.33	1137.43
The Frederick Brothers' Ditch	"	"	30	20 April, 1873	16.32	16.32	1163.76
The Big Bend Ditch	"	"	32	26 September, 1873	20.88	20.88	1272.95
The Theodore Wheeler Ditch	"	"	35	15 April, 1874	13.45	13.45	1398.36
First enlargement	"	"	39	1 June, 1875	6.68	20.13	1628.06
Second enlargement	"	"	42	10 May, 1876	21.42	41 55	1870.05
The Union Ditch	"	"	36	5 November, 1874	100.00	100 00	1411.81
First enlargement	"	"	54	2 November, 1881	84.03	184.03	3057 39
The Mayfield Ditch	"	"	44	15 October, 1876	15.66	15.66	1965.72
The Beeman Ditch	"	"	47	19 December, 1877	127.00	127.00	2164.48
The Wyatt Ditch	"	"	48	12 March, 1878	23.63	23.63	2291.48
The Buckers' Ditch	"	"	49	8 July, 1879	121.87	121 87	2315 11
The Side Hill Ditch	"	"	55	29 April, 1882	94.80	94.80	3141.42
				Total for South Platte River Ditches	3480 84		

TABLE II.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Patterson Ditch	South Platte.	.....	15 June, 1870	11.90	11.90	.....
The Lone Tree and Hockersin Ditch	" "	.....	—November, 1873	117.18	117.18	.....
The Carr Ditch	" "	.....	2 April, 1884	32 78	32.78	.....
			Total	161.86		
			Total for South Platte River Ditches	3480.84		
			Total Water District No. 2	3642.70		

The last three Ditches are not included in the above Decrees, but are filed for record in the office of the County Clerk in Weld County.

WATER DISTRICT No. 3.

TABLE III.

Giving the date and order of priority and amount of each appropriation, together with the total amount of preceding appropriations of ditches and canals in District No. 3, as they have been established by the Decree of the Court of the Second Judicial District, dated April 11, 1882.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Yeager Ditch	Cache la Poudre River.	1	1 June, 1860	24.80	24.80	0.00
First enlargement	" "	8	1 June, 1863	8.70	33.50	176.06
The Watrous, Whedbee and Secord Ditch	" "	2	1 June, 1861	1.44	1.44	24.80
First enlargement	" "	19	1 July, 1865	4.33	5.77	371.92
Second enlargement	" "	29	1 June, 1868	4.33	10.10	593.78
The Dry Creek Ditch	" "	3	10 June, 1861	11.66	11.66	26.24
First enlargement	" "	36	21 October, 1870	14.42	26.08	744.77
Second enlargement	" "	64	15 September, 1873	12.13	38.21	2174.76
Third enlargement	" "	82	15 July, 1879	12.70	50.91	3367.55
Pleasant Valley & Lake Canal Co.'s Ditch	" "	4	1 September, 1861	10.96	10.96	37.90
First enlargement	" "	11	10 June, 1864	29.63	40.59	216 86

TABLE III.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
Second enlargement	Cache La Poudre River.	49	19 July, 1872	16.50	57.09	1490.72
Third enlargement	" "	83	18 August, 1879	80.83	137.92	3380.25
Fourth enlargement	" "	91	10 October, 1881	.....	....	....
The Pioneer Ditch Co	" "	5	1 March, 1862	12.92	12.92	48.86
First enlargement	" "	12	15 September, 1864	16.66	29.58	246.49
The Boyd and Freeman Ditch	" "	6	15 March, 1862	66.05	66.05	61.78
First enlargement	" "	20	15 July, 1866	9 00	75.05	376.25
Second enlargement	" "	60	1 August, 1873	24.33	99.38	2077 49
The Whitney Irrigation Ditch	" "	7	1 September, 1862	48.23	48.23	127.83
First enlargement	" "	42	10 September, 1871	12.95	61.18	1145.06
The B. H. Eaton Ditch	" "	9	1 April, 1864	29.10	29.10	184.76
First enlargement	" "	18	1 June, 1866	3.33	32.43	368.59
Second enlargement	" "	52	25 July, 1872	9.26	41.69	1602.68

The Larimer & Weld Irrigation Canal	Cache La Poudre River.	10	1 June, 1864	3.00	3.00	213.86
First enlargement	" "	21	1 April, 1867	16 66	19.66	385.25
Second enlargement	" "	44	20 September, 1871	75.00	94.66	1328.01
Third enlargement	" "	69	15 January, 1874	54.33	148.99	2413.70
Fourth enlargement	" "	79	1 August, 1878	571.00	719.99	2653.79
The John G. Coy Ditch	" "	13	10 April, 1865	31.63	31.63	263.15
The John R. Brown Ditch	" "	14	1 May, 1865	8.00	8.00	294.78
The Box Elder Ditch	" "	15	1 March, 1866	32.50	32.50	302.78
First enlargement	" "	23	25 May, 1867	8.33	40.83	494.97
Second enlargement	" "	30	1 July, 1868	11.93	52.76	598.11
The Chamberlain Private Ditch	" "	16	1 April, 1866	14.83	14.83	335 28
The Taylor & Gill Ditch	" "	17	15 April, 1866	18.48	18.48	350.11
The Mason and Hottel Mill Race	" "	22	15 April, 1867	93 06	93.06	401.91
The Wm. R. Jones Ditch	" "	24	1 September, 1867	15.52	15.52	503.30
The Josh Ames Ditch	" "	25	1 October, 1867	35.92	35.92	518.82
The Martin Callaway Ditch	Box Elder.	26	1 March, 1868	15.22	15.22	554.74

TABLE III.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Noah and Philo Bristol Ditch No. 1.....	Box Elder.	27	10 March, 1868	15.22	15.22	569.96
The Canon Canal Co.'s Ditch.....	Cache La Poudre River.	28	15 March, 1868	8.60	8.60	585.18
First enlargement	" "	55	20 March, 1873	48.88	57.48	1798.87
The Cache la Poudre Irrigation Co.'s Ditch...	" "	31	1 May, 1869	62.08	62.08	610.04
First enlargement	" "	57	1 May, 1873	20.42	82.50	2022.75
The Fort Collins Irrigation Ditch	" "	32	1 June, 1869.....	1.66	1.66	672.12
First enlargement.....	" "	38	1 April, 1871	31.66	33.32	869.19
Second enlargement	" "	51	20 July, 1872	33.33	66.65	1569.35
Third enlargement.....	" "	63	1 September, 1873	62.28	128.93	2112.48
The New Mercer Ditch Co.'s Ditch.....	" "	33	1 September, 1869	4.16	4.16	673.78
First enlargement	" "	46	10 October, 1871.....	8.33	12.49	1444 01
Second enlargement	" "	48	1 July, 1872	15.00	27.49	1474.72
Third enlargement.....	" "	88	15 February, 1880.....	136.00	163.49	3832.91
The Noah and Philo Bristol Ditch No. 2.....	Box Elder.	34	1 March, 1870	14.83	14.83	677.94

The Union Canal No. 3	Cache La Poudre River.	35	1 April, 1870	52.00	52.00	692.77
First enlargement	"	45	1 October, 1871	41.00	93.00	1403.01
Second enlargement	" "	50	15 July, 1872	63.13	156.13	1506.22
Third enlargement	" "	58	15 May, 1873	16.67	172.80	2043.17
Cache la Poudre Irrigation Co.'s Canal	" "	37	25 October, 1870	110.00	110.00	759.19
First enlargement	" "	43	15 September, 1871	170.00	280.00	1158.01
Second enlargement	" "	68	10 November, 1874	184.00	464.00	2229.70
Third enlargement	" "	75	15 September, 1877	121.00	585.00	2498.50
The Wm. Callaway Ditch No. 1	N. Fork of the Poudre.	39	1 May, 1871	21.05	21.05	900.85
The Mill Power Canal	Cache La Poudre River.	40	1 July, 1871	160.00	160.00	921.90
The Fletcher and Freeman Ditch	" "	41	1 September, 1871	63.16	63.16	1081.90
The Chaffee Irrigating Ditch	" "	47	10 March, 1872	22.38	22 38	1452.38
The Lake Canal	" "	53	1 November, 1872	158.33	158.33	1611.94
The W. S. Taylor Ditch	" "	54	15 March, 1873	28.60	28.60	1770.27
The Larimer Co. Canal No. 2 Irrigating Ditch	" "	56	1 April, 1873	175.00	175.00	1847.75
The Aquilla Morgan Ditch	North Fork of Poudre.	59	1 July, 1873	17.65	17.65	2059.84

TABLE III.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority	Date of Appropriation.	Cubic feet of wat r per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The H. F. Sturdevant Ditch	Box Elder.	61 62	15 to 20 August, 1873	10.66	10.66	2101.82
The Vanderwark Ditch	Cache La Poudre River.	65	1 May, 1874	10.16	10.16	2186.89
The Mitchell and Weymouth Ditch No. 1	Lone Pine Creek.	66	15 May, 1874	17.35	17.35	2197.05
The Boyd and Stafford Ditch	Fish Creek.	67	1 November, 1874	15.30	15.30	2214.40
The Wm. Callaway Ditch No. 2	North Fork of Poudre.	70	28 January, 1875	14.16	14.16	2468.03
The Wetzler, Weymouth & Mitchell Ditch	Lone Pine Creek.	71	22 March, 1875	10.36	10.36	2482.19
First enlargement	" "	74	1 March, 1877	3.00	13.36	2495.50
*The Warren Lake Reservoir	Cache La Poudre River.	72	15 April, 1875	.....	.....	2492.55
The Kitchell and Ladd Ditch	CooperSlough	73	1 October, 1875	2.95	2.95	2492.55
The Henry Smith and others Ditch	Cache La Poudre.	76	1 April, 1878	7.23	7.23	2619.50
The Abram Washburn Ditch No. 1	CooperSlough	77	15 April, 1878	9.56	9.56	2626.73

* The appropriation for this reservoir is included in the appropriation for priority No. 56.

The Box Elder Reservoir Co.'s Canal	Box Elder.	78	18 June, 1878	17.50	17.50	2639.29
The Carter Cotton Mill Ditch.....	Cache La Poudre River.	80	1 April, 1878	127.30	127.30	3224.79
First enlargement	" "	85	31 December, 1879	37.16	37.16	3464.48
The Abram Washburn Ditch No. 2	CooperSlough	81	15 April, 1879	15.43	15.43	3352.09
The John McNey & Chas. M. Chace Ditch...	North Fork of Poudre.	84	1 September, 1879.....	3.40	3.40	3461.08
The Mitchell and Weymouth Ditch No. 2...	Lone Pine.	86	19 January, 1880	16.27	16.27	3501.24
The North Poudre Land,Canal & Reserv'r Co.	North Fork of Poudre.	87	1 February, 1880	315.00	315 00	3517.91
The Larimer County Ditch.....	Cache La Poudre River.	89	25 April, 1881	469 80	469.80	3968 91
The Eagle Nest Ranch Ditch	North Fork of Poudre.	90	1 October, 1881	5.02	5.02	4437.71
			Total appropriation	4442.73		
The Ogilvy Ditch.....	Cache La Poudre River.	.....	8 February, 1883	115.65	115.65	.....
Total for District No. 3.....				4558 38		

NOTE.—The Ogilvy Ditch, which was filed in the office of the County Clerk of Weld county, is not included in the above Decree.

WATER DISTRICT No. 4.

TABLE IV.

Giving the date and order of priority and amount of each appropriation, together with the total amount of preceding appropriations of ditches and canals in District No. 4, as they have been established by the Decree of Court of the First Judicial District, dated May 28, 1883.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Big Thompson Ditch	Big Thompson	1	10 November, 1861	96.50	96.50	0 00
The Big Thompson Ditch & Mfg. Co.'s Ditch	" "	2	1 April, 1863	34.02	34 02	96.50
First enlargement	" "	4	1 May, 1864	37.01	71.03	133.64
Second enlargement	" "	10½	1 March, 1867	65.47	136.50	328.94
Third enlargement	" "	20	1 May, 1872	9.75	146.25	608.67
The Mariana Ditch	" "	3	1 May, 1863	3 12	3.12	130.52
The Farmers' Irrigating Canal	" "	4	1 May, 1864	5.72	5.72	170.65
First enlargement	" "	14½	1 June, 1868	2.60	2.60	492.06
Second enlargement	" "	41	1 August, 1878	54 08	54.08	1468.40
The Big Thompson Irrigating Ditch	" "	5	25 February, 1865	78.00	78 00	176.37

The Loveland and Greeley Canal	Big Thompson	6	20 October, 1865	18.56	18.56	254.37
Original construction of branch	" "	7	1 November, 1865	8.36	26.92	272 93
First enlargement Greeley Canal	" "	13½	1 June, 1867	12 06	38.98	475.71
Second enlargement	" "	17	20 October, 1870	39.04	78.02	526.17
Third enlargement	" "	21½	23 June, 1873	19.93	97.95	813.42
Fourth enlargement	" "	23	25 October, 1873	35.50	133.45	833.35
Fifth enlargement	" "	42	1 November, 1878	15 20	148.65	1522 48
Sixth enlargement	" "	48	1 April, 1881	297.44	446.09	1771.00
The Big Thompson & Platte River Ditch	" "	8	18 November, 1865	35.00	35.00	281.29
First enlargement	" "	31	15 May, 1876	86.18	121.18	1024.51
The Rist and Goss Ditch	" "	9	20 March, 1866	6.41	6.41	316.29
First enlargement	" "	29	15 April, 1875	80.07	86.48	924 94
The W. R. Blower No. 2 Ditch	Little Thompson.	10	31 May, 1866	6.24	6.24	322.70
The Hill and Brush Ditch	Big Thompson	11	30 June, 1866	61.80	61.80	394.41
The Culver and Mahoney Ditch	Little Thompson.	13	15 April, 1867	19.50	19.50	456 21
First enlargement	" "	30	30 April, 1875	19 50	39.00	1005 01
The Osborne and Caywood Ditch	" "	14	1 June, 1861	3.12	3.12	487.77
First enlargement	" "	28	10 March, 1875	16.64	19.76	908.30

TABLE IV.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal	Cubic feet per second previously appropriated.
The Lykens Ditch ...	Little Thompson.	14	1 May, 1868	1.17	1.17	490.89
First enlargement	" "	16	3 May, 1869	4.03	5.20	521.96
The W. R. Blower Ditch	" "	15	1 April, 1869	27.30	27.30	494.70
First enlargement	" "	33	1 May, 1876	17.63	44.93	1110.69
The Jim Eglin Ditch	" "	16	31 May, 1869	0 18	0.18	525.99
First enlargement	" "	19	15 April, 1872	3.46	3.64	605.21
The Loudon Irrigating Canal	BigThompson	18	1 October, 1871	40.00	40.00	565.21
First enlargement	" "	38	1 November, 1877	154.30	194.30	1183.44
The Geo. Rist Ditch	" "	21	1 May, 1873	195.00	195.00	618.42
The Perkins Ditch	Buckhorn C'k	24	15 June, 1874	2.60	2.60	868.85
First enlargement	" "	45	15 June, 1879	0.50	3.10	1576 37
Second enlargement	" "	49	9 June, 1881	4 47	7.57	2068.44
The Hillsborough Ditch	BigThompson	25	15 October, 1874	8.25	8.25	871.45

First enlargement	BigThompson	40	15 April, 1878	99.46	107.71	1368.94
Second enlargement	" "	51	6 October, 1881	45 69	153.40	2351 76
The Meining Ditch	Little Thompson.	26	20 December, 1874	1.40	1.40	879.70
The Boulder & Larimer County Irrigating and Manufacturing Ditch & Reservoir	" "	27	30 June, 1875	27.20	27.20	881.10
First enlargement	" "	36	20 May, 1877	39 52	66 72	1143.92
The Eagle Ditch	" "	35	1 March, 1877	15.60	15.60	1128.32
The Handy Ditch	BigThompson	39	28 February, 1878	31.20	31.20	1337.74
First enlargement	" "	47½	15 December, 1880	141.23	172.43	1629.77
The Supply Lateral Ditch	Little Thompson.	43	30 November, 1878	35.57	35.57	1537.68
The Neville Ditch	Buckhorn C'k	44	25 April, 1879	3 12	3 12	1573.25
The Buffum Ditch	" "	46	28 June, 1879	2.60	2.60	1576.87
The South Side Ditch	BigThompson	47	7 November, 1880	50.30	50.30	1579.47
The Home Supply Ditch	" "	50	15 July, 1881	278.84	278.84	2072.92
Total for District No. 4				2397.45		

WATER DISTRICT No. 5.

TABLE V.

Giving the date and order of priority and amount of each appropriation, together with the total amount of each preceding appropriation, of ditches and canals in District No. 5, as they have been established by the Decree of Court of the First Judicial District.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Hayseed Ditch	St. Vrain C'k.	1	1 January, 1860	43.68	43.68	0.00
The James R. Mason Ditch	" "	2	31 July, 1860	6.50	6 50	43.68
The Coffin Meadow Ditch	" "	3	1 May, 1860	7.80	7.80	50.18
The Northwest Mutual Life Ins. Co.'s Ditch	" "	4	31 December, 1860	5.20	5.20	57.98
The Beckwith Ditch	" "	5	8 March, 1861	14 04	14.04	63.18
The Bonus Ditch	" "	6	30 March, 1861	26 85	26 85	77.22
The Bacon's appropriation	" "	7	1 June, 1861	30.29	30.29	104.07
The Cushman Ditch	" "	8	20 June, 1861	11.44	11.44	134 36

The Chapman and McGaslin Ditch	St. Vrain C'k.		9	10 March, 1862	52.00	52.00	145.80
The Pella Ditch	"	"	10	20 March, 1862	16.85	16.85	197.80
First enlargement	"	"	35	10 May, 1867	6.60	23 45	691.22
Second enlargement	"	"	56	1 June, 1873	27.87	51.32	1402.26
The True and Webster Ditch	"	"	11	1 April, 1862	8.32	8.32	214.65
The Clough and True Ditch	"	"	12*a*	15 April, 1862	8.32	8.32	222.97
The Dickens Private Ditch	"	"	12*b*	15 April, 1862	13.00	13.00	231.27
The Montgomery Private Ditch	"	"	12½	15 May, 1862	5.20	5.20	241.27
The Smead Private Ditch	"	"	13	1 October, 1862	15.60	15 60	246.47
The Clough Private Ditch	"	"	14	15 April, 1863	8.32	8.32	262.07
The Runyan Ditch	"	"	15	1 May, 1863	14.98	14.98	270.39
The Left Hand Ditch	"	"	15½	1 June, 1863	20.80	20 80	285.37
First enlargement	"	"	41	1 June, 1870	188.86	209.66	776.86
The South Flat Ditch	"	"	16	15 May, 1863	43.42	43 42	306 17
The St. Vrain and Gold Hill Ditch	South Fork St. Vrain C'k.		17	25 October, 1863	15.44	15.44	349.59

TABLE V.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Hager's Meadow Claim	St. Vrain C'k.	18	1 January, 1864	3.64	3.64	365.03
The Northwest Mutual Life Ins. Claim	" "	18	1 January, 1864	6.76	6.76	368.67
L. H. Dickson's appropriation	" "	19	20 February, 1864	13.00	13.00	375.43
The Coffman Ditch	" "	20	30 May, 1864	5.20	5.20	388.43
First enlargement	" "	.....	21 March, 1866	10.40	15.60	
Second enlargement	" "	.....	1 March, 1867	1.56	17.16	
The Island Ditch	" "	.....	15 June, 1864	7.49	7.49	
The Zweck and Farmer Ditch	" "	21	30 June, 1864	57.20	57.20	413.08
The Longmont Supply Ditch	" "	21½	1 May, 1865	46.80	46.80	470.28
The St. Vrain and Palmerston Ditch	" "	23	31 May, 1865	23.40	23.40	517.08
First enlargement	" "	30	31 May, 1866	31.20	54.60	619 57
Second enlargement	" "	.....	30 June, 1874	49.40	104.00	650.77

The Ni Wot Ditch	St. Vrain C'k.	24	1 June, 1865	24.96	24.96	540.48
First enlargement	" "	39½	1 June, 1869	10.35	25.31	809.88
The Baker and Weese Ditch	" "	24	1 June, 1865	3.90	3.90	540.48
The Goss Ditch No. 2	" "	25 *a*	30 June, 1865	4.16	20.80	569.34
The Goss Private Ditch	" "	25 *b*	30 June, 1865	16.64	16.64	573.50
The Webster and McCaslin Ditch	" "	27	5 July, 1865	11.23	11.23	590.14
The Denio and Taylor Ditch	" "	28	15 July, 1865	13.00	13.00	601.37
First enlargement	" "	57	15 October, 1873	7.80	20.80	1484.73
The Weese Private Ditch	" "	29	1 September, 1865	5.20	5.20	614.37
* The Coffin and Davis Ditch	" "	31	1 June, 1866	11.23	11.23	700.17
First enlargement	" "	45	1 June, 1871	31.20	42.43	1085.48
The Oligarchy Ditch	" "	32	1 June, 1866	26.00	26 00	711.40
First enlargement	" "	42	1 December, 1870	48 88	74.88	1020.32
Second enlargement	" "	48	1 March, 1872	22.62	97.50	1269.04
Third enlargement	" "	59	1 April, 1874	32.50	130.00	1492.53

TABLE V.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
¶ The Davis and Downing Ditch	St. Vrain.	33	1 November, 1866	.....	.....	.....
First enlargement	" "	34	1 May, 1867	8 42	8.42	737.40
Second enlargement	" "	40	15 March, 1870	11.23	19.65	820.23
Third enlargement	" "	.....	1 May, 1874	.....	....	....
Fourth enlargement	" "	69½	1 October, 1876 ..	2.70	22.35	1556.31
The Peck and Metcalf Ditch	Dry Creek No. 2.	36	15 May, 1867	4.68	4.68	752.42
The James Ditch	St. Vrain	37	30 June, 1868	12.48	12.48	757.10
First enlargement	" "	47	30 December, 1871	9 36	21.84	1259.68
Second enlargement	" "	70	1 April, 1877	16.85	38.69	1585.01
The Rough and Ready Ditch	" "	38	13 March, 1869	39.00	39.00	769.58
First enlargement	" "	55½	4 March, 1873	39.00	78.00	1417.86
The Nelson Ditch	Lyken's Dry Creek.	39	1 April, 1869	1.30	1.30	808.58
First enlargement	" "	51	10 May, 1872	0.52	1.82	1401.64

Second enlargement	Lyken's Dry Creek.	62	20 May, 1874	1.43	3.25	1532.52
Third enlargement	" "	67	1 May, 1875	1.95	5.20	1543.05
The Swede (Beaver) Ditch	St. Vrain.	44	1 May, 1871	14.98	14.98	1069.20
First enlargement	" "	53	1 May, 1873	13.10	28.08	1404.76
The Beal and McCory Ditch	Lyken's Dry Creek.	45	1 June, 1871	1.30	1.30	1084.18
First enlargement	" "	68	1 June, 1875	0.91	2.21	1545.00
The Highland Ditch with first, second and third enlargements	St. Vrain.	46	30 November, 1871	143.00	143.00	1116.68
Fourth enlargement	" "	69½	1 June, 1876	26.00	169.00	1582.31
Fifth enlargement	" "	71	1 June, 1877	39.00	208.00	1601.86
Sixth enlargement	" "	75½	1 June, 1878	25.48	233.48	1752.35
The Last Chance Ditch	" "	49	15 March, 1872	109.98	109.98	1291.66
The Spring Creek Ditch	" "	52	1 June, 1872	2.60	2.60	1402.16
The Renner Ditch	Lyken's Dry Creek.	60	1 May, 1874	7.49	7.49	1525.03
The Richardson Ditch	" "	64	15 June, 1874	3.90	3.90	1533.95
The Ullery Ditch	Steele Gulch.	66	1 July, 1874	5.20	5.20	1567.85
The Denio and Taylor Extension Ditch	St. Vrain.	69	1 June, 1875	10.40	10.40	1545.91

TABLE V.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Titus and Goyne Ditch	Dry Creek.	72	1 April, 1878	7.49	7.49	1640.86
The Supply Ditch	St Vrain.	75	31 May, 1878	104.00	104.00	1648.35
The Taylor Ditch No. 1	Dry Creek.	78	1 June, 1879	9.93	9.93	1777.83
‖ The Taylor Ditch No. 2	Dry Creek No. 2.	80	2 June, 1879	.....	.....	.....
The Lagerman Supply Ditch	Spring Gulch.	80	14 November, 1879	11.23	11.23	1798.99
The Dickens Private Ditch	Booming Dry Gulch.	81	1 April, 1880	11.70	11.70	1810.22
The Lykens Gulch Ditch	Lyken's Gulch	82	15 May, 1881	3.90	3.90	1821.92
Total from St. Vrain and tributaries				1825 82		
The Cochran Ditch	Left Hand C'k	1	1 September, 1860	0.94	0.94	0.00
First enlargement	" "	15	15 June, 1866	12.06	13.00	66.38
The Hornbaker Ditch	" "	2	15 May, 1861	4.99	4 99	0.94
First enlargemeut	" "	9	15 July, 1864	2.60	7.59	33 41

Second enlargement	Left Hand C'k		12	1 June, 1865	17 47	25.06	47 14
The Williamson and Carey Ditch	"	"	3	31 May, 1862	3.74	3.74	5.93
First enlargement	"	"	4	1 May, 1863	5.61	9.35	9.67
Second enlargement	"	"	10	1 May, 1865	7.80	17.15	36 01
The Holland Ditch	"	"	4	1 May, 1863	1.56	1.56	11.23
First enlargement	"	"	14	1 May, 1865			
Second enlargement	"	"	26	21 October, 1873	3.74	5.30	158.37
The Bader Ditch No. 2	"	"	5	31 May, 1863	1.95	1.95	16.84
First enlargement	"	"	19	15 March, 1870	5.85	7.80	105.27
The Farmer's Ditch	"	"	6	1 June, 1863	1.87	1.87	18.79
First enlargement	"	"	13	15 June, 1865	1.77	3 64	64 61
Second enlargement	"	"	21	1 November, 1870	12.00	15.64	114 55
The Baum and Goyne Ditch	"	"	7	26 September, 1863	5.26	5.26	20.66
First enlargement	"	"	17	1 May, 1867	7.80	13.06	89.67
The Bader Ditch No. 1	"	"	8	31 May, 1864	7.49	7.49	25.92
The Altoona Ditch	"	"	11	31 May, 1865	3.33	3 33	43 81
First enlargement	"	"	29	15 April, 1875	9.67	13.00	185.61

TABLE V.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Table Mountain Ditch	Left Hand C'k	16	25 June, 1866	11.23	11.23	78 44
First enlargement	" "	27	15 April, 1874	17 37	28.60	168.24
The Way Ditch	" "	18	1 May, 1868	7.80	7.80	97.47
The Toll Gate Ditch	" "	20	1 April, 1870	3.43	3.43	111.12
First enlargement	" "	27	1 May, 1874	4.05	7.48	164.19
Second enlargement	" "	31	3 May, 1879	4.99	12.47	201.96
The Star Ditch	" "	22	1 April, 1871	22.46	22.46	126.55
The Johnston Ditch	" "	25	1 April, 1873	9.36	9.36	149.01
The Lake Ditch	" "	27	15 April, 1874	2.08	2.08	162.11
First enlargement	" "	30	15 April, 1879	6.68	8.76	195.28
The Bacon North Side Ditch	Big Holton.	86	20 May, 1881	3.64	3.64	206.95
Total from the Left Hand and tributaries				210.59		
Total from the St. Vrain and tributaries				1825.82		
Total for District No. 5				2036 41		

TABLE V.—Continued.

RESERVOIR PRIORITIES.

NAME OF RESERVOIR.	Order of Priority.	Date of Appropriation.	Capacity of reservoir in cubic feet.
The Pleasant Valley Reservoir	1	1 June, 1871	70,054,400
The Highland Lake Reservoir	2	31 May, 1874	4,520,878
The Left Hand Reservoir	3	15 April, 1877	20,908,794
The Lagerman Reservoir	4	3 September, 1878	23,537,000
The Divide Reservoir	5	1 March, 1879	39,204,000
The Highland Reservoir No. 1	6	15 November, 1879	33,889,104
The Knoth's Reservoir	7	25 April, 1880	1,633,500
The Highland Reservoir No. 3	8*a*	15 November, 1881	33,889,104
The Highland Reservoir No. 2	8*b*	15 November, 1881	71,855,680
Total capacity of Reservoirs in District No. 5			299,492,460

* Amount claimed by Coffin and Davis Ditch by original construction is 11.23.
* Amount claimed by Coffin and Davis Ditch by enlargement is 31.20.
¶ Amount claimed by Davis and Downing Ditch for priority 33 was enough to run one set of small corn burrs.
‖ Taylor Ditch No 2 appropriates all the water they can get from Dry Creek No. 2 not exceeding 11.23, and not interfering with vested rights.

WATER DISTRICT No. 6.

TABLE VI.

Giving the date and order of priority and amount of each appropriation, together with the total amount of each preceding appropriation of ditches and canals in District No. 6, as they have been established by the Decree of Court of the First Judicial District.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Lower Boulder Ditch	Boulder Creek	1	1 October, 1859	25.00	25.00	0.00
First enlargement	" "	32	1 June, 1870	97.00	122 00	1513 35
The Smith and Goss Ditch	" "	2a	15 November, 1859	44.30	44.30	25.00
The Howell Ditch	" "	2b	1 December, 1859	47.55	47.55	69.30
The Anderson Ditch	" "	4	1 October, 1860	25.00	25.00	116.85
The Gotting, Daily and Plumb Ditch	" "	5	1 March, 1869	7.24	7.24	141.85
First enlargement	" "	26	1 April, 1865	23.20	30.44	1117.03
The Houck Ditch No. 2	" "	6	1 April, 1861	7.16	7.16	149.09
The Jones and Donnelly Ditch	" "	7	1 May, 1860	14 36	14.36	156.25

The Martha M. Matthews Ditch	"	"	8	1 June, 1861	4.60	4.60	170.61
The N. K. Smith and Tyler Ditch	"	"	9	1 June, 1861	29.04	29.04	175.21
The Plumb Ditch	"	"	10	1 April, 1862	5.10	5.10	204.25
The Rural Ditch Company	"	"	12	10 May, 1862	22.75	22.75	298.90
First enlargement	"	"	15	16 March, 1863	198.29	221.04	430.52
The Green Ditch	"	"	13	15 September, 1862	34 58	34.58	521.65
First enlargement	"	"	17	1 May, 1863	34.58	69.16	644.78
Second enlargement	"	"	27	1 May, 1864	34 58	103.74	1140.23
Third enlargement	"	"	29	1 May, 1865	34.58	138.32	1274.51
The Farmer's Ditch	"	"	14	1 October, 1862	73.29	73.29	356.23
The Houck Ditch No. 1	"	"	15a	1 April, 1863	15.97	15.97	628.81
The Smith and Emerson Ditch	"	"	18	1 June, 1863	47.16	47.16	679.36
The Carr and Tyler Ditch	"	"	19	1 June, 1864	33.73	33.73	726.52
The Butte Mill Ditch	"	"	22	1 March, 1865	110.86	110.86	825.25
The Howell and Beasley Ditch	"	"	23	1 March, 1865	28.80	28.80	936.11

TABLE VI.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted	Order of Priority.	Date of Appropriation claimed in Statement.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Delahant Ditch	Boulder Creek	25	1 May, 1865	37 12	37.12	1079.91
The Highland Ditch (south side)	" "	28	1 June, 1865	99 70	99.70	1174.81
First enlargement	" "	30½	1 June, 1868	152.20	251.90	1350.44
The Leggitt Ditch	" "	30	1 May, 1868	31.35	31.35	1319.09
The Taylor Ditch	" "	31	1 April, 1870	10.71	10.71	1502.64
The Boulder and Weld County Ditch	" "	33	1 May, 1871	59.40	59.40	1610.75
The Town of Boulder Ditch and Reservoir	" "	37	17 June, 1875	Domes. use 6.19 Irrigation. 6.19	12.38	2309.25
*The Boulder and White Rock Ditch	" "	35	1 November, 1873	747.38	747.38	1669.75
(Owned by a number of farmers)	" "	11	1 June, 1862	89.55	89.55	209.35
North Boulder and Farmer's Ditch Co.	" "	20	1 June, 1863	65.00	65.00	760.25
First enlargement	" "	24	1 June, 1864	115.00	180.00	964.91
Boulder and Left Hand Ditch Co	" "	36	1 December, 1873	82.80	82.80	2226.45

* On the first 700 yards from its head-gate, the Boulder and White Rock Ditch appropriates 556.70 cubic feet of water per second. For the remainder of distance it appropriates 190.58 cubic feet per second.

First enlargement	"	"	38	1 April, 1876	163.80	246.60	2321.63
The Wellman Ditch	"	"	39	1 May, 1878	12.74	12.74	2485.43
The Mathews Ditch	"	"	40	13 February, 1879	60.60	60.60	2498 17
The Revolution Ditch	"	"	41	7 December, 1881	99.97	99.97	2558.77
Total from Boulder Creek					2658.74		
The McGinn Ditch	S. Boulder C'k		1	1 May, 1860	3.19	3.19	0.00
First enlargement	"	"	10	1 May, 1864	.....	.....	343.23
Second enlargement	"	"	15	1 June, 1865	14.06	17.25	557.42
The Schearer Ditch	"	"	2	1 June, 1860	26.08	26.08	3.19
The Howard Ditch	"	"	3	1 April, 1860	36.00	36.00	29.27
The East Boulder Ditch	"	"	4	1 April, 1862	102.30	102.30	65.27
First enlargement	"	"	27	1 June, 1872	127.20	229.50	1224.13
The South Boulder and Bear Creek Ditch	"	"	5	25 May, 1862	16.60	16.60	167.57
First enlargement	"	"	8	9 May, 1865	26 41	43.01	247.82
Second enlargement	"	"	20	15 May, 1868	54.69	97.70	661.34
Third enlargement	"	"	23	15 April, 1871	129.10	226.80	779.12

TABLE VI.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Cottonwood Ditch No. 2	S. Boulder C'k	6	15 April, 1863	33.70	33.70	184.17
Dry Creek Ditch, Davidson's claim	" "	7	1 May, 1863	29.95	29.95	217.87
The Dry Creek No. 2 Ditch	" "	9	1 May, 1864	69.00	69.00	274.23
The Andrews and Farwell Ditch	" "	11	1 June, 1864	1.35	1.35	343.23
First enlargement	" "	25	1 April, 1871	7.61	8.96	1100.22
The Enterprise Ditch	" "	12	1 February, 1865	34.08	34.08	344.58
First enlargement	" "	18	1 May, 1866	40.76	74.84	601.42
By virtue of general enlargement	" "	33	1 June, 1881	54.25	129.09	1658.54
The Leyner Ditch	" "	13	1 April, 1865	164.00	164.00	378.66
The Marshallville Ditch	" "	14	1 June, 1865	14.76	14.76	542 66
First enlargement	" "	33	30 June, 1878	31.92	46.68	1626.62
The Central Ditch	" "	16	15 May, 1866	14.36	14.36	571.48

The Cottonwood Ditch No. 1	S. Boulder	C'k	17	1 April, 1866	15 58	15.58	585 84
First enlargement	"	"	22	1 October, 1870	36.72	52.30	742.40
The South Side Ditch	"	"	19	1 June, 1866	19.16	19.16	642.18
The South Boulder Canon Ditch	"	"	21	15 May, 1870	26.37	26.37	716.03
First enlargement	"	"	24	15 May, 1871	192.00	218.37	908.22
The Davidson Ditch	"	"	26	15 April, 1872	116.30	116.30	1107.83
First enlargement	"	"	32	10 May, 1875	125.50	241.80	1501.12
The South Boulder and Coal Creek Ditch	"	"	28	1 June, 1872	53.55	53.55	1351.33
The Goodhue Ditch and Reservoir	"	"	29	1 June, 1873	30.31	30 31	1404.88
The South Boulder and Rock Creek Ditch	"	"	30	1 June, 1873	65.93	65.93	1435.19
Total from South Boulder Creek					1712.79		
The Autrey and Eggleston Ditch	Coal	Creek.	1	1 June, 1860	4.16	4.16	0.00
The Wm. Hake Ditch	"	"	2	1 June, 1861	2.94	2.94	4.16
The Eggleston Ditch No. 2	"	"	3	1 May, 1862	4.65	4.65	7.10
The McKenzie Ditch	"	"	4	1 June, 1866	18.00	18 00	11 75

TABLE VI.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Eggleston No. 1 Ditch	Coal Creek.	5	1 October, 1869	6.58	6.58	29.75
The Last Chance Ditch	" "	6	1 May, 1870	10.78	10.78	36.33
The Church Ditch	" "	8	20 September, 1870	18.11	18.11	47.11
The Kinner Ditch	" "	9	20 May, 1872	26.48	26.48	65.22
Total from Coal Creek				91.70		
The Four Mile Canon Ditch	Four Mile C'k	1	1 April, 1875	76.56	76.56	0.00
The Forbes Ditch	" "	2	1 April, 1878	60.66	137.22	76.56
Total from Four Mile Canon				137 22		
The Six Mile Bottom Ditch	Jaine's Gulch	1	1 April, 1875	48.80	48.80	0.00
The North Branch of the Six Mile Botton D'h	" "	2	1 April, 1875	48.80	97.60	48.80
Total from Jaine's Gulch				97.60		
Total from Boulder Creek				2658.74		
Total from South Boulder Creek				1712.79		
Total from Coal Creek				91.70		
Total from Four Mile Canon				137.22		
Total for District No. 6				4698.05		

WATER DISTRICT No. 7.

TABLE VII.

Giving the date and order of priority and amount of each appropriation, together with the total amount of each preceding appropriation of ditches and canals in District No. 7, as they have been established by the Decree of Court of the Second Judicial District, dated October 4, 1884.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Wadsworth Ditch	Clear Creek.	1	25 February, 1860	3.31	3.31	0.00
First enlargement	" "	48	2 November, 1865	9.69	13.00	436 68
The Lees and Baugh Ditch	" "	2	15 May, 1860	5.00	5.00	3.31
The South Side Ditch	" "	3	16 May, 1860	2.00	2.00	8.31
The Brown's Island Ditch	" "	4	19 May, 1860	0.90	0.90	10.31
The Ouellette Ditch	" "	5	31 May, 1860	15.00	15.00	11.21
The Wannemaker Ditch	" "	6	1 June, 1860	8.00	8.00	26.21
First enlargement	" "	52	5 November, 1868	13.00	21 00	482.87
The Sherick Ditch	" "	7	14 June, 1860	1.12	1.12	34.21

TABLE VII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal	Cubic feet per second previously appropriated.
The Lee's Island Ditch	Clear Creek.	8	30 June, 1860	0.50	0.50	35.33
The Golden Canal Co.'s Ditch	" "	9	1 July, 1860	39.80	39.80	35.83
First enlargement	" "	57	1 April, 1872	154.00	193.80	554.89
The Cort, Graves and Hughes Ditch	" "	10	30 April, 1861	7.00	7.00	75.63
The Kershaw Ditch	" "	11	2 May, 1861	16.00	16.00	82.63
The Claus and Couch Ditch	" "	12	13 May, 1861	9.90	9.90	98.63
The Swadley Ditch	" "	13	14 May, 1861	6.00	6.00	108.53
First enlargement	" "	21	1 June, 1862	9.00	15.00	215.91
Second enlargement	" "	44	16 May, 1865	10.00	25.00	411.66
The Lee Ditch	" "	14	2 June, 1861	1.12	1.12	114.53
The Miles and Eskins Ditch	" "	15	11 June, 1861	4.00	4.00	115 65
The Fisher Ditch	" "	16	29 June, 1861	35.00	35.20	119.65

The Graves North Ditch	Clear Creek.	17	30 June, 1861	1.75	1.75	154.65
First enlargement	" "	46	13 June, 1865	1.86	3.61	431.66
The Clear Creek and Platte River Ditch	" "	18	1 November, 1861	49.50	49.50	156.40
First enlargement	" "	34	5 November, 1863	20.56	70.06	259.22
The Rocky Mountain Ditch	" "	19	1 May, 1862	9 21	9.21	205.90
First enlargement	" "	37	31 May, 1864	7.30	16.51	293.18
Second enlargement	" "	41	31 March, 1865	47.13	63.64	356.69
Third enlargement	" "	58	15 March, 1873	113.66	177.30	7 8.89
Fourth enlargement	" "	64	16 March, 1878	12.70	190.00	997.26
The Slater Ditch	" "	20	16 May, 1862	1.80	1.80	215.11
The Sayer and Lees Ditch	" "	22	14 June, 1862	7.00	7.00	225.91
The Sanderson and Slater Ditch	" "	23	1 July, 1862	0.90	0.90	232.91
The Wolff Ditch	" "	24	5 July, 1862	3.06	3.06	233.81
First enlargement	" "	38	14 June, 1864	3.78	6.84	300.48
Second enlargement	" "	43	6 May, 1865	2.06	8.90	4 9.60
The Wolff North Ditch	" "	25	5 July, 1862	2.00	2.00	236.87

TABLE VII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Wadsworth and Graves Ditch	Clear Creek.	26	10 July, 1862	1.35	1.35	238.87
First enlargement	" "	60	5 May, 1874	4.92	6.27	854.35
The Lee, Stewart and Eskins Ditch	" "	27	17 April, 1863	2.18	2.18	240.22
First enlargement	" "	51	23 February, 1868	4.30	6.48	478.57
Second enlargement	" "	53	31 March, 1869	19.77	26.25	495.87
Third enlargement	" "	56	13 April, 1871	6.94	33.19	547.95
The Graves South Ditch	" "	28	21 May, 1863	3.00	3.00	242.40
The Bluff Ditch	" "	29	26 May, 1863	2.60	2.60	245.40
First enlargement	" "	36	27 May, 1864	2.40	5.00	290.78
The Juchens and Ouellette Ditch	" "	30	28 May, 1863	3.22	3.22	248.00
First enlargement	" "	42	23 April, 1865	5.78	9.00	403 82
The Sanderson Ditch	" "	31	31 May, 1863	1.00	1.00	251.22
The Slater and Moody Ditch	" "	32	20 June, 1863	4.00	4.00	252.22

The Rhodes Middle Ditch	Clear Creek.		33	1 August, 1863	3.00	3.00	256.22
The Cort and Graves Ditch	"	"	35	1 May, 1864	11.00	11.00	279 78
The Lane Ditch	"	"	39	20 June, 1864	11.00	11.00	304.26
The Golden City and Ralston Creek Ditch	"	"	40	28 February, 1865	41.43	41.43	315.26
First enlargement	"	"	62	18 November, 1877	18.26	59.69	960.81
Second enlargement	"	"	65	15 November, 1878	18.85	78.54	1009.96
Third enlargement	"	"	66	20 November, 1881	32.34	110.88	1028.81
The Brown and Baugh Ditch	"	"	45	26 May, 1865	10.00	10.00	421.66
The Rhodes South Ditch	"	"	47	5 July, 1865	3.16	3.16	433.52
The Colorado Agricultural Ditch	"	"	49	5 March, 1867	30.20	30.20	446.37
First enlargement	"	"	59	5 April, 1874	31 80	62.00	821.55
The North Side Ditch	"	"	50	30 April, 1867	2.00	2.00	476.57
The Reno and Juchens Ditch	"	"	54	24 May, 1870	6.31	6.31	515.64
First enlargement	"	"	63	2 March, 1878	18.19	24.50	979.07
The Golden Ditch	"	"	55	11 February, 1871	26.00	26.00	521.95

TABLE VII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Agricultural Ditch	Clear Creek.	61	21 December, 1874	101.54	101.54	859.27
First enlargement	" "	67	24 March, 1883	88.46	150.00	1061.15
Total from Clear Creek				1109.61		
The Manhart Ditch	Ralston Creek	1	31 August, 1860	0.80	0.80	0.00
First enlargement	" "	7	20 June, 1862	0.20	1.00	15.27
Second enlargement	" "	11	30 June, 1864	11.80	12.80	20.43
The Swadley and Longan Ditch	" "	2	10 April, 1861	5.50	5.50	0.80
The Haines Ditch	" "	3	30 May, 1861	1.31	1.31	6.30
The Piquette Ditch	" "	4	6 June, 1861	2.03	2.03	7.61
First enlargement	" "	10	6 June, 1864	1.88	3.91	18.55
The Brainard Tucker Ditch	" "	5	1 May, 1862	2.93	2.93	9.64
The Bunny and Ballinger Ditch	" "	6	6 June, 1862	2.70	2.70	12.57
First enlargement	" "	9	5 June, 1864	1.78	1.78	16.77

The McQuiston Ditch	Ralston Creek	8	25 June, 1863	1.30	1.30	15.47
The Davis and Rand Ditch	" "	12	26 May, 1865	5.00	5.00	32.23
The Clark and Brown Ditch	" "	13	31 May, 1865	3.70	3.70	37.23
The Reed Ditch	" "	14	31 August, 1865	2.70	2.70	40.93
The Haines and Ballinger Ditch	" "	15	14 May, 1866	2.80	2.80	43.63
The Churches Ditch	" "	16	31 May, 1866	5.84	5.84	46.43
First enlargement	" "	19	20 May, 1873	2.89	8.73	59.27
The Haines and Piquette Ditch	" "	17	10 May, 1869	5.00	5.00	52.27
The Homestead Ditch	" "	18	6 May, 1871	2.00	2.00	57.57
The Ballinger Ditch	" "	20	31 May, 1873	1.68	1.68	62.16
Total from Ralston Creek				63.84		
The Rand Ditch	Lyden Creek.	1	27 April, 1867	4.00	4.00	0.00
The Davis and Brown Ditch	" "	2	11 May, 1878	3.00	3.00	4.00
Total from Lyden Creek				7.00		
Total from Clear Creek				1109.61		
Total from Ralston Creek				63.84		
Total for District No. 7				1180.45		

TABLE VII.—*Continued.*

RESERVOIR PRIORITIES.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
Sloan Lake and Cooper Lake Reservoirs.....	Clear Creek.	1	1 May, 1873.....	37.00	37.00	0.00
The Churches Reservoirs.....	Ralston Creek	1	31 May, 1868.....	5.84	5.84	0.00
First enlargement	" "	3	20 March, 1873.....	2.89	8.73	10.84
The Tucker Reservoirs.....	" "	2	1 June, 1869.....	5.00	5.00	5.84
The Long Lake Reservoir.....	" "	4	29 May, 1873.....	7.54	7.54	13.73
Total Ralston Creek Reservoirs.....	.....	.....	.....	21.27		

WATER DISTRICT No. 8.

TABLE VIII.

Giving the date and order of priority and amount of each appropriation, together with the total amount of each preceding appropriation, of ditches and canals in District No. 8, as they have been established by the Decree of Court of the Fourth Judicial District.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Platte Water Co.'s Ditch	Not Given.	1	28 November, 1860	30 13	0	
First enlargement	" "	75	1 November, 1873	43.00	43.00	629 49
Second enlargement	" "	130	7 March, 1882	42.95	85 95	2410.22
Rough and Ready Ditch and Mill Race	" "	2	31 December, 1860	37.00	37.00	0.00
First enlargement	" "	35	1 December, 1867	31 27	68 27	354.65
The Garber Creek Ditch	" "	3	30 June, 1861	2.79	2.79	37.00
First enlargement	" "	57	1 December, 1871	1.40	4.19	531.74
The Nevada Ditch	" "	4	30 August, 1861	28.00	28.00	39 79
First enlargement	" "	19	— — 1865	34.20	62.20	255.74

TABLE VIII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted		Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Platte Canon Ditch	Not	Given.	5	Spring, 1861	4 70	4.70	67.79
First enlargement	"	"	14	— December, 1863	34.00	38.70	128.73
Second enlargement	"	"	18	— —— 1864	17.30	56.00	238.44
The Petersburgh Ditch	"	"	6	30 November, 1861	21.60	21.60	72.49
First enlargement	"	"	13	30 — December, 1863 73	5.40	27.00	123.33
Second enlargement	"	"	76	30 December, 1873	27.00	54.00	672.49
The "59" No. 1 Ditch	"	"	7	1 May, 1862	7.28	7.28	94.09
Lengthened, no appropriation	"	"	85	— December, 1874	0.00	7.28	721.96
The Spring Creek Ditch	"	"	8	1 June, 1862	1.83	1.83	101.37
First enlargement	"	"	135	15 May, 1882	2.59	4.42	2464.73
The Brown Ditch	"	"	9	30 November, 1862	16 50	16.50	103.20
The Silzell Ditch	"	"	10	1 December, 1862	2.57	2 57	119.70
Garber Creek Ditch No. 2	"	"	11	Summer, 1863	1.06	1.06	122.27

The Smith Canal	Not	Given.	12	1 December, 1863			123.33
First enlargement	"	"	26	1 December, 1866			318.82
Second enlargement	"	"	86	30 December, 1874			721.96
Third enlargement	"	"	106	30 July, 1878		57.57	791.09
The "59" Ditch No. 2	"	"	15	31 December, 1863	9.00	9.00	162.73
First enlargement	"	"	33	Spring, 1867	4.50	13.50	342.59
The Platte and Denver Ditch Co.'s Ditch	"	"	16	7 October, 1864	61.71	61.71	171.73
The Chatham Ditch	"	"	17	— December, 1864	5.00	5.00	233.44
The Meadow Ditch	"	"	20	31 May, 1866	5.00	5.00	289.94
The John Jones Ditch	"	"	21	31 May, 1866	2.61	2.61	294.94
The Sunny Bank Ditch	"	"	22	1 June, 1866	1.83	1.83	297.55
The Lemon Ditch	"	"	23	1 June, 1866	12.72	12.72	299.38
The Quick Ditch	"	"	24	15 June, 1866	3.80	3.80	312.10
The Craig Ditch	"	"	25	Summer, 1866	2.92	2.92	315.90
The Kelley Ditch	"	"	27	30 March, 1867	2.52	2.52	318.82

TABLE VIII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Sixty-Seven Ditch	Not Given.	28	15 June, 1867	6.82	6.82	321.34
The Bryant Ditch	" "	29	30 June, 1867	5.00	5.00	328.16
The Kountz Ditch	" "	30	Spring, 1867	2.52	2.52	333.16
The Grant Ditch	" "	31	Spring, 1867	2.52	2.52	335.68
The Bear Creek Ditch	" "	32	Spring, 1867	4.39	4.39	338.20
The Pleasant Park Ditch	" "	34	Summer, 1867	7.56	7.56	347.09
The Glenn Plynn Ditch	" "	36	1 December, 1867	1.95	1.95	385.92
The Silzell Ditch	" "	37	1 January, 1868	2.18	2.18	387.87
The Kinner Ditch	" "	38	1 March, 1868	3.52	3.52	390.05
The Last Chance Ditch	" "	39	3 March, 1868	32.00	32.00	393.57
The Gove Ditch	" "	41	1 June, 1869	2.52	2.52	457.57

The Flinton Carey Ditch	Not	Given.	42	Summer, 1869	2.17	2.17	463.09
Lengthened, no extra appropriation	"	"	54	Spring, 1871	.....	.....	514.24
The Hawkey, Dawe and Gird Ditch	"	"	43	— July, 1869	2.50	2.50	462 26
First enlargement	"	"	77	— July, 1873	2.00	4.50	699.59
Second enlargement	"	"	114	— July, 1879-80	15.15	19.65	2313.51
The Boss Ditch	"	"	44	— July, 1869	4.72	4.72	464.76
The East Plum Creek Ditch	"	"	45	30 July, 1869	0.55	0.55	469.48
The Red Rock and Spring Creek Ditches	"	"	46	30 May, 1870	3.00	3.00	470.03
The Red Rock and Spring Creek Ditches	"	"	47	1 June, 1870	3 00	6.00	473.03
The Cook Creek Ditch	"	"	48	— June, 1870	3.80	3.80	476.03
The Lower Plum Creek Ditch	"	"	49	— —— 1870	11.00	11.00	479.83
The Arnold Ditch	"	"	49½	— —— 1870	1.00	1.00	490.83
The Fairview Ditch and Reservoir	"	"	50	— April, 1871	14.00	14.00	491.83
The Ratcliff Spring Creek Ditch	"	"	52	1 June, 1871	5.41	5.41	505.83
The Plum Creek Ditch	"	"	53	1 June, 1871	3.00	3.00	511.24

TABLE VIII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Jarre Ditch	Not Given.	55	Spring, 1871	1.50	1.50	514.24
The Snell Ditch	" "	56	30 September, 1871	16.00	16.00	515.74
The High Line Ditch	" "	57	— —— 1871	3.52	3.52	533.14
First enlargement	" "	73	Spring, 1878	16.48	20.90	611.68
The Houston Ditch	" "	58	— —— 1871	2.67	2.67	536.66
First enlargement	" "	74	Spring, 1873	1.33	4.00	628.16
The Ball Ditch	" "	59	19 April, 1872	3.00	3.00	539.33
The Success Ditch	" "	60	30 April, 1872	24.00	24.00	542.33
The Ratcliff Plum Creek Ditch	" "	61	30 May, 1872	7.50	7.50	566.33
The McLeod Ditch	" "	62	1 June, 1872	3.90	3.90	573.83
The Indian Creek Ditch	" "	63	3 July, 1872	4.00	4.00	577.73
The Birmingham Ditch	" "	64	— December, 1872	5.00	5.00	581 73

The Newmarch Ditch	Not	Given.	65	— April, 1873	3.00	3.00	586.73
The Cann Ditch No. 1	"	"	66	— April, 1873	2.00	2.00	589.73
The Happy Canon Reservoir Ditch	"	"	67	1 April, 1873	3.00	3.00	591.73
First enlargement	"	"	100	10 March, 1879	0.80	3.80	774.43
The Purdy Ditch	"	"	68	— May, 1873	.....	.....	594.73
Lengthened out	"	"	126	—May. 1881	2.00	2.00	2391.84
The Dakan Ditch	"	"	69	1 June, 1873	1.95	1.95	596.73
West Side Ditch	"	"	70	20 June, 1873	2.00	2.00	598.68
The French Ditch	"	"	71	30 June, 1873	3.00	3.00	600.68
The Indian Creek Ditches	"	"	72	Spring, 1873	8.00	8.00	603.68
The Haley Ditch	"	"	78	Spring, 1873	4.00	4.00	701.59
The Kountz Ditch	"	"	79	Summer, 1873	0.75	0.75	705.59
The Stewart Ditch	"	"	80	1 April, 1874	5.00	5.00	706.34
The Woodhouse Ditch	"	"	81	1 April, 1874	2.30	2.30	711.34
The Sobey Ditch	"	"	82	1 April, 1874	1.48	1.48	713.64

TABLE VIII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Harrison Ditch	Not Given.	83	30 May, 1874	4.36	4.36	715.12
The Burrow Ditch	" "	84	Spring, 1874	2.48	2.48	719.48
The George Dane Ditch	" "	87	Spring, 1874	1.80	1.80	729.53
First enlargement	" "	113	Fall, 1879	0.49	2.29	2313.02
The Goodrich Ditch	" "	88	— December, 1874	5.00	5.00	731.33
The West Cherry Creek Ditch	" "	89	— February, 1875	6.87	6.87	729.53
The Murmur Ditch	" "	90	30 March, 1875	3.25	3.25	743.20
First enlargement	" "	105	— December, 1878	1.75	5.00	789.34
The Perry Ditch	" "	91	— June, 1875	1.47	1.47	746.45
The Cleora Ditch	" "	92	— June, 1875	2.00	2.00	747 92
First enlargement	" "	104	— October, 1878	1.50	3.50	787.84
The Crawford Ditch	" "	93	30 June, 1875	5.00	5.00	749.92

The Cann Ditch No. 2	Not	Given.	94	30 October, 1875	1.83	1.83	754.92
The Pioneer Ditch	"	"	95	— March, 1876	5.83	5.83	756.75
First enlargement	"	"	109	Spring, 1879	1.17	7.00	1122.85
The Smith Ditch	"	"	96	10 March, 1876	4.52	4.52	762.58
The McCracken Ditch	"	"	97	Spring, 1877	3.00	3.00	767.10
The Upton T. Smith Ditch	"	"	98	Spring, 1877	1.00	1.00	770.10
The Deer Creek Canon Ditch	"	"	99	8 December, 1877	3.33	3.33	771.10
The Gardner Ditch	"	"	100	18 December, 1877	5.92	5.92	775.23
The Monroe Ditch	"	"	101	— May, 1878	3.25	3.25	781.15
First enlargement	"	"	121	— May, 1880	1.25	4.50	2369.73
The "33" Ditch	"	"	103	Spring, 1878	3.44	3.44	784.40
The Montgonery Ditch	"	"	107		3.50	3.50	841.09
The Denver City Irrigation and Water Co.'s Canal and Reservoir Water Works	"	"	108	10 September, 1878	278.26	278.26	844.59
Northern Colorado Irrigation Co.'s Ditch	"	"	111	18 January, 1879	1184.00	1184.00	1124.02

TABLE VIII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Shore Ditch	Not Given.	112	30 June, 1879	5.00	5.00	2308.02
The East Side Ditch	" "	115	30 August, 1879	2.00	2.00	2328.66
The Snyder Ditch	" "	116	1 November, 1879	3.00	3.00	2330.66
The Stevens Ditch	" "	117	30 December, 1879	7.56	7.56	2333.66
The Gillman Ditch	" "	118	28 February, 1880	9.90	9.90	2341.22
The Huntsville Ditch	" "	119	1 March, 1880	9.12	9.12	2351.12
The Reservoir Ditch	" "	120	3 March, 1880	8.24	8.24	2360.24
Castle Rock Ditch and Reservoir	" "	121	1 April, 1880	2.00	2.00	2368.48
The Enterprise Ditch No. 1	" "	122	15 April, 1880	10.12	10.12	2371.73
The Little Daisy Ditch	" "	123	10 May, 1880	0.99	0.99	2381.85
The Enterprise Ditch No. 2	" "	124	14 May, 1881	4.50	4.50	2882.84

The Excelsior Ditch	Not	Given.	125	25 May, 1881.	4.50	4.50	2387.34
The Glenn Plynn Ditch No. 2	"	"	127	30 May, 1881	12.00	12.00	2391.84
The Hillside Ditch	"	"	128	1 July, 1881	3.65	3.65	2403.84
The Phelan Ditch	"	"	129	1 August, 1881	2.73	2.73	2407.49
J. B. Tucker Ditch	"	"	131	1 November, 1881	4.36	4.36	2453.17
The Alderman Ditch	"	"	132	1 November, 1881	5.20	5.20	2457.53
The Hill Ditch	"	"	134	1 January, 1882	2 00	2.00	2462.73
The Lake Gulch Ditch	"	"	136	28 February, 1882	4.00	4.00	2467.32
The Antelope Ditch	"	"	137	31 March, 1882	3.85	3.85	2471.32
The Necessity Ditch	"	"	138	26 January, 1882	6.67	6.67	2475.17
Total for District No. 8					2481.84		

The name of streams were not given in the decree of the court.

WATER DISTRICT No. 9.

TABLE IX.

Giving the date and order of priority and amount of each appropriation, together with the total amount of each preceding appropriation of ditches and canals in District No. 9, as they have been established by the Decree of Court of the Second Judicial District, dated February 4, 1884.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The McBroom Ditch	Bear Creek.	1	1 November, 1859	11.58	11.58	0.00
The Simonton Ditch	" "	2	25 December, 1860	35 76	35 76	11.58
The Hodgson Ditch	" "	3	1 June, 1861	8.25	8.25	47.34
First enlargement	" "	9	31 May, 1862	2.07	10.32	98.64
The Warrior Ditch, original construction of						
Arnette and Lewis branch	" "	4	1 December, 1861	12.33	12.33	55.59
The Turkey Creek appropriation	Turkey Creek	8	16 April, 1862	2.86	15.19	95.78
Original construction of the Fairbanks,						
Horner and Rist branch	Bear Creek.	14	31 October, 1864	25.47	40 66	161.78
Construction of the Barnes branch	" "	16	1 April, 1865	11 49	52.15	212.38

8 The Olson and Bell Ditch	Bear Creek.	6	15 March, 1862	6.30	6.30	80.33
The Hindry Ditch	" "	7	15 April, 1862	9.15	9.15	86.63
First enlargement	" "	20	31 December, 1867	8.94	18 09	254.99
The Lawn Ditch	" "	10	10 June, 1862	1.47	1.47	100.71
The Pioneer Union Ditch, by construction of Hodgson and McPheeter Ditch	" "	5	10 December, 1861	12.41	12.41	67.92
Original construction of the Pioneer Union Ditch	" "	11	1 September, 1862	18.13	30.54	102.18
First enlargement	" "	15	15 March, 1865	25.13	55.67	187.25
The Spickerman Ditch	Turkey Creek	12	1 November, 1862	10.61	10.61	120.31
The Lewis and Strouse Ditch	Bear Creek.	13	1 March, 1863	30.86	30.86	130.92
The Strouse Ditch	" "	17	1 May, 1865	4.80	4.80	223 87
The Spickerman Lower Ditch	Turkey Creek	18	1 June, 1865	9.33	9.33	228.67
The Robt. Lewis Ditch	Bear Creek.	19	1 October, 1865	17.00	17.00	237.99
The Arnette Ditch (Turkey Creek)	Turkey Creek	21	15 April, 1868	10.75	10.75	263.93

TABLE IX.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Arnette Ditch on Bear Creek	Bear Creek.	23	16 March, 1869	7.94	7.94	281.14
First enlargement	" "	25	1 May, 1871	25.54	33.48	290.57
Second enlargement	" "	30	1 March, 1882	12.87	46.35	361.68
The Spickerman Middle Ditch	Turkey Creek	22	1 June, 1868	6.46	6.46	274.68
The Churn Ditch	Bear Creek.	24	15 April, 1870	1.49	1.49	289.08
The Fischer Ditch	" "	26	16 September, 1871	2.88	2.88	316.11
The Bergen Ditch	Turkey Creek	27	1 May, 1874	12.00	12.00	318.99
The Independent High Line Ditch	" "	28	6 September, 1878	26.68	26.68	330.99
First enlargement	" "	29	25 September, 1881	4.01	30.69	357.67
The Ward Ditch	Bear Creek.	31	6 December, 1882	63.00	63.00	374.55
Total for District No. 9				437.55		

TABLE IX.—Continued.

RESERVOIR PRIORITIES.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Harriman Reservoir	Bear Creek and Turkey Creek	1	1 May, 1873	18.09	18 09	0.00
First enlargement of its feeder		3	1 April, 1875	37.58	55.67	30.09
The Bergen Reservoir	Turkey Creek	2	1 May, 1874	12.00	12.00	18.09
The Bowles Reservoir	Bear Creek.	4	10 May, 1876	11.06	11.06	67.67
By 2d enlargement of the Arnette Ditch	" "	6	15 May, 1880	15.75	26.81	105.41
The Dean Reservoir	Turkey Creek	5	6 September, 1878	26.68	26.68	78.73
First enlargement	" "	8	25 September, 1881	4.01	30.69	147.97
The Johnston Reservoir	Bear Creek.	7	15 May, 1880	26.81	26.81	121.16
The Ward and Kendrick Reservoir	" "	9	6 December, 1882	63.00	63.00	151.98
Total for Reservoirs				214 98		

WATER DISTRICT No. 10.

TABLE X.

Giving the date and order of priority and amount of each appropriation, together with the total amount of each preceding appropriation, of ditches and canals in District No. 10, as they have been established by the Decree of Court of the Fourth Judicial District.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Flanagan Ditch	Fountain C'k.	1	— April, 1860	0.74	0.74	0.00
The Harmes Ditch	" "	2	Fall, 1861	3.50	3.50	0.74
First enlargement	" "	33	Fall, 1872	10.12	13.62	373.31
The Bly Ditch	" "	3	Winter, 1861	22.40	22.40	4.24
Treadwell and Lamb Ditch	" "	4	Fall, 1861	9.84	9.84	26.64
The Lincoln Ditch	" "	5	Fall, 1861	8.86	8.86	36.48
First enlargement	" "	23	Fall, 1863	7.34	16.20	216.68
The Stubbs and Miller Ditch	" "	6	—— 1861	15 30	15.30	45.34
The Banning Ditch	" "	7	20-30 April, 1862	11.20	11.20	60.64

The Owen and Hall Ditch	Fountain	C'k.	8	—— 1862	17 40	17.40	71 84
The Burke Ditch	"	"	9	—— 1862	7.72	7.72	89 24
The Laughlin Ditch	"	"	10	—— 1862	9.36	9.36	96.96
First enlargement	"	"	17	—— 1863	6.42	15.78	171.90
The Fountain Ditch	"	"	11	— February, 1863	23.70	23.70	106.32
First enlargement	"	"	21	—— 1864	7.68	31.38	200.64
The Sheldon Ditch	"	"	12	Winter, 1863	8.37	8.37	130.02
The Robinson Ditch	"	"	13	March, 1863	10.35	10.35	138.39
The Liston and Love Ditch	"	"	14	Spring, 1863	8.82	8.82	148.74
First enlargement	"	"	33	—— 1871	3.60	12.42	369 71
The Lock Ditch	"	"	15	—— 1862	6.30	6.30	157.56
The Miller Ditch	"	"	16	—— 1863	8.04	8.04	163.86
The Tom Wanless Ditch	"	"	18	— March, 1864	7 50	7.50	178.32
Anthony Bott and Chambers Ditch	"	"	19	Spring, 1864	8.82	8 82	185 82
First enlargement	"	"	46	— April, 1881	3.54	12.36	511.84

TABLE X.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Talcott and Colton Ditch	Fountain C'k.	20	—— 1864	6.00	6.00	194.64
The Lock Ditch No. 2	" "	22	—— 1864	8.36	8.36	208.32
First enlargement	" "	45	—— 1880	5.02	13.38	506.82
The Everhart Ditch	" "	24	—— 1865	3.22	3.22	224.02
First enlargement	" "	42	—— 1875	3.78	7.00	477.38
The Doctor Rodgers Ditch	" "	25	— March, 1866	5.55	5.55	227.24
The Irvine Ditch	" "	26	— April, 1866	7.72	7.72	232.39
The Chilcott Ditch	" "	27	Spring, 1866	27.00	27.00	240.51
First enlargement	" "	39	Spring, 1874	20.36	47.36	424.71
The Terrell Ditch	" "	28	—— 1866	8.48	8.48	267.51
The Widefield Ditch	" "	29	—— 1867	9.68	9.68	275.99
First enlargement	" "	41	—— 1874	17.05	26.73	460.33

The Overton, Ames and Loomis Ditch	Fountain C'k.		30	—— 1868	13.20	13.20	285.67
The Gaines and Love Ditch	"	"	31	Spring, 1871	11.34	11.34	298 87
The El Paso County Ditch	"	"	32	Fall, 1871	59.50	59.50	310.21
The Douglas Ditch	"	"	34	Spring, 1872	11.79	11.79	383.43
Iron and Irvine Ditch	"	"	35	— March, 1873	6.00	6.00	395.22
Jackson and Burke Ditch	"	"	37	Spring, 1873	10.85	10.85	401.22
The Pike's Peak Ditch	"	"	38	—— 1863	12.64	12.64	412.07
First enlargement	"	"	40	— August, 1873	15.26	27.90	445.07
Clover Irrigating Ditch	"	"	43	15 November, 1875	17.14	17.14	481.16
Bosworth and Hall Ditch	"	"	44	— February, 1879	8 52	8.52	498.30
The Lincoln Ditch No. 2	"	"	47	Fall, 1881	2.25	2.25	515.38
Templeton and Blume Ditch	"	"	—	About 1862	16.52	16.52	517.63
The Straw Ditch	"	"	—		6.03	6.03	534.15
Total for Fountain					540.18		

TABLE X.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal	Cubic feet per second previously appropriated.
The Anchor Ditch	Monument Ck	1	— March, 1867	2.14	2.14	0.00
The Diamond Ditch	" "	2	10 July, 1867	3.84	3.84	2.14
The Monument Creek Ditch	" "	3	20 June, 1868	4.58	4.58	5.98
First enlargement	" "	12	—— 1875	2.74	7.32	70.59
The Monitor Ditch	" "	4	— June, 1868	11.14	11.14	10.56
The Arapahoe Ditch	" "	5	— June, 1868	11.14	11.14	21.70
The Liered and Guire Ditch	" "	6	— June, 1868	4.12	4.12	32.84
The Star Ditch	" "	7	10 June, 1869	3.64	3.64	36.96
The Monument Ditch No. 2	" "	8	— June, 1870	4.80	4.80	40.60
The Monument Ditch No. 2½	" "	9	Summer, 1871	16.43	16.43	45.40
Walker and Brinker Ditch	" "	10	Spring, 1872	4.12	4.12	61.83

The Seventy-Four Ditch	Monument Ck	11	10 June, 1874	4.64	4.64	65.95
Total from Monument Creek				73.33		
The W. W. Jones Ditch	West Monument Creek.	1	Spring, 1869	6 36	6.36	0.00
The Blodgett Ditch	" "	2	Spring, 1872	4.20	4.20	6.36
The Lennox Ditch	" "	3	Fall, 1873	7.95	7.95	10.56
The Head of the Creek Ditch	" "	4	— —— 1876	2.01	2.01	18.51
Clarkes Ditch No. 1	" "	5	—— 1876	1.66	1.66	20.52
Total from West Monument Creek				22.18		
*The Ditch No. 1	Bear Creek.	1	*——1861	.....	.....	.....
*The Mathews Ditch	" "	2	*Spring, 1863	.....	.....	.....
*The Wellesley and Howbert Ditch	" "	3	*Fall, 1866	.....	.....	.....
*The Wellesley and Fisher Ditch	" "	4	*Spring, 1875	.....	.....	.....
*The Cheyenne Creek Ditch	Cheyenne C'k	1	* — September, 1860	.....	.....	.....
First enlargement	" "	3	*Spring, 1862	.....	.....	.....

TABLE X.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
*The Lowry Ditch	Cheyenne C'k	2	*Fall, 1861	.....	.....	.....
First enlargement	" "	7	*Fall, 1863	.....	.....	.....
The Harris Ditch	" "	4	— March, 1863	15.90	15.90	.....
The Alvord Ditch	" "	5	10 May, 1863	4.28	4.28	.....
The Wolf Ditch	" "	6	Spring, 1863	12.52	12.52	.....
*The John Wolf Ditch	" "	8	*——1864	.....	.....	.....
*The Dixon Ditch	" "	9	*Fall, 1865	.....	.....	.....
The Myers Ditch	" "	10	—— 1871	2.15	2.15	.....
*The Wm. Bastran Ditch	" "	11	* —April, 1872	.....	.....	.....
*The Harlan Ditch	" "	12	Summer, 1872	2.64	2.64	.....
*The Kinsman Ditch	" "	13	*—— 1875	.....	.....	.....

The Hammond Ditch	Cheyenne C'k	14	— August, 1877	1.58	1.58	.....
Total (as far as given) for Cheyenne Creek				39.07		
The Marcott Ditch	Four Mile C'k	1	— April, 1870	1.50	1.50	0.00
The Dorris Ditch	" "	2	Spring, 1870	3.36	3.36	1.50
The Watson Ditch	" "	3	Spring, 1872	1.78	1.78	4.86
First enlargement	" "	13	—— 1877	1.17	2.95	55.24
The Kittridge Ditch	" "	4	— June, 1873	3.88	3.88	6.64
First enlargement	" "	12	— May, 1877	11.24	15.12	44.00
The Watson Ditch No. 2	" "	5	— March, 1874	2.71	2.71	10.52
First enlargement	" "	10	—— ——	3.65	6.36	29.55
The Riggs Ditch	" "	6	— April, 1874	4.76	4.76	13.23
The Riggs Ditch No. 2	" "	7	Spring, 1874	4.12	4.12	17.99
The Nolan Ditch	" "	8	Spring, 1874	3.72	3.72	22.11
The Dome Rock Ditch	" "	9	Spring, 1874	3.72	3.72	25.83
The Westall Ditch	" "	11	—— 1875	10.80	10.80	33.20
Total from Four Mile Creek				56.41		

TABLE X.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The N. Z. Cozens Ditch	Smith Creek.	1	— June, 1870	3.40	3.40	0.00
The N. Z. Cozens Ditch No. 2	" "	2	— June, 1870	4.80	4.80	3.40
The Walker Ditch	" "	3	Spring, 1873	2.15	2.15	8.20
Total from Smith Creek				10.35		
Hammond Slough No. 1	Cheyenne C'k Slough.	1	* —May, 1865			
The Robbins Ditch	" "	2	*— April, 1868			
The Slough Ditch No. 2	" "	3	*— April, 1877			
The Merriams Rock Creek Ditch	Rock Creek.	1	*— June, 1871			
The Ames Ditch	" "	2		4.00	4.00	
The Welty Ditch	Beaver Creek	1	— June, 1867	3.90	3.90	0.00
The Shiedler Ditch	" "	2	Spring, 1872	2.31	2.31	3.90

The Trigg Ditch	Simpson Ck.	1	—— 1866	3.40	3.40	0.00
The Smith Ditch	The Pond.	1	—— 1870	2.36	2.36	0.00
*The Merriam Ditch	Little Fountain Creek.	1	*— June, 1871	.....	.....	0.00
The Roses Spring Ditch	Rose's Spring	1	— May, 1870	1 23	1.23	.00
The enlargement Roses Spring Ditch	" "	2	—— 1873	5.65	6.88	1.23
Total from Rose's Spring				6.88		
*Camp Creek Ditch	Camp Creek.	1	*—— 1864	.....	.....	.....
*The Neff, Hardwick and Chambers Ditch	" "	2	*—— 1874	.....	.....	.....
The Kittridge Ditch No. 2	West Four Mile Creek.	1	21 May, 1870	2.71	2.71	0.00
The Colorado Springs Water Works Ditch	Ruxton Creek	1	— October, 1878	3.10	3.10	0.00
*The Belcher Ditch	Shook's Run.	1	*—— 1873	.....	.....	.....
The Drury Creek Ditch	Drury Creek.	1	—— 1872	5.12	5.12	0.00
The Liston Spring Ditch	Liston Spring	1	—— 1874	2.58	2.58	0.00
The Colton Slough Ditch	R. R Spring.	1	—— 1863	2.11	2.11	0.00

TABLE X.—*Continued.*

SUMMARY FOR DISTRICT No. 10.

Total from Fountain Creek	540.18
Total from Monument Creek	73.33
Total from West Monument Creek	22.18
Total from Four Mile Creek	56.41
Total from Smith Creek	10.35
Total from Beaver Creek	6.21
Total from Simpson's Creek	3.40
Total from Rose's Spring	6.88
Total from the "Pond"	2.36
Total from West Four Mile Creek	2.71
Total from Ruxton Creek	3.10
Totals as far as given from Rock Creek	4.00
Totals as far as given from Cheyenne Creek	39 07
Total from Drury Creek	5.12
Total from Liston Spring	2.58
Total from Colton Slough	2.11
Total as as far as given for District No. 10	779.99

NOTE.—Those ditches marked with a * had not sufficient data given from which to calculate their capacities.
The capacities of the ditches in this District are computed in the office of the State Engineer from the data contained in the Decree, which gives the dimensions of each ditch.

WATER DISTRICT No. 11.

TABLE XI.

Giving the date and order of priority together with the amount of each appropriation, and the total amount of each preceding appropriation, of ditches and canals that are filed in the offices of the Clerk of the District Court and of the Clerk of Chaffee County.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
Gillen Ditch No. 1	Brown'sCreek	1	— May, 1864	6.10	6.10	0.00
Gillen Ditch No. 2	" "	2	— May, 1864	1.13	1.13	6.10
Gillen Ditch No. 3	" "	3	Spring 1865	4.70	4.70	7.23
The Trout Creek Ditch	Trout Creek.	4	— May, 1865	23.22	23.22	11.93
Harrington Ditch	So. Arkansas.	5	10 March, 1866	16.42	16.42	45.15
Cottonwood Irrigating Ditch	Cottonwood. Creek.	6	1 May, 1866	156.87	156.87	61.57
The Govelle Ditch	N.Cottonwood Creek.	7	—— 1866	7.70	7.70	218.44
The Brown's Creek Ditch	Brown'sCreek	8	——1866	78 50	78.50	226.14

TABLE XI.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal	Cubic feet per second previously appropriated.
Chas. E. Lewis Ditch	Chalk Creek.	9	1 May, 1867	23.52	23.52	304.64
The Noland Ditch	So. Arkansas.	10	15 November, 1867	12.70	12.70	328.16
The Cameron Ditch	" "	11	10 January, 1868	20.29	20.29	340.86
The Bertrely and Ehrhart Ditch	Brown'sCreek	12	10 May, 1868	5.00	5.00	361.15
*Chas. Nachtrieb Ditch	Maxwell C'k.	13	— October, 1869	.....	.....	.....
The Nash Ditch	Brown'sCreek	14	— May, 1871	7.06	7.06	366.15
The Bray Ditch No. 1	Cottonwood Creek.	15	Spring, 1872	3.59	3.59	373.21
The Kraft Irrigating Ditch	Arkansas Riv	16	15 May, 1872	11.34	11.34	376.80
First enlargement	" "	21	— August, 1874	11.34	22.68	515.40
The High Ditch	" "	17	1 January, 1874	19.25	19.25	388 14
Cottonwood and Maxwell Creek Ditch	Cottonwood Creek.	18	— May, 1874	100 00	100.00	407.39

The Supply Ditch	Cottonwood Creek.	19	20 May, 1874	3.73	3.73	507.39
The Pine Ditch	Brown'sCreek	20	25 May, 1874	4.28	4.28	511.12
The Mill Ditch	Arkansas Riv	22	14 September, 1874	5.43	5.43	526.74
The Hill and Sprague Ditch	So. Arkansas.	23	22 January, 1875	12.70	12.70	532.17
The Chalk Creek Mill Ditch	Chalk Creek.	24	1 May, 1875	237.64	237.64	544.87
The Nelson and Hutchinson Ditch	So. Arkansas.	25	—— 1875	9.07	9.07	782.51
First enlargement	" "	30	10 April, 1879	2.31	11.38	823.09
The Frantz Ditch	Chalk Creek.	26	— January, 1876	10.24	10.24	791.58
Ronk's Placer Mining Ditch	Cottonwood Creek.	27	21 March, 1877	7.60	7.60	801.82
Giebfred Ditch	Clear Creek.	28	20 April, 1878	10.08	10.08	809.42
The Bray Ditch No. 2	Cottonwood Creek.	29	-- May, 1878	3.59	3.59	819.50
The Old Bayou Ditch	So. Arkansas.	31	—— 1878	11.38	11.38	825.40
The Arkansas Valley Irrigation Canal	Cottonwood Creek.	32	1 May, 1880	21.20	21.20	825.40
The Town of Buena Vista Ditch	" "	33	1 June, 1880	4.82	4.82	846.60

10

TABLE XI.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Christ Ditch	Clear Creek.	34	15 September, 1880	14.94	14.94	851.42
The Lotus Cliff Ditch	Merriam C'k.	35	— April, 1881	6.69	6.69	866 36
The Lusmeigh Ditch	Cottonwood Creek.	36	13 June, 1881	14.00	14.00	873.05
The Eureka Ditch	Squaw Creek.	37	13 November, 1882	8.00	8.00	887.05
The Del Monte Irrigating Ditch	Poncha Creek	38	27 November, 1882	37 90	37 90	895.05
*The Rorer Ditch	Cottonwood Creek.					
*The Mining Ditch	Fork of Cottonwood C'k					
Total (as far as given) for District No. 11				932.95		

TABLE XI.—Continued.

LIST OF DITCHES FILED WITH THE CLERK OF CHAFFEE COUNTY.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Date of Appropriation.	Date of Filing.	Cubic feet of water per second claimed by each ditch.
The Thompson Ditch	Cottonwood Creek.	—— 1869	23 April, 1883	9.90
The North Fork Ditch	So. Arkansas.	13 March, 1882	26 May, 1882	20.30
The Arkansas Valley Ditch	Arkansas Riv	1 September, 1882	4 September, 1882	240.00
The Pancost Ditch	North Cottonwood Creek.		16 April, 1883	15.00
The B. D. Bray Ditch	Arkansas Riv	28 September, 1882	29 September, 1882	26.00
The Helena Ditch	" "	28 November, 1883	30 November, 1883	100.00
The Riverside Ditch	" "		24 September, 1884	1000.00
* The Harmony Ditch	" "			

TABLE XI.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Date of Appropriation.	Date of Filing.	Cubic feet of water per second claimed by each ditch.
*The Trout Creek Ditch	Cottonwood Creek.			
*The Murray Ditch	So. Arkansas.	31 March, 1884	7 April, 1884	
The Low Land Ditch	" "		6 April, 1883	16.44
The Mahon Ditch	Cottonwood Creek.		17 April, 1883	6.00
*The Hid Ditch	ArkansasRiv.	3 January, 1884	16 February, 1884	
Total (as far as given)				1433.64

Note.—Those ditches above marked with a * have not sufficient data from which to calculate their capacities.

WATER DISTRICT No. 14.

TABLE XII.

Giving the date and order of priority and amount of each appropriation, together with the total amount of each preceding appropriation of ditches and canals in District No. 14, as they have been established by the Decree of the Court of the Fifth Judicial District.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
La Loma Ditch	Carnero Creek	1	1 April, 1870	0.26	0.26	0.00
The Madre Ditch	" "	2	— April, 1870	2.21	2.21	0.26
Angostura Ditch	" "	3	— April 1870	1.04	1.04	2.47
La Isla Ditch	" "	4	— May, 1870	1.30	1.30	3.51
La Vega Ditch	" "	5	1 June, 1870	0.52	0.52	4.81
Wilson No. 1 Ditch	" "	6	— April, 1871	0.52	0.52	5.33
Wilson No. 2 Ditch	" "	7	— April, 1871	0.52	0.52	5.85
Wilson No. 3 Ditch	" "	8	— April, 1871	0 52	0.52	6.37

TABLE XII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
La Magotes Ditch	Carnero Creek	9	1 June, 1871	1.82	1.82	6.89
Beaver Ditch	" "	10	— April, 1872	1.30	1.30	8.71
Wilson No. 4 Ditch	" "	11	— August, 1872	2.60	2.60	10.01
Green No. 7 Ditch	" "	12	— October, 1872	0.65	0.65	12.61
Cerro Ditch	" "	13	— May, 1874	0.39	0.39	13.26
Green No. 1 Ditch	" "	14	— August, 1878	1.56	1.56	13.65
Green No. 2 Ditch	" "	15	— October, 1878	0.78	0.78	15.21
Green No. 6 Ditch	" "	16	— October, 1878	1.04	1.04	15.99
Green No. 3 Ditch	" "	17	— May, 1879	0.39	0.39	17.03
Green No. 4 Ditch	" "	18	— May, 1879	0.39	0.39	17.42
Green No. 5 Ditch	" "	19	— May, 1879	0.78	0.78	17.81

The Cascias Ditch	Carnero Creek	20	— June, 1879	0.65	0.65	18.59
The Torrivio Ditch	" "	21	— July, 1879	0.65	0.65	19.24
La Gata Ditch	" "	22	— April, 1880	0.52	0.52	19.8
Total from Carnero Creek				20.41		
The Biedell No. 10 Ditch	La Garita C'k	1	— May, 1870	1.95	1.95	0.00
The Wilson No. 1 Ditch	" "	2	— April, 1871	1.30	1.30	1.95
The Biedell No. 2 Ditch	" "	3	— May, 1871	0.78	0.78	3.25
The Prior Ditch	" "	4	— April, 1872	0 65	0.6	4.03
The Romero Ditch	" "	5	Spring, 1872	0.65	0.65	4.68
The Biedell No. 1 Ditch	" "	6	— May, 1872	1.04	1.04	5.33
The Manuel Ditch	" "	7	— June, 1873	0.78	0.78	6.37
*The McLeod No. 1 Ditch	" "	8	Spring, ——	.....	.....	7.15
*The McLeod No. 2 Ditch	" "	9	—— 1873	.....	.....	7.15
The Niggar Ditch	" "	10	— April, 1874	1.04	1.04	7.15

TABLE XII.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Middle Ditch	La Garita C'k	11	— June, 1874	0.52	0.52	8.19
The Home No. 1 Ditch	" "	12	— November, 1874	1.30	1.30	8.71
The Garcia Ditch	" "	13	— May, 1875	0.52	0.52	10.01
The Biedell No. 7 Ditch	" "	14	— 1875	0.78	0.78	10.53
The Dubois Ditch	" "	15	— June, 1875	1.04	1.04	11.31
The Biedell No. 4 Ditch	" "	16	— May, 1877	0.78	0.78	12.35
The Stewart No. 4 Ditch	" "	17	— April, 1878	1.04	1.04	13.13
The White No. 1 Ditch	" "	18	— May, 1878	1.30	1.30	14.17
The McLeod No. 3 Ditch	" "	19	—— 1878	0.65	0.65	15.47
The Curby No. 1 Ditch	" "	20	— February, 1879	0.78	0.78	16.12
The Curby No. 2 Ditch	" "	21	— February, 1879	0.78	0.78	16.90

The Curby No. 3 Ditch	La Garita C'k	22	—— 1879.	0.78	0.78	17.63
The Curby No. 4 Ditch	" "	23	— February, 1880	1.04	1.04	18.46
The Curby No. 5 Ditch	" "	24	— February, 1880	1.04	1.04	19.50
The McLeod No. 4 Ditch	" "	25	22 April, 1880	1.56	1.56	20.54
The McLeod No. 5 Ditch	" "	26	— May, 1880	1.56	1.56	22.10
The Schiffer Ditch	" "	27	.....	.....	.....	.....
The Biedell No. 11 Ditch	" "	28	.....	.....	.....	.....
The Biedell Home Ditch	" "	29	.....	.....	.....	.....
Total from La Garita Creek (as far as given)				23.66		
Total from Carnero Creek (as far as given)				20.41		
Total for District No. 14				44.07		

NOTE.—The capacity of all ditches in District No. 14 were given by Decree of the Court in *statutory inches* and reduced to cubic feet per second of time in this office, on the basis that 38.4 statutory inches is equal to one cubic foot per second.

Those ditches marked with a * have not their capacities stated in the Decree.

WATER DISTRICT No. 23.

TABLE XIII.

Giving the date and amount of each appropriation, with the date of filing of ditches and canals in District No. 23, as they have been filed in the office of the Clerk of the District Court of Costilla County.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Date of Appropriation.	Date of Filing.	Acres claimed to be irrigated by ditch.	Eq'lent in cubic feet per second of acres claimed to be irriga'd
The McCarthy Ditch No. 1	Trinchera Riv	—— 1864	18 April, 1881	160	3.20
The Judges Ditch	" "	—— 1864	20 April, 1881	100	2.00
The Breen Dam Ditch	" "	—— 1868	29 May, 1881	320	6.40
The Thomas Stewart Ditch	" "	—— 1868	31 May, 1881	200	4.00
The Hughes Ditch No. 1	" "	—— 1869	20 April, 1881,	80	1.60
The Benino Duran Ditch	" "	—— 1871	30 May, 1881	160	3.20
The Dolores Romero Ditch	" "	—— 1872	31 May, 1881	120	2.40
The South Side Ditch	" "	— May, 1873	19 April, 1881	160	3.20

The McCarthy Ditch No. 2	Trinchera Riv	—— 1873	18 April, 1881	140	2.80
The McCarthy Ditch No. 3	" "	—— 1874	18 April, 1881	120	2.40
The Hughes Ditch No. 2	" "	—— 1875	30 May, 1881	160	3.20
The Seyfried Ditch	" "	—— 1878	31 May, 1881	160	3.20
The Wegee Ditch	" "		31 May, 1881	100	2.00
The McEmery Ditch	" "	—— 1881	18 April, 1881	140	2.80
Total from Trinchera Creek	" "				44.40
The Past Ditch	Ute Creek.	—— 1875	30 May, 1881	160	3.20
The Parrott and Dever Ditch	" "	—— 1876	1 April, 1882	320	6.40
The Juan Martin Ditch	" "	15 April, 1880	31 May, 1881	160	3.20
The Lucero Ditch	" "		30 May, 1881	300	6.00
The Carey Ditch	" "		30 May, 1881	150	3.00
The MacMullan Ditch	" "		18 May, 1881	120	2.40
Total from Ute Creek	" "				24.20

TABLE XIII.—*Continued.*

NAME OF DITCH OR CANAL.	Name of stream from which water is diverted.	Date of Appropriation.	Date of Filing.	Acres claimed to be irrigated by ditch.	Eq'lent in cubic feet per second of acres claimed to be irriga'd
The Thompson Ditch	Sangre de Christo Creek	— — 1870	30 May, 1881	50	1.00
The Parrott and Dever Ditch	" "	— — 1876	1 April, 1882	640	12.80
The Newton Ditch	" "	— — 1830	31 May, 1881	160	3.20
Total from Sangre de Christo Creek					17.00
Total from Trinchera River					44.40
Total from Ute Creek					24.20
Total for District No. 23					85.60

WATER DISTRICT No. 25.

TABLE XIV.

Giving the date and order of priority and amount of each appropriation, together with the total amount of each preceding appropriation of ditches and canals in District No. 25, as they have been established by the Decree of the Court of the Sixth Judicial District.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
Gaudalupe Main Ditch	Conejos.	1	1 March, 1855	69.82	69.82	0.00
Head's Mill and Irrigation Ditch	" "	2	1 June, 1855	117.14	117.14	69.82
The El Coda Ditch	San Antonio.	3	4 August, 1855	25.18	25.18	186.96
The Llano Ditch	Los Pinos.	4	20 August, 1855	31.84	31.84	212.14
The Garcia Ditch	Conejos.	4½	1 October, 1855	6.23	6.23	243.98
First enlargement	" "	17	1 April, 1857	6.09	12.32	500.33
The Servietta Ditch	" "	5	5 March, 1855	31.77	31.77	250.21
Seledonia Valdez Irrigation and Mill Ditch	" "	6	20 March, 1856	31.77	31.77	281.98

TABLE XIV.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Los Pinos Ditch	Los Pinos.	7	1 April, 1856	22 94	22.94	313.75
The Salazar Ditch	Conejos.	8	1 April, 1856	12.32	12.32	336.69
The Mill Ditch	" "	9	1 April, 1856	12.67	12.67	349.01
The San Jose Ditch	" "	10	15 April, 1856	40.28	40.28	361.68
The Sincero Ditch	San Antonia.	11	15 April, 1856	18.31	18.31	401.96
The Del Puerticito Ditch	Conejos.	12	13 April, 1856	8.76	8.76	420.27
San Rafael and Conejos Ditch	" "	13	1 May, 1856	8.81	8.81	429.03
First enlargement	" "	28	1 April, 1862	8.81	17.62	786.56
The El Serito Ditch	" "	14	13 May, 1856	6.19	6.19	437.84
The Gabriel Martinez Ditch	" "	15	1 August, 1856	0.71	0.71	444.03
The Santiago Ditch	" "	16	1 April, 1857	55.59	55.59	444.74

The Archuleta and Trogillio Ditch No. 1.....	Conejos.	18	1 April, 1857	8.81	8.81	506.42
The Archuleta and Trogillio Ditch No. 2.....	Natural Sp'gs	19	1 April, 1857	14.94	14.94	512.23
The Overflow Ditch.....	Conejos.	20	10 April, 1857	11.79	11 76	530.17
The Trogillio Ditch	" "	21	15 April, 1857.....	29.80	29.80	541.96
First enlargement	" "	30	1 April, 1863.....	23.68	53.48	814.91
The Canon Irrigation Ditch	" "	22	15 April, 1857	42.89	42.89	571.76
The La Del Rio Ditch.....	" "	23	13 April, 1857.....	31.44	31.44	614.65
The Rincones Ditch	" "	24	15 May, 1857.	22.25	22.25	646.09
The Fuerticitos Ditch.....	" "	25	1 April, 1858.....	31.47	31.47	668.34
The Mecitos Ditch.....	" "	26	1 September, 1858.	38.99	38.99	699.81
The San Juan and San Rafael Ditch	" "	27	1 April, 1861.....	47.76	47.76	738.80
The Espinosa Ditch	Natural Sp'gs.	29	1 April, 1862.....	19.54	19.54	795.37
The Chacon Ditch No. 1	Conejos.	31	1 May, 1863	18.31	18.31	838.59
The Los Sauces Ditch	" "	32	20 May, 1867.....	88.43	88.43	856.90

TABLE XIV.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Lovato Irrigating Ditch	San Antonia.	33	14 June, 1867	27.58	27.58	945.33
The Jose Bonifacio Romero Ditch	Conejos.	34	1 March, 1870	56 97	56.97	972.91
The Bernardo Romero Ditch	" "	35	15 March, 1870	9.26	9.26	1029.88
The Galbis Ditch	Los Pinos.	36	1 July, 1870	10.97	10.97	1039.14
The Sanchez Ditch	Conejos.	37	20 August, 1870	27.26	27.26	1050.11
The J. F. Chacon Ditch No. 3	" "	38	1 July, 1872	18.31	18.31	1077.37
The Sabine School Section Ditch	" "	39	1 May, 1873	11.95	11.95	1095.68
The J. D. Martinez Ditch	Natural Sp'gs.	40	31 July, 1873	9.26	9.26	1107.63
The Vega Grande Ditch	Conejos.	41	1 April, 1875	5.77	5.77	1116.89
First enlargement	" "	46	1 April, 1878	5.77	11.54	1159 54
The An Con Irrigation Ditch	" "	42	1 April, 1876	10 80	10.80	1122.66
The Wm. Stewart & Co.'s Irrigation Ditch	" "	43	30 June, 1876	11.40	11.40	1133.46

The J. F. Chacon Ditch No. 2	Conejos.	44	15 November, 1877	7.54	7.54	1144.86
First enlargement	" "	49	10 November, 1879	4.54	12.08	1253.03
The Lovato Ditch	Natural Sp'gs.	45	1 March, 1878	7.54	7.54	1152.40
The McCarroll Ditch	Conejos.	47	1 May, 1878	13.72	13.72	1165.71
The Manassa Ditch	" "	48	1 May, 1879	73.60	73.60	1179.43
Wm. Sabine Ditch No. 1	" "	50	1 April, 1880	7.71	7.71	1257.57
The Martinez Ditch	" "	51	1 April, 1880	15.84	15.84	1265.28
The J. M. Espinosa Ditch	Natural Sp'gs.	52	1 April, 1880	26.00	26.00	1281.12
The Cordova Ditch	El Brasso.	53	1 April, 1880	6.54	6.54	1307.12
The Chavez Ditch	San Antonia.	54	1 May, 1880	12.72	12.72	1313.66
Jack's Irrigation Ditch	Conejos.	55	25 March, 1881	8.12	8.12	1326.38
Ephraim's Ditch	" "	56	28 March, 1881	47.00	47.00	1334.50
Martinez Ditch (on San Antonio)	San Antonia.	57	15 April, 1881	13.68	13.68	1381.50
Los Ojos No. 2 Ditch	Conejos.	58	1 May, 1881	5.95	.95	1395.18

TABLE XIV.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Order of Priority.	Date of Appropriation.	Cubic feet of water per second appropriated to each priority.	Summation of appropriations of each ditch or canal.	Cubic feet per second previously appropriated.
The Richfield Ditch	Conejos.	59	12 November, 1881	56.24	56.24	1401.13
The Loma Padre Ditch	" "	60	15 February, 1882	10.31	10.31	1457 37
The Beecroft Ditch	" "	61	15 April, 1882	7.54	7.54	1467.68
The Wm. Sabine Ditch No. 2	" "	62	1 May, 1882	7.71	7.71	1475.22
The Los Ojos No. 1 Ditch	" "	63	10 July, 1882	44 16	44 16	1482.93
The Elledge's Ditch	" "	64	1 April, 1883	7.52	7.52	1527.09
The Angustura Ditch	" "	65	1 April, 1883	42 72	42.72	1534.61
The Northeastern Ditch	" "	66	23 April, 1883	34.71	34.71	1577.33
Total for District No. 25				1612.04		

TABLE XV.

Giving the dates of appropriation and of filing, with the number of acres claimed to be irrigated, and the equivalent of acres claimed to be irrigated in cubic feet of water per second, as they have been filed in the office of the Clerk of the District Court of Costilla County.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Date of Appropriation.	Date of Filing.	Acres claimed to be irrigated by ditch.	Eq'lent in cubic feet per second of acres claimed to be irriga'd
The San Pedro People's Ditch	Culebra Creek	— — 1852	31 May, 1881	5000	100.00
The Culebra Creek Ditch No. 1	" "	— — 1852	31 May, 1881	2000	40.00
The Culebra Creek Ditch No. 2	" "	— — 1852	31 May, 1881	2000	40.00
*The Culebra Creek Ditch No. 3	" "	1 September, 1852	31 May, 1881	.....	.....
The Lucero Ditch	" "	— — 1854	30 May, 1881	800	16.00
The Crescencio Ditch	" "	— — 1854	31 May, 1881	1500	30.00
The Boyle No. 1 Ditch	" "	— — 1854	27 May, 1881	2300	46.00
The Boyle No. 2 Ditch	" "	— — 1854	27 May, 1881	2700	54.00

TABLE XV.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Date of Appropriation.	Date of Filing.	Acres claimed to be irrigated by ditch.	Eq'lent in cubic feet per second of acres claimed to be irriga'd
The San Luis People's Ditch	Culebra Creek	— — 1854	28 May, 1881	6000	120.00
The San Accacio People's Ditch	" "	— — 1854	31 May, 1881	7000	140.00
The Cerro Ditch	" "	— — 1855	30 May, 1881	100	2.00
The Del Cerro Ditch	" "	— — 1855	30 May, 1881	5000	100.00
*The San Luis Mill Ditch	" "	— — 1855	31 May, 1881	.....	.....
*The Tacheco Ditch	" "	15 September, 1856	31 May, 1881	.....	.....
*The Louis Cohn Ditch	" "	— — 1863	31 May, 1881	.....	.....
The Buena Vista No. 1 Ditch	" "	— — 1866	28 May, 1881	6000	120.00
The Buena Vista No. 2 Ditch	" "	— — 1866	4 June, 1881	6000	120.00
The Ventura Lucero Ditch	" "	— — 1867	31 May, 1881	200	4.00
The Cardillera Ditch	" "	— — 1867	30 May, 1881	2000	40.00

The Narcissa Garcia Ditch	Culebra Creek	— — 1868	31 May, 1881	500	10 00
The Sanchez Ditch	" "	— — 1870	31 May, 1881	150	3.00
The Culebra Creek Ditch No. 4	" "	— — 1870	31 May, 1881	2000	40.00
The Culebra Creek Ditch No. 5	" "	1 September, 1870	31 May, 1881	2000	40.00
The Culebra Creek Ditch No. 6	" "	1 September, 1870	31 May, 1881	2000	40.00
*The Mestaz Ditch	" "	— — 1876	31 May, 1881	.....	.....
*The Quintana Ditch	" "	— — 1876	31 May, 1881	.....	.....
The Valdez Ditch	" "	— — 1878	4 June, 1881	300	6.00
The Piedra Ditch	" "	— — 1881	31 May, 1881	300	6.00
The Antonio Paudo Ditch	" "	— — 1882	26 December, 1882	100	2.00
The Bosque Grande Ditch	" "	— — 1882	26 December, 1882	1500	30.00
The People's Ditch No. 1	Costilla Creek	— — 1854	31 May, 1881	5000	100.00
The People's Ditch No. 2	" "	— — 1855	31 May, 1881	150	3.00
The Costilla Creek Ditch	" "	— — 1855	31 May, 1881	50	1 00

TABLE XV.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Date of Appropriation.	Date of Filing.	Acres claimed to be irrigated by ditch.	Eq'lent in cubic feet per second of acres claimed to be irriga'd
*The Acequia Madre Ditch	Costilla Creek	— — 1855	16 May, 1881	.....	.....
The People's Ditch No. 3	" "	— — 1856	31 May, 1881	2000	40.00
The People's Ditch No. 4	" "	— — 1856	31 May, 1881	3000	60.00
The Gonzales Ditch	" "	— — 1860	31 May, 1881	10	0.20
The Vigil Ditch	" "	— — 1863	30 May, 1881	160	3.20
The Nausanarez Ditch	" "	— — 1870	31 May, 1881	500	10.00
The Francisco Antonio Ditch	" "	— — 1872	31 May, 1881	100	2.00
*The Rito Seco No. 1	Rito Seco C'k.	1 September, 1852	30 May, 1881	.....	.....
The Western Ditch	" "	— — 1852	30 May, 1881	2000	40.00
The Rito Seco Ditch No. 2	" "	1 September, 1852	31 May, 1881	1000	20.00
*The Rito Seco Ditch No. 3	" "	— — 1856	31 May, 1881	.....	.....

The Oratorio Ditch	Rito Seco C'k.	— — 1860	31 May, 1881	50	1.00
The Acequia Chicito Ditch	" "	— — 1870	30 May, 1881	100	2.00
The Middle Ditch	San Francisco Creek.	— — 1856	31 May, 1881	1000	20.00
The San Francisco People's Ditch	" "	— — 1859	31 May, 1881	100000	2000.00
The Jose Felipe Ditch	" "	— — 1865	31 May, 1881	1000	20.00
The Cruz Martin Ditch	" "		31 May, 1881	50	1.00
The Rio Grande Central Ditch	Rio Grande River.	1 June, 1875	30 May, 1881	1920	38.40
The Excelsior Ditch	" "	— — 1878	30 May, 1881	6000	120.00
The Independent Ditch	" "	16 June, 1879	31 May, 1881	1000	20.00
The Rio Grande Ditch	" "	15 July, 1881	15 April, 1881	2500	50.00
The Los Ojos Ditch	Los Ojos Creek	1 June, 1875	31 May, 1881		
The Hull Ditch	" "	Spring, 1874	31 May, 1881	8000	160.00
The Medano Ditch	Medano C'k.	Spring, 1874	31 May, 1881		
The South Medano Springs Ditch	" "		9 May, 1881	320	6.40

TABLE XV.—*Continued.*

Name of Ditch or Canal.	Name of stream from which water is diverted.	Date of Appropriation.	Date of Filing.	Acres claimed to be irrigated by ditch.	Eq'lent in cubic feet per second of acres claimed to be irriga'd
The Gallejos Ditch	Los Ojos C'k.	— — — 1880	31 May, 1881	200	4.00
The North Ditch	Vallejos Creek	— — — 1880	31 May, 1881	1000	20.00
The South Ditch	" "	— — — 1880	31 May, 1881	5000	100.00
The Alberts Ditch	" "		31 May, 1881	160	3.20
The Meyers Ditch	Zapato Creek.	— — — 1870	19 April, 1881	300	6.00
The Shady Retreat Ditch	" "	— — — 1879	23 April, 1881	640	12.80
The Mestaz Ditch	Jarosa Creek.	— — — 1881	21 July, 1882	160	3.20
The Medina Ditch	" "		30 May, 1881	160	3.20
The Abundo Martin Ditch	Torcedo Creek	— — — 1874	31 May, 1881	160	3.20
The Ramon Vigil Ditch	Uracca Creek.	— — — 1880	7 June, 1881	160	3.20
The Hot Spring Ditch	Ventero Creek	— — — 1881	28 May, 1881	160	3.20

The Holly's Ditch	Coyote Creek.	— —— 1881	26 May, 1881	320	6.40
The Arcano Ditch	Twin Creek.	— September, 1882	1 June, 1883	160	3.20
Total appropriation of water in Costilla county, not included in District No, 23					4124.40

NOTE.—In converting the number of acres claimed to be irrigated into its equivalent in cubic feet per second of water, fifty acres is assumed as being the number of acres that one cubic foot per second will irrigate.

Those ditches marked with a * had not sufficient data from which to compute their capacities.

TABLE XVI.

Giving list of ditches in Delta County, with their capacities, as computed from data furnished by W. L. Marcy, C. E.

NAME OF DITCH OR CANAL.	Name of stream from which water is diverted.	Cubic feet of water per second claimed by each ditch.
The Alfalfa Ditch	Surface Creek.	104.20
The Juse Hart Ditch	Alfalfa branch.	0.25
The Garnet Ditch	Uncompahgre.	126.00
The Hotchkiss Ditch	Leroux Creek.	14 00
The Peterson, Kaer and Bairuns Ditch	" "	40.00
The Leroux Ditch	" "	43.00
*The Paonia Ditch	N Fork of the Gunnison	.....
The Bonafide Ditch	Gunnison.	36.00
The Big Ripple Ditch	" "	24.00

The Hartland Ditch	Gunnison.	34.00
The Hutchinson Ditch	" "	8.30
The Meyers and Orth Ditch	" "	6.00
The Uncompahgre Ditch	Uncompahgre.	28.00
The Purdy and Vickers Ditch	" "	15.00
The Delta Ditch	" "	75.00
The Eggleston Ditch	" "	26.50
The Bolles and Manny Ditch	" "	18.75
The Orchard Ranch Ditch	Surface Creek.	30.00
The Settle Ditch	" "	10.00
The Shepherd Ditch	" "	28 00
Wm. Kennecot's Three Small Ditches	" "	10.00
The Sunflower Ditches	Forked Tongue.	6.00
The Rawhide Ditch	" "	6.00

TABLE XVI.—*Continued.*

NAME OF DITCH OR CANAL.	Name of stream from which water is diverted.	Cubic feet of water per second claimed by each ditch.
The E. and W. Ditch	Forked Tongue.	14.00
The Park Ditch	" "	9.00
*The Maud S. Ditch	Dough Spoon.	.....
The Fawcett Ditch	Holy Terror.	2.00
The Spring Ditch	Alkali Creek.	10.00
The Quackenbush Ditch	Bell Creek.	8.00
The Clark and Wade Ditch	Minnesota Creek.	26.00
The Cedar Canon and Iron Springs Ditch	Crystal Creek.	50.00
The McIntyre and Hartman Ditch	Muddy Creek.	30.00
The McIntyre Bros. Ditch No. 1	" "	12.00

The McIntyre Bros. Ditch No. 2	Muddy Creek.	12.00
The McIntyre Bros. Ditch No. 3	" "	12.00
Total (as far as given) for Delta County		974.00

NOTE.—Those ditches marked with a * had not sufficient data from which to compute their capacities.

TABLE XVII.

Giving the date of appropriation and date of filing, together with the amount claimed by each ditch or canal, that are filed with the County Clerk of San Miguel County.

Name of Ditch or Canal.	Name of stream from which water is diverted.	Date of Appropriation.	Date of Filing.	Cubic feet per second of water claimed by each ditch.
The Naturita Water Right Ditch	Naturita C'k.	18 January, 1884	9 February, 1884	*
The Gypsum Valley Irrigating Canal	Dolores River	20 November, 1883	16 February, 1884	26.04
The Montana Ditch	Cornett Creek		12 July, 1884	2.60
The Water Right Ditch	Sheep Creek.	16 August, 1884	16 August, 1884	1.30
The Naturita Cattle and Land Co.'s Ditch	West Beaver and Little Beaver Creeks	15 April, 1884	16 September, 1884	53.40

*Claim all the water in Naturita Creek.

The amount of each appropriation was calculated in this office from data furnished by the County Clerk of San Miguel County.

APPENDIX B.

TABLE I.

Field notes taken in gauging the Cache la Poudre River, September 4, 1884.

GAUGING STATION No. 1.

Width of flume 103.16
Depth of water..... 1.30
Meter used.....No. 70

Distance from north side of weir in feet.	Reading of meter at beginning of observation.	Reading of meter at end of observation.	Number of revolutions of meter.	Duration of observ'tions in seconds.	Revolut'ns of meter per second.	Average of revolutions per second of each set of observ'tions	Velocity of water due to revolutions of meter.
	279.1	301.9	22.8	100.00	.22800		
5	301.9	324.9	23.0	100.00	.23000	.22767	1.673
	324.9	347.4	22.5	100.00	.22500		
	348.2	379.8	31.6	100.00	.31600		
15	404.6	436.9	32.3	100.00	.32300	.32000	2.360
	436.9	468.1	31.2	100.00	.31200		
	467.9	505.9	38.0	100.00	.38000		
25	505.9	544.9	39.0	100.00	.39000	.38333	2.833
	544.9	582.9	38.0	100.00	.38000		
	603.0	644.2	41.2	100.00	.41200		
	644.2	686.1	41.9	100.00	.41900		
35	686.1	728.6	42.5	100.00	.42500	.41975	3.106
	728.6	770.9	42.3	100.00	.42300		
	770.9	816.8	45.9	100.00	.45900		
45	816.8	862.8	46.0	100.00	.46000	.46000	3.408
	862.8	909.0	46.2	100.00	.46200		
	909.0	950.7	41.7	100.00	.41700		
55	950.7	992.6	41.9	100.00	.41900	.41300	3.055
	992.6	1032.9	40.3	100.00	.40300		

TABLE I.—*Continued.*

Distance from north side of weir in feet.	Reading of meter at beginning of observation.	Reading of meter at end of observation.	Number of revolutions of meter.	Duration of observ'tions in seconds.	Revolut'ns of meter per second.	Average of revolutions per second of each set of observ'tions	Velocity of water due to revolutions of meter.
	32.9	67.2	34.3	100 00	.34300		
65	67.2	101.2	34.0	100.00	.34000	.34300	2.531
	101.2	135 8	34.6	100.00	.34600		
	135.9	165.0	29.1	100.00	.29100		
75	165.0	194.1	29.1	100.00	.29100	.29100	2.144
	194.1	223.2	29.1	100.00	.29100		
	223.2	259.6	36.4	100.00	.36400		
85	259.6	296.0	36.4	100.00	.36400	.36400	2.688
	296.0	332.4	36.4	100.00	.36400		
	332.4	372.7	40.3	100.00	.40300		
95	372.7	412.0	39.3	100.00	.39300	.39533	2.923
	412.0	451.0	39.0	100.00	.39000		
	451.0	489.0	38.0	100.00	.38000		
103	489.0	527.6	38.6	100.00	.38600	.38200	2.823
	528.1	566.1	38.0	100.00	.38000		
					Aggregate velocity		29.544
					Mean velocity		2.686

Width of flume, 103.16. Depth of water, 1.30. 1.30X103 16=134.108=area of water section. 134 108X2 686=360.214=discharge in cubic feet per second.

NOTE.--Five other observations at different stages of water were made in same manner as the above, from which the curve is traced and Table II constructed.

TABLE II.

Giving the amount of water in cubic feet per second that will pass through the measuring flume at Guaging Station No. 1, Cache la Poudre river, for every tenth of a foot in depth from 0.0 to 6.0 feet.

Depth in feet.	Discharge in cubic feet per second.	Depth in feet	Discharge in cubic feet per second.	Depth in feet.	Discharge in cubic feet per second.	Depth in feet.	Discharge in cubic feet per second.	Depth in feet.	Discharge in cubic feet per second	Depth in feet.	Discharge in cubic feet per second.
0.0	0.00	1.0	218 34	2 0	873.36	3.0	1965.07	4.0	3493.45	5.0	5458.51
.1	2.18	1	264.19	.1	962.88	.1	2098.25	1	3670.30	.1	5679.04
.2	8.73	.2	314.32	.2	1056.77	.2	2235.81	.2	3851.53	.2	59c3.93
.3	19.65	.3	369.00	.3	1155.02	.3	2377.73	.3	4037.16	.3	6123.19
.4	34.93	.4	427.95	.4	1257 64	.4	2524.02	.4	4227.07	.4	6366.81
.5	54.54	.5	491.27	.5	1364.63	.5	2674.67	.5	4421.39	.5	6604.80
.6	78.60	.6	558.95	.6	1475.98	6	2829.69	.6	4620.09	.6	6847.60
.7	106.99	.7	631.00	.7	1591.70	.7	2989.08	.7	4823.16	.7	7093.88
.8	139.74	.8	707.42	.8	1711.79	.8	3152.84	.8	5030.57	.8	7344 97
.9	176.85	.9	788.21	.9	1836.24	.9	3320.96	.9	5242.36	.9	7600.44
										6.0	7860.29

CACHE LA POUDRE RIVER.

TABLE III.

A table compiled and computed from rating Table II. Appendix B, and the daily record of the automatic register at Gauging Station No. 1, Cache la Poudre River, for the season of 1884, beginning March 15th and ending midnight October 16th.

Date.	Daily mean height.	Daily rate, cubic feet per second	Daily discharge, cubic feet.	Monthly mean height.	Monthly mean rate, cubic feet per second	Monthly discharge, cubic feet.
March 15	0.581	72.5	6,264,000	Gauged for 17 days only.		
" 16	0.576	71.2	6,151,680			
" 17	0.557	66.7	5,762,880			
" 18	0.538	62.0	5,356,800			
" 19	0.547	64.0	5,729,600			
" 20	0.600	77.5	6,696,000			
" 21	0.653	92.3	7,974,720			
" 22	0.475	48.3	4,173,120			
" 23	0.547	64.0	5,729,600			
" 24	0.571	70.0	6,048,000			
" 25	0.576	71.5	6,176,600			
" 26	0.595	76.2	6,573,680			
" 27	0.557	66.7	5,762,880			
" 28	0.502	54.6	4,717,440			
" 29	0.480	49.7	4,294,080			
" 30	0.542	63.3	5,469,120			
" 31	0.590	75.0	6,480,000	0.558	67.382	99,361,200
April 1	0.648	91.9	7,871,040			
" 2	0.592	75.5	6,523,200			
" 3	0.586	73.7	6,367,680			
" 4	0.576	71.2	6,151,680			
" 5	0.5712	70.2	6,065,280			
" 6	0.562	68.0	5,875,200			

TABLE III.—*Continued.*

Date.	Daily mean height.	Daily rate, cubic feet per second	Daily discharge, cubic feet	Monthly mean height.	Monthly mean rate, cubic feet per second	Monthly discharge, cubic feet.
April 7	0.547	64.5	5,572,800			
" 8	0.576	71.2	6,151,680			
" 9	0.610	78.3	6,765,120			
" 10	0.610	78 3	6,765,120			
" 11	0.619	82.5	7,128,000			
" 12	0.653	92.2	7.966,080			
" 13	0.758	124.8	10,782,720			
" 14	0.730	115.4	9,970,560			
" 15	c.744	120.0	10,368,000			
" 16	0.722	129.4	11,180,160			
" 17	0.748	121.5	10,497,600			
" 18	0.931	189.0	16,329,600			
" 19	0.897	176.0	15,206,400			
" 20	0.892	173.5	14,990,400			
" 21	0.902	176.5	15,249,600			
" 22	0.960	201.0	17,366,400			
" 23	6 921	185.5	16,027,200			
" 24	1.139	279.0	24.105,600			
" 25	1.415	438.5	37,886,400			
" 26	1.567	535.0	46,224,000			
" 27	1.799	707.5	61,127,680			
" 28	1.793	701.7	60,626,880			
" 29	1.746	665.5	57,499,200			
" 30	1.660	602.0	52,012,800	0 921	218.577	566,654,080
May 1	1.515	501.0	43,286,400			
" 2	1.448	453.0	39,139,200			
" 3	1.507	495.5	42,811,200			
" 4	1.546	521.0	45,014,400			
" 5	1.478	477.0	41,212,800			
" 6	1.526	508.0	43,891.200			
" 7	1.546	521.0	45,014,400			

TABLE III.—*Continued.*

Date.	Daily mean height.	Daily rate, cubic feet per second	Daily discharge, cubic feet	Monthly mean height.	Monthly mean rate, cubic feet per second	Monthly discharge, cubic feet.
May 8	1.752	670.7	57.948,480			
" 9	2.102	965.1	83,384,640			
" 10	2.520	1386.9	119,828,160			
" 11	2.907	1845.0	159,408,000			
" 12	3.077	2067.1	178,597,440			
" 13	3.010	1977.8	170,881,920			
" 14	2.866	1793.4	154,919,760			
" 15	2.947	1897.0	163,900,800			
" 16	3.998	3490.7	301,596,480			
" 17	4.138	3738.4	322,997,760			
" 18	4.046	3575.5	308,923,200			
" 19	3.720	3021.8	261,083,520			
" 20	3.931	3374.7	291,574,080			
" 21	4.970	5392.8	465,937,920			
" 22	4.432	4289.2	369,986,880			
" 23	4.245	3932 7	339,785,280			
" 24	4.114	3694.9	319,239,360			
" 25	4 066	3609.4	311,852,100			
" 26	4.187	3828.3	320,765,120			
" 27	4.480	4381.7	378,578,880			
" 28	4.595	4610.3	398,329,920			
" 29	4.394	4214.6	364,141,440			
" 30	4.149	3756.5	324,561,600			
" 31	4.082	3637.4	314,271,360	3.203	2246.4	6,783,093,640
June 1	3.989	3473 64	300,122,496			
" 2	4.096	3597.81	311,050,784			
" 3	4 278	3996.1	345,263,040			
" 4	4.538	4493.4	388,229,760			
" 5	4.706	4834.54	417,704,256			
" 6	4.816	5063.9	437,520,960			
" 7	4.744	4913.57	424,532,448			

TABLE III.—*Continued.*

Date.	Daily mean height.	Daily rate, cubic feet per second	Daily discharge, cubic feet.	Monthly mean height.	Monthly mean rate, cubic feet per second	Monthly discharge, cubic feet.
June 8	4.682	4785.1	413,432,640			
" 9	4.715	4854.1	419,394,240			
" 10	4.878	5195.9	448,925,760			
" 11	4.869	5177.0	447,292,800			
" 12	4.734	4894.0	422,841,600			
" 13	4.850	5135.0	443,664,000			
" 14	5.000	5458.5	471,614,400			
" 15	4.902	5247.7	453,401,280			
" 16	4.648	4720.0	423,360,000			
" 17	4.566	4553 0	393,379,200			
" 18	4.446	4318.0	373,075,200			
" 19	4.499	4421.0	381,974,400			
" 20	4.648	4720.0	407,808,000			
" 21	4.706	4833.0	417,571,200			
" 22	4.653	4723.0	408,067,200			
" 23	4.418	4259.0	368,841,600			
" 24	4.710	4838.0	418,003,200			
" 25	4.864	5159.0	445,737,600			
" 26	4.974	5404.0	466,905,600			
" 27	5.032	5530.0	477,792,000			
" 28	5.070	5611.0	484,790,400			
" 29	4.979	5415.0	467,856,000			
" 30	4.662	4747.0	410,140,800	4.689	4798.373	12,490,290,864
July 1	4.202	3852.0	322,812,800			
" 2	4.264	3970 0	343,008,000			
" 3	4.197	3845.0	322,208,000			
" 4	4.198	3848,0	322,467,200			
" 5	3.979	3459.0	298,857,600			
" 6	3.893	3309.0	285,897,600			
" 7	4.050	3581.0	309,398,400			
" 8	4.045	3572 0	308,620,800			

TABLE III.—*Continued.*

Date.	Daily mean height.	Daily rate, cubic feet per second	Daily discharge, cubic feet.	Monthly mean height.	Monthly mean rate, cubic feet per second	Monthly discharge, cubic feet.
July 9	3.816	3180.0	274,752,000			
" 10	3.437	2575.0	222,480,000			
" 11	3.288	2360.0	203,904,000			
" 12	3 187	2218.0	191,635,200			
" 13	3.250	2305.0	199,152,000			
" 14	3.355	2458.0	212,371,200			
" 15	2.978	1933.0	167,011,200			
" 16	2.832	1753.0	151,459,200			
" 17	2.837	1755.0	151,632,000			
" 18	2.726	1622.0	140,140,800			
" 19	2.640	1522 0	131,500,800			
" 20	2.557	1428.0	123,379,200			
" 21	2.509	1462.0	126,316,800			
" 22	2.342	1198.0	103,507,200			
" 23	2.338	1193.5	103,118,400			
" 24	2.290	1145.0	98,928,000			
" 25	2.267	1123 0	97,027,200			
" 26	2.120	982.0	84,844,800			
" 27	2.091	955.0	82,512,000			
" 28	2.034	903.2	78,001,920			
" 29	1.987	862.0	74,476,800			
" 30	2.168	1026.0	88,646,000			
" 31	2.206	1063.0	91,843,200	3.041	2143.49	5,711,910,320
August 1	2.211	1068.0	92,275,200			
" 2	2,163	1022.0	88,300,800			
" 3	2,264	1120.0	96,768,000			
" 4	2.374	1231.0	106,358,400			
" 5	1,988	863.0	74,563.200			
" 6	1.971	849.0	73,353,600			
" 7	1.938	820.0	70,848,000			
" 8	1.880	772.0	66,690,800			

TABLE III.—*Continued.*

Date.	Daily mean height.	Daily rate, cubic feet per second	Daily discharge, cubic feet.	Monthly mean height.	Monthly mean rate, cubic feet per second	Monthly discharge, cubic feet.
August 9	1.984	859.7	74,278,080			
" 10	2.067	933.5	80,654,400			
" 11	1.986	860.0	74,304,000			
" 12	1.918	804.0	69,465,600			
" 13	1.890	780.1	67,400,640			
" 14	1.909	795 9	68,765.760			
" 15	1.899	787.5	68,040,000			
" 16	1.947	827.0	71,452,800			
" 17	1.954	833.0	71,971,200			
" 18	2.048	916.33	79,170,912			
" 19	2.058	925.0	79,920,000			
" 20	2.022	921.7	79,634,880			
" 21	1.914	800.0	69,000,000			
" 22	1.768	683.0	59,011,200			
" 23	1.643	590.0	50,976,000			
" 24	1.691	624.7	53,974,080			
" 25	1.730	652.7	56,393,280			
" 26	1.662	603.0	52,099,200			
" 27	1.691	624.6	53,965,440			
" 28	1.650	594.0	51,321,600			
" 29	1.530	510.7	44,124,480			
" 30	1.426	443.0	38,275,200			
" 31	1.392	423.2	36.564,480	1.889	791.536	2,020,116,252
September 1	1.429	446.1	38,543,040			
" 2	1.338	390.0	33,696,000			
" 3	1.296	369.0	31,881,600			
" 4	1.267	350.0	30,240,000			
" 5	1.286	361.2	31,207,680			
" 6	1 291	364.1	31,458,240			
" 7	1.350	397.4	34,335,360			
" 8	1.371	409.9	35,415,360			

TABLE III.—*Continued.*

Date.	Daily mean height.	Daily rate, cubic feet per second	Daily discharge, cubic feet.	Monthly mean height.	Monthly mean rate, cubic feet per second	Monthly discharge, cubic feet.
September 9	1.282	360.0	31,104,000			
" 10	1.207	318.0	27,475,200			
" 11	1.176	302.0	26,092,800			
" 12	1.200	314.32	27,157,248			
" 13	1.162	294.0	25,401,600			
" 14	1.114	270.5	23,371,200			
" 15	1.197	312.5	26,028,000			
" 16	1.310	375.0	32,400,000			
" 17	1.210	319.3	27,587,520			
" 18	1.133	280.0	24,192,000			
" 19	1.082	255.0	22,032,000			
" 20	1.048	239.3	20,675,520			
" 21	1.035	233.4	20,165,760			
" 22	1.030	231.2	19,975,680			
" 23	1.043	236.7	20,450,880			
" 24	1.110	268.9	23,232,960			
" 25	1.093	260.3	22,489,920			
" 26	1.062	245.9	21,245,760			
" 27	1.061	245.0	21,168,000			
" 28	1.050	240.2	20,753,280			
" 29	1.039	235.2	20,321,280			
" 30	1.028	230.3	19,897,920	1.177	305.191	789,995,808
October 1	1.015	224.6	19,353,600			
" 2	0.985	211.5	18,144,000			
" 3	0.966	203.4	17,444,000			
" 4	0.952	197.3	16,917,120			
" 5	0.966	203.4	17,444,000			
" 6	0.957	199.3	17,089,920			
" 7	0.757	199.3	17,089,970			
" 8	0.986	211.8	18,169,920			
" 9	0.980	209.1	17,936,640			

TABLE III.—*Continued.*

Date.	Daily mean height.	Daily rate, cubic feet per second	Daily discharge, cubic feet.	Monthly mean height.	Monthly mean rate, cubic feet per second	Monthly discharge, cubic feet.
October 10	0.992	214 7	18,420,480	Gauged for 16 days only.		
" 11	0.962	202.3	17,349,120			
" 12	0.952	202.3	17 319,120			
" 13	0,952	197.3	16,917,200			
" 14	0.958	199.9	17,124,480			
" 15	0.958	199.9	17,124,480			
" 16	0 948	195.7	16,761,600	0.968	204.875	280,635,600

NOTES TO TABLE III.

Notes appertaining to the annual discharge of the Cache la Poudre river:

Total discharge in 1884 ..... 30,485,079,481 cubic feet.

Area of watershed above measuring flume, meandered on Hayden's Drainage Map of Colorado, with a planimeter, is about 972 square miles. This gives a "run off" equal to

31,054,608.4 cubic feet per square mile.
48,522.8 " " acre, or
1.113917 " " square foot of water shed.

of water shed, equal to 13.367 inches, which is a little less than the mean average annual rainfall on the plains east of the mountains.

The mean annual rainfall on Pike's Peak, 1874 to 1881 inclusive, was 33.6 inches.

"A"—If one million cubic feet will irrigate 20 acres for one season, this quantity will irrigate 609701.6 acres.

"B"—If one cubic foot per second for 90 days will irrigate 55 acres, this quantity stored for use when required will irrigate 215,622.4 acres, and at $1,000 per water right of 80 acres, the purchase value would be $2,695.279.

If irrigation is computed at $1.50 per acre per season, the annual values will be

[a,] $914,552 38
[b,] 323,433 60

and this represents the extremes of the present practice of irrigation in Colorado.

The quantity discharged will cover 800 square miles 16.4 inches deep.

The percentage of monthly discharge, compared to annual discharge, is as follows, viz:

January, February, November, December;	4.59 per cent.	estimated.
March	0.59 "	estimated.
April	1.86 "	
May	22.55 "	
June	40.97 "	
July	18.74 "	
August	6.63 "	
September	2.59 "	
October	1.78 "	estimated.
	100.00	

APPENDIX C.

I.

The following extract from the speech of Mr. William Ham. Hall, State Engineer of California, before the State Irrigation Convention, held at Riverside, California, May 14, 15 and 16, 1884, is given for the information of the Colorado public:

"We are not without a precedent for the course I propose for California in this matter. Colorado is an irrigation country, having larger canals and more of them than has California. I have had my pride as a citizen of this State somewhat taken down of late, by looking into the affairs of irrigation in Colorado. They had there a few years ago, a perfect chaos with respect to water rights; litigation reigned supreme, as it reigned here. But in 1879 they passed a law providing for an examination into the subject of water-rights and irrigation, and in 1881 they passed a law providing for the *proper* proving up and recording of water right claims, and the administration of the affairs of the waters and the streams." Here Mr. Hall quotes the law referred to, states that decrees have been issued in Judicial Districts Nos. 2, 3 and 9, and quotes the decree of District 9 to illustrate the subject, and after eulogizing the common sense displayed in the general frame-work of the law, goes on as follows: "I have taken some pains to find out how the people are satisfied with its workings, and have entered into correspondence with quite a number of leading citizens there, with this view. I have quite a collection of letters in answer to my inquiries, obtained indiscriminately from lawyers, judges, members of the legislature, agriculturists and others. Some of these I have with me, and will read extracts as samples. I think they are interesting and go right to the point of one source of trouble in this State, and indirectly to another.

"The first letter is from Mr. L. R. Rhodes, an attorney of very considerable standing, who has, as I am informed, had a large share in the litigation and settlement of water right matters. After giving an account of the condition of interminable and expensive litigation, in which the water right interest was, and of the details of the operation of the law, Mr. Rhodes says: 'Now as to results; in all the decrees which have been entered by the District Courts in the various water districts, involving millions of dollars' worth, of property, belonging to thousands of different parties, there has been but one appeal taken to the Supreme Court, and that was taken to determine the validity of a grant made by the legislature of Kansas to the water of the South Platte River. The district comprising the Cache la Poudre River has been acting under these decrees for three years; the water commissioner has had comparatively no trouble; not a case of litigation has sprung up; the rights are so well defined, so easily understood; the system of measurement so simple and correct that each company and individual understands his or their right of property in water the same as in land. The same experience prevails in other districts where the system has been established; in short, let me say, the farming community of this State recognize in the laws which have been inaugurated and now govern our system, a blessing.'

"Here is a letter from the Hon. David Boyd, President of the State Board of Agriculture, of which I read the portions in point: 'Some six years ago a number of the appropriators of water for purposes of irrigation became alarmed at the number of large irrigation canals at that time being projected. All of these were being taken out of the natural streams above the most of those already constructed and in use. It was seen that these would have the advantage of position in times of scarcity, and that it would be extremely difficult for those below having older rights, to secure their recognition through the courts. Hence a convention of farmers and owners of canals was called to meet in Denver in the month of December, 1878. Some of the appropriators there met, entertained apprehensions concerning the restriction of their rights by the operation of an irrigation law. The subject was discussed and those in favor of the enactment of a law beat the other side at every point. * *

"'At that time most of the Colorado bar was opposed to the enactment of a law recording and defining rights and regulating the use of water. This was no doubt partly due to selfish motives, but was still more due to the reluctance of the legal mind to entertain any projects for which the past furnished no precedent. The older members of both bar and bench were more opposed to the scheme than the younger ones; while members of broader reading and reflection were generally in favor from the commencement. I here speak of the attitude of the bar and bench in order to bring before you the favorable change that has gradually come over the members of the legal profession, for scarcely one of this profession can now be found who is not convinced of the salutary effect of the law. I understand that you have written to ex-Senator Rhodes. Of the favorable light in which he will now lay the benefits of the law before you, I do not entertain the least doubt. Still, at the first convention, above spoken of, Mr. Rhodes then State Senator elect, made his appearance and opposed any attempt to have a law passed on the subject. According to him, the courts would afford the appropriate remedy. He spoke so strongly in the convention that the chair called him to order, and he fought against the bill at every stage of its progress through the legislature. In brief, the individuals and corporations who fought against the measure are now, so far as I know, amongst its warmest friends.

"'There are now no law suits pending in the courts about the appropriation of water, save one which is based upon an old grant made when Colorado was a part of the Territory of Kansas.'" The Senator Rhodes to whom reference is made in the above letter, is the gentleman whose letter I first read to you, and who said the law had turned out to be a blessing."

"Here is a letter from the Hon. H. P. H. Bromwell. He says: 'Our law of 1879, amended in 1880, has been pretty well tried in our courts in a number of Water Districts, and gives general satisfaction. It was entirely misunderstood by a majority of the people and of the bar at first, and it is only within the last two years that opposition to it has ceased. It was supposed to be a law affecting the rights of persons in respect to their *property* in ditches

and reservoirs, and many feared the consequences. But on trial it has worked so well that no complaint is now heard.' This gentleman then gives a long account of the proceedings had under this law in the Cache la Poudre Water District, 'where fifty-four ditches, many of them very large and costing from $50,000 to $200,000 each, had been constructed.' He says that 'much excitement existed in this district and heated controversies had been running during several years.' The evidence taken in carrying out the initiatory steps under the law, in this district, was very voluminous, covering about 800 pages of closely written manuscript, together with a great number of documents. The decree had 93 separate findings, which it took 77 days, labor of the referee to draw. When finally considered in court, all interested parties being represented, it was agreed to and finally entered by the court and has never been appealed from."

"Finally, here is a letter from the Hon. B. S. LaGrange, a former President of the State Board of Agriculture, and a recognized leader in irrigation matters in Colorado. Speaking of the water law, he says: 'Its former strongest and most bitter opponents are now its strongest advocates. Why? Because they see that State control gives and forces protection to their claims, individual as well as corporate. * * * * The State must enforce the proper filing of all claims; require the necessary proofs, and make record of the same. Without this the nature and amount of claims cannot be ascertained, nor can an equitable distribution be made. * * * * The working of the law is very satisfactory to the bench and bar of the State, as also to the persons interested in water claims. * * * * In this District, where all claims have been adjusted and decrees rendered, a basis of credit has been established both in land and water holdings; order and system has been established where all was anarchy and confusion. All interests are protected, confidence restored, and litigation ceased.' This kind of evidence might be piled up to the same effect, but enough has been brought to your notice to show that the Colorado people are satisfied with the working of their law."

II.

The following is an extract from the Tulare *Register*, of December 12, 1884, in which is an account of the proceedings of the California State Irrigation Convention, at their *adjourned* meeting, held at Fresno on December 3, 4, 5 and 6, 1884. After a preliminary disquisition the *Register* gets down to business as follows, viz:

"The following is the complete report of the Committee, and every reader of *The Register* should study it as though his soul's salvation depended upon his undering it:

"1. That the cubic foot per second be adopted as the unit measurement throughout the State.

"2. It is important and desirable to institute a system of making all water rights a matter of proof and record.

"3. A declaration by the Legislature that all the waters of the State in natural streams and lakes belong to the people, and are subject to appropriation by the people for irrigation, mining, manufacturing and other useful purposes.

"4. To provide the machinery for the voluntary formation of irrigation districts, by which the owners of land may acquire water rights, and assess the lands for the purpose of constructing canals, ditches, or other irrigation works, or for purchasing those already constructed.

"*Provided*, That waters already appropriated shall thereafter be utilized as at present through existing works or the extension of the same, so far as may be necessary, for the irrigation of lands dependent thereon; *and further provided*, that no lands shall be taxed for the construction of works of irrigation, except lands actually to be irrigated by said works.

"5. To so extend the Law of Eminent Domain as to allow an irrigation district, or a corporation outside of an irrigation district, to condemn and pay for rights of way, land, canals, ditches and water claims and rights of whatever nature held by any person or corporation, or any other

private rights of property, however existing, or acquired, or by whatever name designated, which may be necessary for the appropriation or use of water.

Provided, That in condemning water used at the time of the commencement of an action for the same, a manifest greater public interest shall be shown.

[That the irrigation district with power to condemn is defined as the sub-district within the hydrographic district, while the hydrographic district is one without condemnatory power, but with regulation power only.]

"6. To provide for a thorough and complete annual accounting for all the waters used by any and all districts or companies, and for a proper distribution of the waters of any stream between appropriators, and for such other police regulations as may be necessary.

"*a*" Where these is so wide a diversity of opinion, as now exists in this State, as to what the law is, in relation to water rights, it is clearly the duty of the law-making power to so improve it as to leave it free from all ambiguity and render it definite and easy to be understood by the people and the courts.

"*b*" That the Legislature has this power, is made plain by Sec. 2, Art. 1, of the Constitution, which reads as follows: 'All political power is inherent in the people. Government is instituted for the protection, security, and benefit of the people, and they have the right to alter or reform the same whenever the public good may require it.'

"*c*" The Constitution of our State recognizes and sanctions the appropriation of water, and does not recognize or sanction the doctrine of riparian rights. Its language is as follows: 'The use of all water now appropriated, or that may hereafter be appropriated, for sale, rental, or distribution, is hereby declared to be a public use, and subject to the regulation and control of the State, in the manner to be prescribed by law.'

"*d*" Title 8th of the Civil Code, providing for the appropriation of water, is the law of the State, and wherever

the common law of England is antagonistic to or inconsistent with any section of said title, it has no force or effect as law in this State.

"*e*" Law is defined by our Code as 'the will of the people solemnly expressed.' The language of the Code is as follows;

"'Sec. 4466. Law is a solemn expression of the will of the supreme power of the State.

"'Sec. 4467. The will of the supreme power is expressed—

"'1. By the Constitution.

"'2. By the statutes.

"'Sec. 4468. The common law of England, so far as it is not repugnant to or inconsistent with the Constitution of the United States, or the Constitution or laws of this State, is the rule of decision in all the Courts of this State.'

"That the Committees on Legislation and Resolutions be consolidated and be known as the Legislative Committee, and be continued in existence after the adjournment of the Convention, with power to draw or cause to be drawn a bill or bills for passage by the Legislature, according to the principles embodied in their report, as approved by this Convention, and to present the same to the next Legislature for passage; and do such other things as they may deem proper to effect the objects of this Convention; and with power also to appoint from among its members an Executive Committee, with the usual powers of such Committee.

III.

The following paper was read by Professor E. Meade to the Farmers' Institute at Fort Collins February 24, 1884. The paper was prepared by the Hon. B. S. LaGrange, Water Commissioner of the Third Water District, from information furnished him by this office.

LAGRANGE ON IRRIGATION.

It is always of interest and value to a community that its members have a correct appreciation of the character and degree of their advancement, compared with other pursuits, and also their relative standing, when compared to those following the same pursuit in other localities.

With this idea in view, let us contrast the agriculture of a half century ago with that of the present, and see what we have done, and, if possible, to determine some of the responsibilities resting on our future.

Fifty years ago farming was conducted by muscular power. Had the farmers of Colorado been compelled to harvest their grain with the implements of those times there would be no question of a surplus of wheat. Then we harvested our grain with a hand sickle; to day the farmer drives into his field, riding in his seat, cutting and binding his grain, fifteen acres a day. Then our steam threshing machine was a flail; we dispensed with separators and fanning mills by letting the grain fall and the wind blow out the chaff. Then our Oliver chilled plows were made of wood, coulter and share only being of iron, and one handle sufficed to control it.

Nor was the absence of improved implements the only hindrance to prosperous husbandry. Every other branch of the pursuit has made a kindred advance. Then there was but little attention paid to the improvement of stock. In the place of our improved breeds of cattle, we had a race of scrubs brought from different countries. In the stead of the Essex and Berkshire swine of to-day, we had the elm peeler and razor back of the woods.

These are some of the features which mark the advance in our pursuit. The direction of our progress has been to

lighten physical toil, but it has made a constantly increasing demand on our intellectual capacity, and the agriculture of a community or State has been prosperous just as it has kept pace with this advance. The agriculture of Colorado has shared fully in the progress of the times, and it is its progressive character which renders the right solution of the irrigation question both difficult and important. If our agriculture was of the primitive kind that we could meet with in a day's journey, where we should find the methods of Job's time carried out in their primitive simplicity, there would be no need of any more efficient regulations than those which guarded the irrigation system of Egypt. Science, knowledge and inventive skill have, however, worked as great a revolution in our calling as it has in other pursuits, and the farmer who begins his calling in this State at the present time is confronted by questions of greater importance to himself and requiring more intelligence in their successful solution than ever beset the pioneer agriculturist of the older States of our country.

He must gain some acquaintance with the principles of one of the most difficult branches of the science of engineering. He must not only meet the increased competition which comes from improved methods of farming elsewhere, but he must take part in the development of an irrigation system which will accord with our improved agricultural practices. Not only this; as the citizen of a self-governing commonwealth he must realize the true relation of the State toward an important element of our prosperity; a matter made all the more difficult from the fact that it has no counterpart in the older sections of our country. As this last feature is one which we are disposed to neglect, I will first speak of the relation which the individual and State each bear toward the water supply.

Water is the precious element wherever irrigation is necessary. The soul, the vital spark in each and every irrigation enterprise, is, its right to use water, but all the water in the natural streams belongs to the public domain. Property of the public, and that sovereign power over all the public domain, authorizes the State to appropriate any part of it to a necessary public use, and to control and regulate the same. Therefore, previous to 1882, all persons,

private or corporate, who made, or caused to be made, any structure in the stream or banks of the stream for the purpose of diverting water from the same, were trespassers upon the public domain, and made themselves amenable and liable under the law to an action at law. The first trespass on the water of the Cache la Poudre, of which we have any record, was made by J. H. Yeager in June, 1860, in Pleasant Valley—amount claimed as diverted, 24.80 cubic feet per second. Between 1860 and 1870 numerous other parties were engaged in these unlawful acts. Prominent among the number were the Hon. B. H. Eaton, Robert Boyd, Wm. R. Jones, Fred. Whitney, Sherwood, Coy, Howes, Ames, and many others. During this time twenty ditches had been constructed on the line of the Poudre from the mouth of the cañon to its intersection with the Platte, a distance of 75 miles. The amount of water diverted and claimed by these parties at this date was 581 cubic feet per second of time. During the next five years, from '70 down to '76, the advent of the Union colony, and subsequently the Fort Collins colony, gave a new impulse to the agricultural progress of Colorado. Several large canals were incorporated and completed, enlarged and re-enlarged. Many of the older ones enlarged during this period, until we find from the record that the block of water diverted from the stream during this period, amounted to 1911½ cubic feet per second of time, or a total in the district of 2492½ cubic feet for the fifteen years above mentioned. From 1875 to 1884 several large enterprises have been inaugurated and brought to completion. Notably among the number may be mentioned the Larimer and Weld irrigating canal, Larimer county and the North Poudre canals. Pleasant Valley and Lake canal are at the present making some valuable improvements at a cost of $22,000. The amount of water claimed for this period aggregates 1820⅝ cubic feet per second of time, making the sum total for the whole period of twenty-three years 4312.70 cubic feet per second as claimed in this district for household and agricultural purposes. Deduct twenty-five per cent for excessive claims and we have 3234 cubic feet per second—a very close estimate of the amount claimed and used in this valley for agricultural purposes.

Previous to 1880 a conflict of interests had grown up, as each irrigation enterprise progressed. The laws of the State afforded nō adequate method for adjustment. Every water user, private or corporate, became the opponent of all others. There were no defined rights, and in case of conflicting claims the only remedy was a resort to the courts, and then in most cases the claim could be but partially established as against some particular rival claimant. The policy of the State was to leave the distribution of the water from the stream to the several claimants thereof and the settlement of all disputes to the courts. The general government might just as well have thrown open the public domain to appropriation; have no regulation; require no proof of claims except when disputed in the courts. There would be no basis of credit in lands and no limit to the acquirement of large holdings. It is just this policy which the State pursued toward the irrigation interests—a free to all rule which brings trouble to all. A non-intervention policy on the part of the government of a country never has nor never can solve the problem of irrigation.

How then do we acquire a right to water? The whole foundation of the water right system is its use. Whoever has acquired a legal vested right to the use of water, and has need for the same, must be protected at all times in the enjoyment of its use. But whenever that need ceases then it becomes the property of the public. The streams are the property of the public; segregation must be made before we can get possession. Once in possession it becomes property, coupled always with a beneficial use and no waste.

Owing to the climatic conditions and atmospheric influences on our water sheds, the water is ever variable in amount, constantly slipping from the grasp, ever moving onward, wasting in many ways an element of wealth temporarily and at not very regular periods and then in quantities rarely sufficient for all, and is most precious at the time of least supply and should be administered in a manner that the public will derive the greatest possible benefit. Our lands are worthless without water, and the State should give equal protection to the ownership of water as well as to the land.

THE CONSTITUTION.

The constitution of the State of Colorado dedicates all the waters in the natural streams of the State to the use of the people, irrigation being a necessity. Here is an element of wealth, a valuable commodity, the use of which is donated to the people. The State becomes the donor, a grantee to a grantor, without any fixed condition attached to regulate or control.

By an act of the legislature of 1879 the first step was taken to place the waters of all the natural streams under the regulation and control of the State. Irrigation districts were formed. Provision was made for water commissioners in each water district to divide the waters from the streams and regulate the same according to the prior rights respectively, and for the establishment of reservoirs and regulation of the same. This act being defective in some of its provisions, some of its clauses were repealed.

The legislature in 1881 passed a bill entitled "An act to make further provisions for settling the priority of rights to the use of water for irrigation;" also an act creating the office of State Engineer and prescribing his duties. By virtue of these legislative enactments the State is enabled to exercise a just, wise and beneficial policy.

In this district all claims have been adjusted and decrees rendered; a basis of credit established both in land and water holdings; order and system established where all was anarchy and confusion. This was the first step necessary to enable the State to ascertain the nature, extent and amount of these water claims as diverted from the streams. Measurements and tabulations are being made of the intake of water on all the canals in this district, for the purpose of determining the quantity diverted from the stream. Also a gauge station has been established in the cañon of the Poudre to measure the flow of the stream, and a daily record is kept of the same.

Tables are being prepared showing the daily and hourly discharge, during the entire year. By these means a known quantity is determined. Therefore, having a known quan-

tity always at hand to deal with, a more equitable and satisfactory distribution can be made to the several claimants by the commissioner in the discharge of his duty.

We must keep constantly in mind that the agricultural possibilities of this region are only limited by the water supply, and that land practically worthless without water becomes fertile and valuable when that element is added. There is a constant danger, therefore, that the cultivated area will be extended beyond the limit that is either profitable or safe. To show that this apprehension is not groundless, let us consider the condition and probable future of our own district, where we fortunately have sufficient data to form a close estimate of our real condition. As has before been stated, the decrees already granted entitle the canals of the Cache la Poudre to divert 4312.72 cubic feet per second, and it is only a question of a few years at most before their capacity will be taxed to the utmost to supply the farmers along their course.

Let us assume, however, that the actual present capacity of the canals which draw their supplies from the Poudre is 3234.53 cubic feet per second of time. Does the river furnish that amount? The discharge of the river was gauged in 1881 and again in 1883, and the results are a warning of a danger which the State should provide against before it is too late, viz:—to prevent the construction of additional canals after the capacity of the stream has been reached.

Beginning with the season of 1883, which was noted for the unusually large quantity discharged, the record begins with March 23, and ends August 20. The discharge on March 23 was 106 62, which by April 1 had increased to 340.89 and continued to increase until May 1, when it registered 1131.9 cubic feet per second. The average discharge for the first ten days of May was 1395.79 cubic feet per second, and for the last ten days 2033.85 cubic feet per second, or an average discharge of 1714.82 cubic feet per second for the twenty days.

Arranging the discharge for the months of May, June, July and August in a tabular form we have:

Day of Month.	May.	June.	July.	August.
First	1131.90	2034.53	5081.60	1683.6
Tenth	1706.99	2879.92	3092.40	1005.
Twentieth	2201.33	6008.09	2587.10	250.
Thirtieth	1802.75	5722.93	1834.40	
Average for four days . . .	1710.72	4161.37	3149.2	946.2

These figures reveal the fact that even in the unusual season of last year the discharge of the river at the period of its greatest flow was not equal to the actual capacity of our present canals and was not over three-fifths of the intake granted the canals in their decrees. There were times, of course, when the river discharged a much greater amount, the greatest being on June 22 and 23 when the discharge was 7292.04 cubic feet per second. But the average for the four months was less than the actual capacity of our canals. Now if this is the case in a season when the supply is unusually abundant, what will be the condition of affairs in a season of scanty supply? The record of 1881 will furnish a partial answer to that question.

June.		July.		August.	
Date.	Amount.	Date.	Amount.	Date.	Amount.
20	1104 00	1	1622.	1	342.2
25	1095.	10	963.	5	301.5
30	1640.	20	713.		
		30	361.4		
Average . . .	1279.		914.82		322 35

Now, the lesson to be drawn from these figures seems to me to be this—that it is the urgent and imperative duty of the State to take such control of our streams as will prevent the building of additional canals or the enlargement of the present ones until it has been ascertained that there is a surplus of water in the stream. As it is now, canal building is going on rapidly on the Platte and other streams when even the projectors of these enterprises are ignorant as to whether there is sufficient water in the stream to supply their wants. If our present system only worked a hardship to those parties who might build canals after the capacity of the stream was exhausted, the result would not be so disastrous, although it would be far from desirable. The real hardship would fall on the agriculturist of small means, who, coming from the East and not understanding the situation, would settle along these canals, fondly imagining that he was at least secure from the vagaries of the weather. These are the parties who would suffer.

A Board of State Control, however, would prevent all this, and at the same time would work no hardship to anyone. Their granting of a permit to build a canal would be an assurance to the projectors of the enterprise that the project was a safe one, and in this way it would furnish a basis of credit. It would relieve our farming interest of any apprehension as to a possible future conflict over this question.

DUTY OF WATER.

Frequent inquiries are made of how much water is required to irrigate an acre of land. In my opinion there have not at the present time been sufficient data collected to determine the quantity necessary to irrigate any given area. That the ultimate duty of water can be determined upon in any case, is not in the nature of things possible at the present time. As a general thing, the duty of water is increasing in the older sections of the State where irrigation has long been practiced. Climatic and atmospheric influences incident to a high mountain region and the variableness in the character of our soils, places all calculations at fault. Improved methods of preparing land and increasing skill in the application of water, all have a tendency to lessen

the amount necessary to the growth of crops. The duty of water might be expressed by an announcement of the quantity required to irrigate an acre of land. Thus, in the case of a ditch which delivers water at the rate of two cubic feet per second through the season and accomplishes the irrigation of 200 acres of land, it is said that the water performs a duty of 100 acres per second foot. That is, a continuous flow of one cubic foot per second for the season will irrigate 100 acres of land. From my experience and observation the duty of water in this district varies from 1½ to 2 cubic feet per second, necessary to irrigate a growing crop of wheat on eighty acres of land, and that the highest duty of water is only attained where its scarcity compels the utmost economy in its use.

RESERVOIRS.

The subject of storing the surplus arising from storm floods and the excessive overflow of the streams at irregular periods, is attracting the attention of all thoughtful men in Northern Colorado. And as the settlement of the country progresses and the use of water becomes more extended, this question will continue to be agitated. But little has been accomplished as yet, but there is great need, in times of scarcity, for a system of storage under the management of State control and regulation. Legislation is very much needed upon this important subject. On the head waters of the streams are many basins covering hundreds of acres, furnishing natural sites for the storage of large quantities of water at a minimum cost.

Rainfall is rarely, if ever, sufficient on the plains of Colorado for maturing crops. Therefore, provision should always be made for securing elsewhere a supplementary supply for the dryest seasons. Whenever sufficient water cannot be procured from the natural sources of supply direct during the irrigating season, recourse must be had to storage in reservoirs, the supply being obtained from the natural sources of supply in the non-irrigation season or when there is an excess of water above the requirements of direct irrigation.

A general law should be provided for the condemnation of reservoir sites intended for independent irrigation of lands or supplementing canal supplies.

First—To store and use the storm-floods or waste waters of any stream.

Second—To divert from the natural channel and use the storm-floods or waste waters of a stream.

Third—To divert from the natural channel and use the waters of the ordinary flow of the streams; provided that prior rights or privileges are not to be infringed upon or paramount interests injuriously affected thereby.

Fourth—Under the regulation of a State Board of Water Commissioners with their powers and duties prescribed.

Also, a State water-right register of all existing legal claims to use of water; and also a State register of all permits or water privileges that may be hereafter granted should be established.

In conclusion, I would recommend the following measures as tending to secure a more efficient control and equitable distribution of the waters of the State:

1. There should be established a State Board of Water Commissioners and a State registry of all existing water claims.

2. Provide for the issue of water privileges in proportion to the water supply in each stream.

3. Establish a definite standard of measurement for water used for agricultural or mining purposes, together with regulations from time to time tending to prevent waste and guard against the careless use and waste of water in irrigation.

4. State control of the sources of water supply on the various water sheds, and allow no interference with the same without a permit from the proper authority.

A record should also be made of the discharge of each stream whose waters are used for agricultural purposes, and an act should be passed making it unlawful for any person or corporation, except upon a permit from the proper authority, to construct any wier or dam across, or partially across, or in the channel of any stream within the boundaries of any organized Water Division in the State, or to construct any canal in or alongside the banks of any stream within any organized Water District in the State.

Also, the duties of the State Engineer should be better defined; Water Commissioners put under bonds for the faithful discharge of their duties, and their powers enlarged, making the service more effective.