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BIENNIAL REPORT

OF THE

STATE ENGINEER

COLORADO

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PART I

C. Still

Comp.

Geo Hargree







ALLITT CANAL DAM AND HEADGATE ON ARKANSAS RIVER. HEADGATE IN SOLID ROCK. WATER DISTRICT NO. 67.



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## LETTER OF TRANSMITTAL.

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Sir: In compliance with section 167, chapter 72, Revised Statutes 1908, I have the honor to transmit in parts I and II the fourteenth biennial report of the transactions of this department, for the two fiscal years ending November 30, 1908, with recommendations in matters relating to irrigation and internal improvements.

I have the honor to be, sir,

Very respectfully,

THOMAS W. JAYCOX,

State Engineer.

To His Excellency,

Henry A. Buchtel,

Governor of Colorado.

On page 153, Alamosa Creek Canal vs. Nelson should read 93 Pac. Rep., 1112, instead of 98 Pac. Rep.

## STATE ENGINEERS OF COLORADO.

Since Department Was Organized, June 3, 1881.

Eugene K. Stinson.....	June, 1881, to April, 1883
Edwin S. Nettleton.....	April, 1883, to April, 1887
J. Sire Greene.....	April, 1887, to April, 1889
James P. Maxwell.....	April, 1889, to April, 1893
Charles B. Cramer.....	April, 1893, to April, 1895
Horace A. Sumner.....	April, 1895, to April, 1897
John E. Field.....	April, 1897, to April, 1899
Addison J. McCune.....	April, 1899, to April, 1903
Louis G. Carpenter.....	April, 1903, to April, 1905
Thomas W. Jaycox.....	April, 1905, to April, 1909

## LIST OF OFFICERS

In Charge of Irrigation in Colorado, November 30, 1908.

Thomas W. Jaycox.....	State Engineer
Charles W. Beach.....	Deputy State Engineer
Gavin N. Houston.....	Deputy State Engineer
Thomas Grieve, Jr.....	Hydrographer
George H. Angell.....	Draughtsman
H. E. Rockwell.....	Filing Clerk
M. H. Griffith.....	Stenographer
E. M. Williams.....	Stenographer

## IRRIGATION DIVISION ENGINEERS.

NAME	DIVISION	RESIDENCE
William Rist.....	No. 1	Denver, Colorado
John M. Jackson.....	No. 2	Pueblo, Colorado
Dan S. Jones.....	No. 3	Center, Colorado
Arthur H. Stokes.....	No. 4	Grand Junction, Colorado
A. J. Dickson.....	No. 5	Glenwood Springs, Colorado

## WATER COMMISSIONERS.

DIV. NO.	DIST. NO.	NAME	RESIDENCE
1	1	J. M. Dille.....	Fort Morgan
1	2	Charles M. Jump.....	Platteville
1	3	John L. Armstrong.....	Fort Collins
1	4	Oswald Allen.....	Loveland
1	5	W. H. Barney.....	Longmont
1	6	Edward Autrey.....	Boulder
1	7	W. M. Davis.....	Edgewater
1	8	S. F. Couch.....	Littleton
1	9	John W. McLean.....	Morrison
2	10	William Frizzell.....	Manitou
2	11	Charles Spencer.....	Buena Vista
2	12	John Kile.....	Rockvale
2	13	Frank Kelling.....	Westcliffe
2	14	Robert Burton.....	Boone
2	15	Lewis Harris.....	Rye
2	16	John J. Wright.....	Walsenburg
2	17	S. W. Cressy.....	Rocky Ford
2	18	J. S. Calderhead.....	Aguilar
2	19	E. G. Duling.....	Trinidad
3	20	Robert W. Maddox.....	Monte Vista
3	21	G. S. Lovett.....	La Jara
3	22	B. W. Harrison.....	Manassa
1 & 2	23	David Collard.....	Fairplay
3	24	J. P. Sanchez.....	San Pablo
3	25	Frank Cargo.....	Villa Grove
3	26	Z. T. Clark.....	Saguache
3	27	Feles Charez.....	La Garita
4	28	J. Roy Hicks.....	Sargents
4	29	Robert H. Bostwick.....	Pagosa Springs
4	30	John Cundiff.....	Bayfield
4	31	.....	.....
4	32	.....	.....
4	33	John Cunningham.....	Hesperus
4	34	H. M. Barber.....	Mancos
3	35	I. N. Janney.....	Zapato

DIV. NO.	DIST. NO.	NAME	RESIDENCE
5	36	H. H. Hill.....	Plains
5	37	N. W. Nelson.....	Gypsum
5	38	Charles H. Harris.....	Carbondale
5	39	D. E. Eakins.....	Rifle
4	40	George Hider.....	Austin
4	41	W. O. Hersum.....	Olathe
4	42	Henry W. Davis.....	Molina
5	43	George Lechmere.....	Rio Blanco
5	44	Arthur Collum.....	Axial
5	45	G. W. Taughenbaugh.....	Rifle
1	46	J. P. Vaughn.....	Walden
1	47	A. E. Butler.....	Walden
1	48	Walter G. Decker.....	P. O. Jehm, Wyoming
2	49	Bert Ragan.....	Landsma
5	50	.....	.....
5	51	.....	.....
5	52	Clarence Rundell.....	Sheephorn
5	53	J. C. Crossan.....	Toponas
5	54	.....	.....
5	55	.....	.....
5	56	.....	.....
5	57	.....	.....
5	58	John B. Souther.....	Nampa
4	59	.....	.....
4	60	C. H. Smith.....	Coventry
4	61	Fred Dixon.....	Paradox
4	62	J. P. Morgan.....	Montrose
4	63	.....	.....
1	64	R. C. Perkins.....	Sterling
1	65	A. D. Murdock.....	Wray
2	66	Jesse Turner.....	Springfield
2	67	E. M. Mears.....	Lamar
4	68	John Merling.....	Ouray
4	69	Henry M. Royce.....	Rico
5	70	Geo. F. Newton.....	Debeque



## CHAPTER I.

### WORK OF THE DEPARTMENT.

#### OFFICE WORK.

The clerical work in this office is constantly increasing. There is much demand for copies of filings for use in court proceedings. The work of comparing maps filed here requires nearly the entire time of two clerks. The Fifteenth General Assembly made a special appropriation for one filing clerk. The salary of the second clerk was taken from funds which should otherwise have been spent on much needed field work. I would recommend that appropriation be made for the services of two filing clerks.

#### DITCH RATINGS.

This office made 110 ratings of canals during the past two years, besides a great number of miscellaneous measurements. The rating station in the South Platte at Denver; South Boulder at Marshall, Boulder Creek at Boulder; St. Vrain at Lyons, and Big Thompson at Handy Dam were maintained by this office during the past two years. These required a number of gaugings from time to time to obtain sufficient data for making of an accurate rating curve. The expense of these canal readings and maintaining the gaging stations were paid from funds of this office. The policy of paying for canal ratings was met with general approval by canal owners. This kind of work should be extended so that every canal of importance should be rated at least once every year.

This office also co-operated with the United States Geological Survey by paying the gage readers at the following river stations: Arkansas River at Canon City, Pueblo and Holly; Clear Creek at Forks Creek; Conejos at Mogote; Cucharas at Walsenburg; Purgatory at Trinidad; Rio Grande at Wason, Del Norte and Lobatos; South Fork of South Platte at South Platte; South Platte at Kersey and Julesburg, and North Fork of South Platte at Cassells.

The information thus collected adds to the hydrographic records of the streams, and is very valuable to irrigation and power interests in the State. At many places in the State there is a lack of accurate knowledge of stream flow. Many irrigation and power schemes are held in abeyance, or are abandoned altogether, because of insufficient data upon which to base an estimate of land that may be irrigated or power that may be developed. Money spent in collecting data of this character gives



great returns to the State in the way of interesting capital for development of our resources.

In many cases rating tables of canals and rivers were made out and sent to the water commissioners, division engineers and canal owners. The duty of rating large canals properly belongs to this office and ample funds should be supplied for doing the work. Such canals should be rated at least once each year and in some cases two or three times a year. The water commissioner is then supplied with correct rating tables and is relieved of any implication of favoritism or partiality and is able to discharge his duties more accurately.

In cases where conditions are suitable I would earnestly recommend the use of a weir as a means of the measurement of water. In the mountainous sections of the State, where small canals have considerable fall, the weir could be used to advantage.

As much time as possible was devoted to gaging work and the results showed that the work could be enlarged upon with profit to our canal companies and the State in general.

The accurate distribution of water between the water districts lying upon the same stream, and also between the canals in taking water from the same stream, is a very important duty of our irrigation officials. An error of a few cubic feet per second is robbing some one of the use of property whose value amounts to several thousand dollars.

#### RIVER BULLETINS.

In Irrigation Division No. 2 daily bulletins were issued by John M. Jackson, irrigation division engineer, Division No. 2, with the assistance of water commissioners in Water Districts Nos. 11, 12, 14, 17 and 67, and with the aid of information gathered from some private sources. These reports gave the amount of water carried each day by every canal taking water from the Arkansas river from Canon City to the State line.

The method of getting out the reports was as follows: About seven o'clock in the evening the division engineer would call up by telephone one water commissioner after another and receive the daily report of the condition of canals and rivers as they existed at the close of the day. These conditions were recorded upon the report. Copies of the report were mailed and in the canal owner's hands the next morning. The length of river covered was three hundred miles.

The past season, which was short of water, demonstrated more clearly than ever the value of this report. The expense of obtaining reports, such as postage, blank forms, telephone tolls and clerk hire was paid for by the Arkansas Valley Ditch Association. The expense was from five to six hundred dollars for each year.

#### REPORTS OF DIVISION ENGINEERS.

From the daily and weekly reports of the water commissioners, the division engineers were required to report to this office

once each week, the general conditions existing in the various irrigation divisions, as to amount of water distributed, latest decree receiving water, commissioners reporting, and those failing to report, and reasons for such failure, disputes pending and settled, and any other items affecting irrigation.

This system of reports enabled this office to supervise the work of distributing water in an efficient manner and to exercise a general control over all irrigation officials.

#### RESERVOIRS SURVEYED.

The following reservoirs have been surveyed for capacities during the past biennial period:

Lawn reservoir, in Water District No. 4, surveyed by Harry True in 1907; Cameron Pass reservoir, in Water District No. 3, surveyed by Harry True in 1907; Twin Lakes reservoir, in Water District No. 11, surveyed by Porter J. Preston in 1908 from the 18-foot contour to the 11-foot contour. The capacity between the 18-foot contour and the 28-foot contour had been determined by a previous survey.

Antero reservoir in Water District No. 23 is being surveyed by Antoine Jacob.

#### GUNNISON TUNNEL.

Work on the Gunnison Tunnel has progressed rapidly during the past two years. There remains about 3,500 feet of tunnel to drive. It is confidently expected that water will be flowing through the tunnel by June, 1909.

Many unforeseen difficulties have delayed the work and increased the cost beyond the first estimates. It was found necessary to secure from the water users' association an agreement to bear the additional burden of increased cost. The total cost of water rights will be \$35.00 per acre.

The settler is given very liberal terms for the payment of his water rights. The water rights are to be paid for in ten equal annual payments, without interest.

#### GOVERNMENT HIGHLINE CANAL.

Filing maps have been received in this office for claim to water from the Grand river for the Government Highline canal.

The headgate of this canal lies nearly twenty miles above the town of Grand Junction. It is proposed to irrigate 65,000 acres of land lying north of Grand Junction.

The canal is to have a capacity of 1,300 cubic feet per second.

Surveys have been completed and construction work is expected to commence early in the year 1909.

#### CAREY ACT FILINGS.

There have been no Carey Act filings approved in the last biennial period.

#### WATER COMMISSIONERS' REPORTS.

In compliance with section 2455, Mills' Annotated Statutes, this office had prepared blank report forms for daily and weekly

reports of the water commissioners to the division engineer. These blanks were bound in tablet form with a second sheet. A carbon sheet was supplied, and the water commissioner was enabled to retain an exact copy of his report. Each water commissioner was furnished, through the division engineer, with a tablet containing fifty blank report forms, reports to be made out at least once each week and in some cases daily. By means of these reports the division engineer knew what was going on in all parts of his division.

Blank report forms for the water commissioners' annual reports were caused to be printed and distributed by the division engineers. In addition to the crop data heretofore gathered, space was provided for data about reservoirs and reservoir water, and the part it takes in the agriculture of our State. This information is of great interest and value.

The information contained in the water commissioners' annual reports is daily sought after in this office. It represents the only official history of canals reported upon as to amount of water carried, number of days water was carried, and kind and acreage of crops grown. In case of litigation over water rights these records are of great value.

#### WATER COMMISSIONERS' REPORTS.

During my term of office I made a special effort to secure as complete and accurate returns as possible from the water commissioners for the statistical value they have. Blank field books were furnished the water commissioners. A space was provided for each ditch and reservoir in a district. If one book did not contain enough blank spaces, several books were provided. The field books were to be carried by the water commissioner, and all official acts were to be recorded as they occurred. Notes were to be made on every canal visited as to amounts of water carried, date water was turned in or shut out of canal. Notes on crops were to be taken from day to day, and when the time came for making up the annual reports, all the information necessary was supposed to be in the field books.

#### WATER COMMISSIONERS.

A very considerable amount of space was devoted to this subject in the thirteenth report, illustrating the method of appointment and system of payment for services of the water commissioners, and but little additional can be made thereto, as no change was made by the last legislature in reference to these subjects, and the recommendations made at that time are emphasized by the passage of the past two years.

The interest that was finally aroused by the inequalities of the present system of payment culminated in a convention of the Boards of County Commissioners which was held in Denver.

Mr. George Hider, water commissioner district No. 40, presented his accounts for services during the year 1907 to the board of county commissioners of Gunnison county, claiming that this

county was included in his water district and should pay its pro rata share of the expense of distributing the water.

The board refused to pay the accounts, whereupon the water commissioner was obliged to begin an action to collect the same. In this he was successful, getting a judgment for the amount of his claim.

This brought about a meeting of the boards of county commissioners of Gunnison, Delta and Montrose counties, the counties interested in the outcome of the suit, and it was resolved that a convention should be called, provided a sufficient number of the counties in the State should agree thereto.

Accordingly the following notice was sent to all the counties:

OFFICE OF  
COUNTY CLERK OF MONTROSE COUNTY,  
STATE OF COLORADO.

Montrose, Colorado, March 14, 1908.

To the Board of County Commissioners of ———— County, Colo.,

Gentlemen: Pursuant to a joint resolution passed by boards of county commissioners of Delta, Gunnison and Montrose counties, I was instructed to request the opinion of said boards as to the advisability of calling a convention of all said boards to meet in Denver for the purpose of considering ways and means for a more equitable distribution of the burden of the expense of water commissioners upon the various counties of the State.

According to the resolution, when a favorable response should be received from at least twenty counties, the convention was to be called. At this date I have received responses from twenty-eight counties, all of which request the meeting to be called.

Therefore, by virtue of the aforesaid joint resolution, a convention consisting of not less than two representatives of the board of county commissioners of each county of the State of Colorado is hereby called to meet at Denver, Colorado, in the House of Representatives at the Capitol Building on Thursday, April 30, 1908, at 10 o'clock a. m., to consider and take such action as may be then and there determined concerning the expense of water commissioners.

Respectfully yours,

T. W. MONELL.

County Clerk of Montrose County, Colo.

Pursuant to the above call, the convention met in the House of Representatives, Capitol Building, at 10 a. m., April 30, 1908.

Hon. A. T. Stewart of Pueblo county was chosen chairman and Mr. T. W. Monell, of Montrose county, was selected as secretary.

Thirty-eight counties were represented, either by members of the board of commissioners or their county attorney, being as follows:



Adams.	Fremont.	Otero.
Baca.	Garfield.	Ouray.
Bent.	Grand.	Park.
Clear Creek.	Gunnison.	Pueblo.
Conejos.	Huerfano.	Rio Blanco.
Costilla.	Kit Carson.	Saguache.
Custer.	Lake.	San Miguel.
Delta.	Larimer.	Summit.
Denver.	Mesa.	Teller.
Douglas.	Mineral.	Washington.
Eagle.	Montezuma.	Weld.
Elbert.	Montrose.	Yuma.
El Paso.	Morgan.	

The convention was in session for two days and a spirited discussion was had upon the question of payment of water commissioners' salaries, with the result that the committee having in charge the irrigation resolution presented the following as its report, and the same was read and unanimously adopted.

## A BILL

### FOR

An Act to Amend Section Two of an Act Entitled "An Act to Give Police Powers to Water Commissioners, Fix Their Salaries, Define Their Duties and Provide Their Assistants, and to Repeal Certain Parts of Acts Inconsistent Herewith," Approved March 25, 1889, and to Amend an Act Entitled "An Act to Amend Section 42 (16), Chapter LVII of the General Statutes of the State of Colorado, Entitled 'Irrigation,' Requiring the Water Commissioners to Give Bond in an Amount to be Fixed by the Board of County Commissioners and Providing for the Governor to Fix the Amount of Such Bond in the Event that the County Commissioners Disagree Thereon."

Be It Enacted by the General Assembly of the State of Colorado:

Section 1. That section 4 of "An Act to give police powers to water commissioners, fix their salaries, define their duties and provide their assistants, and to repeal certain parts of acts inconsistent herewith," approved March 25, 1889, shall be amended to read as follows:

Sec. 4. The water commissioners shall be entitled to pay at the rate of five dollars (\$5.00) per day for each day actually and necessarily employed in regulating and distributing the waters of their respective districts, and their deputies in such actual employment to be allowed the sums now provided by law, to be paid monthly out of the State Treasury. Each water commissioner shall keep a just and itemized account of the actual and necessary time spent by him and each of his deputies in distributing the waters of his district, and shall make out

monthly bills therefor against the State, and shall properly verify each bill and state in each verification, under oath, that each day charged for in the foregoing bill represents at least eight hours of actual and necessary labor performed in the distribution of water in his district, naming the same, and if such distribution is made for irrigation purposes he shall state that the same was done under a call from the water users as provided by statute, and if any part thereof was performed in the distribution of water for other than irrigation purposes, he shall state under oath that the same was performed on the good faith and voluntary demand of an owner of an adjudicated water right, stating the purpose for which the same was decreed, and further stating, under oath, that all the time charged for was actually and necessarily devoted to the proper distribution of such water. No water commissioner is or shall be, authorized to interfere in the distribution of water for other than irrigation purposes, or to make any charge therefor, unless voluntarily called out by the owner or possessor of an adjudicated water right at the time of such call. Any commissioner or other person who shall wilfully swear falsely to any item in such bill shall be guilty of perjury. All bills for the distribution of water shall be transmitted by the water commissioner through his superior, the proper Irrigation Division Engineer, with the latter's recommendation to the State Engineer. If the Irrigation Division Engineer shall have any information or any reason to believe that any bill is not just, or has any reason to question the good faith of any bill, he shall investigate the same and report his conclusions to the State Engineer; or the State Engineer may at any time have an investigation of any bill before his approval, in a manner by him deemed most advisable in ascertaining the truth or correctness of such bill. The State Engineer shall examine all bills, and if he finds them correct he shall approve the same and transmit them to the State Auditor, who shall audit the same for payment in the usual manner. Nothing herein shall prevent the Auditor from disallowing or investigating the correctness or good faith of any bill.

Sec. 2. That section 1 of "An Act to amend section 42 (16), Chapter LVII of the General Statutes of the State of Colorado entitled 'Irrigation,' requiring the water commissioners to give bond in an amount to be fixed by the board of county commissioners, and providing for the Governor to fix the amount of such bond in the event that the county commissioners disagree thereon," shall be amended to read as follows:

Sec. 1. That section 42 of chapter LVII of the General Statutes of the State of Colorado, entitled "Irrigation," the same being general section 1752 thereof, be and the same is hereby amended so as to read as follows:

1752. Sec. 42. There shall be one or more water commissioners for each of the above named districts and for each district hereafter formed, who shall be appointed by the State

Engineer and shall be subject to removal or suspension from office at the will of the State Engineer, and the water commissioners so appointed shall, before entering upon his duties, give a good and sufficient bond for the faithful discharge of his duties with not less than three sureties in a sum not less than one thousand dollars (\$1,000), nor more than five thousand dollars (\$5,000), the amount of said bond to be fixed by the State Engineer and approved by him. The commissioner so appointed shall hold his office until his successor is appointed and qualified.

Sec. 3. All acts and parts of acts in conflict herewith are hereby repealed.

Sec. 4. In the opinion of the General Assembly an emergency exists; therefore, this act shall take effect and be in force from and after its passage.

The above bill for an act of the General Assembly in some respects does not meet my approval.

In the majority of water districts it will not be possible to retain the water commissioners unless the term of service is definitely fixed, and in that event the salary would better be per annum or month than by the day.

The water commissioner should be under the direct supervision and control of the irrigation division engineer, as to the duration of his service, the kind and amount of work he shall perform, subject to the approval of the State Engineer.

The duties of the water commissioner should not be confined to that of the distribution of water to decreed ditches, but should consist of any work appertaining to the office that may be assigned to him.

If the water commissioners are to be appointed by the State Engineer, there should be an examination authorized to ascertain the qualifications of the applicant, who, after appointment and giving bond, should not be removed from office except for good cause shown, or upon charges sustained by the State Engineer after a trial to the issues.

Below is a table giving the amounts received from the counties by the water commissioners and the total yearly salary received by the water commissioners in 1906. This table is approximately correct for 1908. This table was compiled from statements rendered this office by the various water commissioners and by the clerks of the various counties. A division of the water districts into classes is not a difficult matter.





PORTION OF CONCRETE FLUME ON HANDY DITCH, CROSSING DRY CREEK, SIX MILES WEST OF LOVELAND.  
LENGTH OF FLUME, 768 FEET. SIZE, 3 FEET BY 8 FEET. GREATEST HEIGHT ABOVE THE GROUND, 23 FEET.













GILPIN.....	Water District.....	No Water Commissioner.							
	Water Commissioner. Deputies.....	No. 36	No. 50	No. 51	No. 52	No. 53			
GRAND.....	Water District.....	No. 36	No. 50	No. 51	No. 52	No. 53			
	Water Commissioner. Deputies.....	No. 36	No. 50	No. 51	No. 52	No. 53			
GUNNISON.....	Water District.....	No. 40	No. 28	Bills presented by Water Commissioner and Deputies as county's 1-3 for district, but unpaid according to Water Com missioner.					District 38
	Water Commissioner. Deputies.....	No. 40	No. 28						\$ 111.25 1,119.17 \$ 1,230.42
HINSDALE.....	Water District.....	No Water Commissioner; called out in 1906 and refused to pay in 1905 on account of no benefit received.							
	Water Commissioner. Deputies.....								
HUERFANO.....	Water District.....	No. 16	This amount is only approximate, as there is no report from the County or the Water Commissioner. Pueblo Co. pays for $\frac{1}{2}$ the services of Water Com- missioner and Deputies, but data is not sufficient for accurate results.						\$1,506.50
	Water Commissioner. Deputies.....	No. 16							
JEFFERSON.....	Water District.....	No. 2	No. 6	No. 7	No. 8	No. 9	No. 23		\$2,456.33
	Water Commissioner. Deputies.....	No. 2	No. 6	No. 7	No. 8	No. 9	No. 23		



TABLE SHOWING AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS IN 1906.  
TAKEN FROM REPORTS RECEIVED FROM COUNTY CLERKS AND WATER COMMISSIONERS—Continued.

COUNTY	AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS AND DEPUTIES OF VARIOUS DISTRICTS										TOTALS
KIOWA	Water District.....	No Water Commissioner.									
	Water Commissioner.										
	Deputies.....										
KIT CARSON	Water District.....	No Water Commissioner.									
	Water Commissioner.										
	Deputies.....										
LAKE	Water District.....	No. 11									\$ 600.00
	Water Commissioner.	\$407.50									
	Deputies.....	142.50									
LA PLATA	Water District.....	No. 30	No. 31	No. 33	Water Commissioner of District 33 claims pay for 106 days' services, but received no pay. No Commissioner in District 31 and no report from District 30, nor the County Clerk.						
	Water Commissioner.										
	Deputies.....										
LARIMER	Water District.....	No. 3	No. 4	No. 5	No. 46	No. 47	No. 48				\$3,169.02
	Water Commissioner.	\$900.00	\$365.00	\$334.99	\$375.00	\$490.00	\$386.50				
	Deputies.....		50.00	253.36			14.17				

	Water District..... Water Commissioner. Deputies.....	No. 18 \$205.00 .....	No. 19 \$500.00 .....	No. 66 No Comm'r	County Commissioners appropriate certain amounts and refuse to pay more.	\$ 705.00
LAS ANIMAS.....						
LINCOLN.....	Water District..... Water Commissioner. Deputies.....	No Water Commissioner.				
LOGAN.....	Water District..... Water Commissioner. Deputies.....	No. 64 \$230.00 .....	..... ..... .....	..... ..... .....	..... ..... .....	\$ 230.00
MESA.....	Water District..... Water Commissioner. Deputies.....	No. 42 \$500.00 725.00	No. 70 \$342.50		Water Commissioner's bill in District 70 was for \$342.50, but only \$230.00 was paid at time of report pending investigation.	\$1,567.50
MINERAL.....	Water District..... Water Commissioner. Deputies.....	No. 20 \$199.39 82.73			..... ..... .....	\$ -282.12
MONTEZUMA.....	Water District..... Water Commissioner. Deputies.....	No. 34 \$145.00 .....			..... ..... .....	\$ 145.00

TABLE SHOWING AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS IN 1906.  
TAKEN FROM REPORTS RECEIVED FROM COUNTY CLERKS AND WATER COMMISSIONERS—Continued.

COUNTY	AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS AND DEPUTIES OF VARIOUS DISTRICTS							TOTALS
MONTROSE	Water District Water Commissioner Deputies	No. 40 \$406.56 689.28	No. 41 \$312.50 610.00	No. 60 \$118.75	No. 61 \$232.50	No. 68 \$182.50 144.75	Commissioner in District 68 not appointed until latter part of July.	\$2,696.78
MORGAN	Water District Water Commissioner Deputies	No. 1 \$268.83						\$ 268.83
OTERO	Water District Water Commissioner Deputies	No. 14 \$780.00	No. 17 \$576.62					\$1,356.62
OURAY	Water District Water Commissioner Deputies	No. 68 \$182.50 143.75	Without services of a Commissioner until September.					\$ 326.25
PARK	Water District Water Commissioner Deputies	No. 23 \$185.48 149.98						\$ 335.46

	No Water Commissioner.									
PHILLIPS.....	Water District.....									
	Water Commissioner.									
	Deputies.....									
PTKIN.....	Water District.....	No. 38								\$ 11 .25
	Water Commissioner.	\$111.25								
	Deputies.....									
PROWERS.....	Water District.....	No. 17	No. 67							\$1,258 .47
	Water Commissioner.	\$575.97	\$682.50							
	Deputies.....									
PUEBLO.....	Water District.....	No. 12	No. 14	No. 15	No. 16					About \$5,500.00
	Water Commissioner.	\$288.75	\$780.00	\$1,485.00	\$1,506.50					
	Deputies.....	252.25		1,187.50						
RIO BLANCO.....	Water District.....	No. 43	No. 44							\$ 350 00
	Water Commissioner.	\$350.00								
	Deputies.....									
RIO GRANDE.....	Water District.....	No. 20	No. 21							\$ 822.64
	Water Commissioner.	\$251.41	\$240.00							
	Deputies.....	136.23	195.00							







# TABLE SHOWING AMOUNTS RECEIVED BY WATER COMMISSIONERS AND DEPUTIES FROM THE COUNTIES IN 1906.

TAKEN FROM REPORTS RECEIVED FROM COUNTY CLERKS AND WATER COMMISSIONERS.

WATER DISTRICT		AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS AND THEIR DEPUTIES						TOTALS	TOTAL FOR DISTRICT
		County	Adams	Arapahoe	Elbert	Morgan	Washington	Weld	
No. 1	Water Commissioner		\$268 33	\$268 34	\$268 83	\$268 83	\$268 33	\$268 33	\$1,611 00
	Deputies								\$1,611.00
No. 2	Water Commissioner		Adams	Denver	Jefferson	Weld			\$1,825.00
	Deputies		\$456 25 133 75	\$456 25 260 26	\$456 25 133 75	\$456 25 133 75			\$2,486.51
No. 3	Water Commissioner		Larimer	Weld					\$1,800.00
	Deputies		\$900 00	\$900 00					\$1,800.00
No. 4	Water Commissioner		Boulder	Larimer	Weld				\$1,095.00
	Deputies		\$365 00 50 00	\$365 00 50 00	\$365 00 50 00				150 00
No. 5	Water Commissioner		Boulder	Larimer	Weld				\$1,005.00
	Deputies		\$335 00 101 66	\$334 99 253 36	\$335 00 101 66				456 68



No. 6	County..... Water Commissioner... Deputies.....	Adams \$265.00 101.87	Boulder \$265.00 96.87	Jefferson \$265.00 33.66	Weld \$265.00 96.87	..... ..... .....	\$1,060.00 329.27	\$1,389.27
No. 7	County..... Water Commissioner... Deputies.....	Adams \$232.00 100.50	Boulder \$232.00 100.50	Denver \$232.00 108.00	Jefferson \$300.00 108.00	Weld \$300.00 108.00	\$1,296.00 525.00	\$1,821.00
No. 8	County..... Water Commissioner... Deputies.....	Adams \$240.00	Arapahoe \$240.00 20.50	Denver \$261.00	Douglas \$261.00	Jefferson \$261.00	\$1,263.00 20.50	\$1,283.50
No. 9	County..... Water Commissioner... Deputies.....	Arapahoe \$387.26	Clear Creek Refuse to pay account no service rendered.	Jefferson \$416.67	.....	.....	\$ 803.93	\$ 803.93
No. 10	County..... Water Commissioner... Deputies.....	El Paso \$992.50 77.50	.....	.....	.....	.....	\$ 992.50 77.50	\$1,070.00
No. 11	County..... Water Commissioner... Deputies.....	Chaffee \$467.50 143.75	Lake \$467.50 142.50	.....	.....	.....	\$ 935.00 286.25	\$1,221.25

# TABLE SHOWING AMOUNTS RECEIVED BY WATER COMMISSIONERS AND DEPUTIES FROM THE COUNTIES IN 1906.

TAKEN FROM REPORTS RECEIVED FROM COUNTY CLERKS AND WATER COMMISSIONERS—Continued.

WATER DISTRICT		AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS AND THEIR DEPUTIES					TOTALS	TOTAL FOR DISTRICT
		Fremont	Custer	Teller	Pueblo	.....		
No. 12	County.....					.....		
	Water Commissioner...	\$230.50	\$230.50	\$288.75	\$288.75	.....	\$1,038.50	\$2,639.82
	Deputies.....	386.91	386.91	575.25	252.25	.....	1,601.32	
No. 13	County.....	Custer	Fremont	.....	.....	.....		
	Water Commissioner...	\$317.50	\$317.50	.....	.....	.....	\$ 635.00	\$ 875.84
	Deputies.....	120.42	120.42	.....	.....	.....	240.84	
No. 14	County.....	Otero	Pueblo	.....	.....	.....		
	Water Commissioner...	\$780.00	\$780.00	.....	.....	.....	\$1,560.00	\$1,560.00
	Deputies.....	.....	.....	.....	.....	.....		
No. 15	County.....	Pueblo	.....	.....	.....	.....		
	Water Commissioner...	\$1,485.00	.....	.....	.....	.....	\$1,485.00	\$2,672.50
	Deputies.....	1,187.00	.....	.....	.....	.....	1,187.50	
No. 16	County.....	Huerfano	Pueblo	.....	.....	.....		
	Water Commissioner...	\$1,506.50	\$1,506.50	Deputies' salaries included.	.....	.....	\$3,013.00	\$3,013.00
	Deputies.....	.....	.....	.....	.....	.....		

No. 17	County..... Water Commissioner... Deputies.....	Otero \$576.62	Powers \$575.97	Bent \$547.68	..... ..... .....	..... ..... .....	\$1,600.27	\$1,600.27
No. 18	County..... Water Commissioner... Deputies.....	Las Animas \$205.00	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... .....	\$ 205.00	\$ 205.00
No. 19	County..... Water Commissioner... Deputies.....	Las Animas... \$500.00	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... .....	\$ 500.00	\$ 500.00
No. 20	County..... Water Commissioner... Deputies.....	Costilla \$198.99 122.56	Mineral \$199.39 82.73	Rio Grande \$251.41 136.23	..... ..... .....	..... ..... .....	\$ 649.79 341.52	\$ 991.31
No. 21	County..... Water Commissioner... Deputies.....	Conejos \$240.00 195.00	Rio Grande \$240.00 195.00	..... ..... .....	..... ..... .....	..... ..... .....	\$ 480.00 390.00	\$ 870.00
No. 22	County..... Water Commissioner... Deputies.....	Conejos .....	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... .....		

TABLE SHOWING AMOUNTS RECEIVED BY WATER COMMISSIONERS AND DEPUTIES FROM  
THE COUNTIES IN 1906.

TAKEN FROM REPORTS RECEIVED FROM COUNTY CLERKS AND WATER COMMISSIONERS—Continued.

WATER DISTRICT	AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS AND THEIR DEPUTIES						TOTALS	TOTAL FOR DISTRICT
	County	Jefferson	Park	Teller				
No. 23	County							
	Water Commissioner	\$181.67	\$185.48	\$185.48			\$ 552.63	\$ 852.59
	Deputies		149.98	149.98			299.96	
No. 24	County	Costilla						
	Water Commissioner	\$434.00					\$ 434.00	\$ 434.00
	Deputies							
No. 25	County	Saguache						
	Water Commissioner	\$1,085.00					\$1,085.00	\$1,197.50
	Deputies	\$112.50					112.50	
No. 26	County	Saguache						
	Water Commissioner	\$1,050.00					\$1,050.00	\$1,537.50
	Deputies	487.50					487.50	
No. 27	County	Saguache						
	Water Commissioner	\$885.00					\$ 885.00	\$ 885.00
	Deputies							

No. 28	County..... Water Commissioner... Deputies.....	Gunnison \$ 37.50 .....	Saguache \$ 37.50 .....	.....	.....	.....	\$ 75.00	\$ 75.00
No. 29	County..... Water Commissioner... Deputies.....	Archuleta \$10.00 for 2 years. .....	.....	.....	.....	.....		
No. 30	County..... Water Commissioner... Deputies.....	La Plata ..... .....	.....	.....	.....	.....		
No. 31	County..... Water Commissioner... Deputies.....	La Plata ..... .....	.....	.....	.....	.....		
No. 32	County..... Water Commissioner... Deputies.....	Montezuma No Comm'r .....	.....	.....	.....	.....		
No. 33	County..... Water Commissioner... Deputies.....	La Plata Water Commi .....	.....	.....	.....	.....	County Comm issioners refuse to pay.	



TABLE SHOWING AMOUNTS RECEIVED BY WATER COMMISSIONERS AND DEPUTIES FROM  
THE COUNTIES IN 1906.

TAKEN FROM REPORTS RECEIVED FROM COUNTY CLERKS AND WATER COMMISSIONERS—Continued.

WATER DISTRICT		AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS AND THEIR DEPUTIES							TOTALS	TOTAL FOR DISTRICT
		County.....	Montezuma \$145.00	.....	.....	.....	.....	.....		
No. 34	Water Commissioner.....	.....	.....	.....	.....	.....	.....	.....	\$ 145.00	\$ 145.00
	Deputies.....	.....	.....	.....	.....	.....	.....	.....		
No. 35	County.....	.....	Costilla	.....	.....	.....	.....	.....	\$ 370.00	\$ 370.00
	Water Commissioner.....	.....	\$370.00	.....	.....	.....	.....	.....		
No. 36	Deputies.....	.....	.....	.....	.....	.....	.....	.....		
No. 36	County.....	.....	Grand	.....	.....	.....	.....	.....		
	Water Commissioner.....	.....	No Comm'r	.....	.....	.....	.....	.....		
No. 37	Deputies.....	.....	.....	.....	.....	.....	.....	.....		
	County.....	.....	Eagle	.....	.....	.....	.....	.....	\$ 505.00 25.00	\$ 530.00
	Water Commissioner.....	.....	\$505.00	.....	.....	.....	.....	.....		
No. 38	Deputies.....	.....	25.00	.....	.....	.....	.....	.....		
	County.....	.....	Eagle	.....	.....	.....	.....	.....	\$ 445.00	\$ 445.00
	Water Commissioner.....	.....	\$111.25	.....	.....	.....	.....	.....		
No. 38	Deputies.....	.....	.....	.....	.....	.....	.....	.....		
	County.....	.....	Garfield	.....	.....	.....	.....	.....	\$ 445.00	\$ 445.00
	Water Commissioner.....	.....	\$111.25	.....	.....	.....	.....	.....		
No. 38	Deputies.....	.....	.....	.....	.....	.....	.....	.....		
	County.....	.....	Gunnison	.....	.....	.....	.....	.....		
No. 38	Water Commissioner.....	.....	\$111.25	.....	.....	.....	.....	.....		
	Deputies.....	.....	.....	.....	.....	.....	.....	.....		
No. 38	County.....	.....	Pitkin	.....	.....	.....	.....	.....	\$ 445.00	\$ 445.00
	Water Commissioner.....	.....	\$111.25	.....	.....	.....	.....	.....		
No. 38	Deputies.....	.....	.....	.....	.....	.....	.....	.....		
	County.....	.....	.....	.....	.....	.....	.....	.....		

No. 39	County..... Water Commissioner... Deputies.....	Garfield \$160.00	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... .....	\$ 160.00	\$ 160.00
No. 40	County..... Water Commissioner... Deputies.....	Delta \$376.60 745.97	Gunnison \$406.67 675.00	Montrose \$406.56 689.28	..... ..... .....	..... ..... .....	\$1,189.83 2,110.25	\$3,300.08
No. 41	County..... Water Commissioner... Deputies.....	Delta \$312.50 610.00	Montrose \$312.50 610.00	..... ..... .....	..... ..... .....	..... ..... .....	\$ 625.00 1,220.00	\$1,845.00
No. 42	County..... Water Commissioner... Deputies.....	Mesa \$500.00 725.00	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... .....	\$ 500.00 725.00	\$1,225.00
No. 43	County..... Water Commissioner... Deputy.....	Rio Blanco \$350.00	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... .....	\$ 350.00	\$ 350.00
No. 44	County..... Water Commissioner... Deputy.....	Rio Blanco	Routt \$ 37.50	..... ..... .....	..... ..... .....	..... ..... .....	\$ 37.50	\$ 37.50



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TABLE SHOWING AMOUNTS RECEIVED BY WATER COMMISSIONERS AND DEPUTIES FROM  
THE COUNTIES IN 1906.

TAKEN FROM REPORTS RECEIVED FROM COUNTY CLERKS AND WATER COMMISSIONERS—Continued.

WATER DISTRICT	AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS AND THEIR DEPUTIES										TOTALS	TOTAL FOR DISTRICT
No. 56	No Water Commissioner											
No. 57	No Water Commissioner											
No. 58	County . . . . . Water Commissioner Deputies	Routt \$450.00									\$ 450.00	\$ 450.00
No. 59	No Water Commissioner											
No. 60	County . . . . . Water Commissioner Deputies	Montrose \$118.75	San Miguel \$ 97.50								\$ 216.25	\$ 216.25



No. 61	County..... Water Commissioner... Deputies.....	Montrose \$232.50	San Miguel \$232.50	..... ..... .....	..... ..... .....	..... ..... .....	\$ 465.00	\$ 465.00
No. 62	County..... Water Commissioner... Deputies.....	Gunnison Water Commissioner not called out in 1906.	Hinsdale	Montrose	Ouray Was out 71 days in 1905. Hinsdale County	..... ..... .....	refused to pay its proportion.	
No. 63	No Water Commissioner							
No. 64	County..... Water Commissioner... Deputies.....	Logan \$230.00	Sedgwick \$230.00	Washington \$230.00	..... ..... .....	..... ..... .....	\$ 690.00	\$ 690.00
No. 65	County..... Water Commissioner... Deputies.....	Yuma \$185.00	..... ..... .....	..... ..... .....	..... ..... .....	..... ..... .....	\$ 185.00	\$ 185.00
No. 66	No Water Commissioner							

TABLE SHOWING AMOUNTS RECEIVED BY WATER COMMISSIONERS AND DEPUTIES FROM  
THE COUNTIES IN 1906.

TAKEN FROM REPORTS RECEIVED FROM COUNTY CLERKS AND WATER COMMISSIONERS—Concluded.

WATER DISTRICT		AMOUNTS PAID BY COUNTIES TO WATER COMMISSIONERS AND THEIR DEPUTIES						TOTALS	TOTAL FOR DISTRICT
		County	Bent	Prowers					
No. 67	County Water Commissioner Deputies		\$682.50	\$682.50				\$1,365.00	\$1,365.00
No. 68	County Water Commissioner Deputies		Montrose \$182.50 144.75	Ouray \$182.50 144.75	Commissioner not appointed	until latter part of July.		\$ 365.00 289.50	\$ 654.50
No. 69	No Water Commissioner								
No. 70	County Water Commissioner Deputies		Garfield \$342.50	Mesa \$342.50	Mesa Co. suspended payment on \$112.50 pending investigation.			\$ 685.00	\$ 685.00



REINFORCED CONCRETE DROP. COMANCHE CANAL, WATER DISTRICT NO. 67. FOUR HUNDRED SECOND FEET  
OF WATER PASSING.



## IRRIGATION DISTRICTS.

Since the last report from this office some of the irrigation districts that were approaching completion have begun the operations for which they were formed, and the results attained were deemed of sufficient importance to receive mention in this report. With this object in view, a visit was made by an employe of this office to the districts along the South Platte river and his report is as follows:

## JULESBURG IRRIGATION DISTRICT.

This district comprises about 22,900 acres, of which about three-fourths is under cultivation. Work on the project was begun in October, 1904, the contractor being D. A. Camfield of Greeley. The contract price was \$390,000, payable in district bonds. The entire bond issue is \$465,000, issued in two lots of \$450,000 and \$15,000.

The officers of the district are Bert Davis of Sedgwick, president; E. J. Frederick and C. C. Saunders, directors; and C. M. Harris of Julesburg, secretary. The district has one reservoir with a capacity of 1,255,000,000 cubic feet. It has never been completely filled, about 800,000,000 cubic feet being turned into it for the season of 1908. This amount was considered sufficient to meet all demands, after the first water was turned out, beginning July 21. A steady flow of water was kept up from that date till October 15, when it was shut off, with about four days' supply still on hand.

The district was fortunate at the beginning in having acquired two old ditches, the Settlers and Peterson ditches, with good dams and headgates, thus supplying a large part of its acreage with water direct from the river. Considerable trouble was experienced from the beginning of operations with the reservoir and the intake and outlet ditches. The intake ditch is nineteen and one-half miles in length and the outlet twenty-four miles long. The former ditch has been considered too narrow by some parties in the district, but is now taking in water at the rate of about 300 cubic feet per second without trouble.

About one and one-half miles of the new High Line ditch contains a series of twelve 8-foot drops. Originally these drops were of wood, but they proved a complete failure and have since been replaced by concrete drops, which have been successful, with one exception. The use of rip-rap of stones for the reservoir embankments also proved a failure, it being necessary to replace the rip-rap on one long fill with cement facing at a cost of \$13,000. The entire district has about 107 miles of ditches.

The total cost per acre per annum since the district was formed has been about \$2.40, including maintenance, interest and repairs. Next season it is anticipated that the cost will be about \$2.00. The operations of the district have been only fairly suc-



cessful up to the present time, owing to the necessity for so much repair work, but it is believed that the project is now under better control and from now on will furnish water without difficulty during each irrigation season. The original cost price of construction work was lower in this district than in some others, but the repair work has been heavy. Sixty-five thousand dollars' worth of bonds were turned over by the district to the Peterson Canal and Reservoir Company for its ditch and \$18,000 was paid for the Settlers ditch.

#### NORTH STERLING IRRIGATION DISTRICT.

This project has not yet been started, although the plans and specifications are now being completed and the contract is about to be let. C. W. Johnson, of Crook, is president of the board of directors, Arthur G. Buchanan and H. Herbert White being the other members of the board. W. B. Giacomini, of Sterling, is secretary.

It is proposed to irrigate 80,000 acres in this district. Of this acreage about 50,000 acres will be deeded land, 7,000 acres State land, to be sold or leased at a rental of one and one-half times per acre the cost to deeded lands, and approximately 18,000 acres of desert land. This latter land will have to be included in the district under some special arrangement yet to be devised, as either the land must be obtained outright from the government before it can obtain water rights, or the water rights must be obtained before the government will relinquish it. The legal question involved is a disturbing one, but it is thought it can be overcome in some way so the land may be included.

It is proposed to bond the land at about \$26 per acre, making the entire issue about \$2,080,000.

The amount of the bond issue was fixed by Camfield & Shields, the probable contractors, who made the second survey.

Saturday, November 21, the bond issue of \$2,080,000 was voted upon. Only 18 votes were recorded, out of 36 or 37 qualified voters living within the district. All votes were favorable, but the question was raised as to whether there was an actual majority, and the proposition is to be voted upon again in a few weeks.

The proposed construction price under consideration is said to be \$1,580,000, this being fixed on the survey made by L. L. Stimson for Camfield & Shields, the probable contractors. Two years interest will be assumed by the contractor and a special price of 75 cents for rock work has been agreed upon. The contractors are to be paid in bonds, to be purchased from the district at 95 cents on the dollar. The new survey is said to cover 10,000 more acres than the first.

It is proposed to irrigate the entire district by one reservoir. Fifty thousand dollars in bonds is to be paid to the promotion company from which certain rights were acquired. The two years' interest to be assumed by the contractor amounts to about

\$250,000. The capacity of the reservoir will be about 81,000 acre feet, or 3,500,000,000 cubic feet. It is estimated that this capacity will successfully irrigate the 80,000 acres in the proposed district.

The proposed intake ditch is 61 miles in length and the outlet ditch is of the same length. The capacity of the former outlet ditch was 530 cubic feet and the one now practically agreed upon will have a capacity of 919 cubic feet. The site of the reservoir will be about 12 miles north and west of Sterling, the land to be irrigated paralleling the Union Pacific railroad.

Mr. S. A. Naugle, attorney for the irrigation district, and Mr. Johnson of the board of directors, state that a definite contract will be entered into with the contractors and a close check made upon their survey. They have inquired into the construction work in the Julesburg and other districts and say they do not intend to take up the project except on very definite terms. They consider the bonding of the land at \$26 per acre a safe amount.

#### BIJOU IRRIGATION DISTRICT.

There are about 27,000 acres in this district at present, but this acreage will be increased to 35,000 as soon as certain desert land has proved up. The district was organized in April, 1905, and has had trouble from the start. The original directors were W. B. Chapman, president, A. D. Bennett and John L. Odell. The present directors are John Odell, president, Thomas S. Work and Thomas S. Grace. Odell's term expires this year and a new man may be elected in his place. Repeated charges of incompetence have been made against the directors and about 93 landowners in the district asked them to resign, but they refused to do so.

The contract for this project was let by the district to Camfield & Shields March 9, 1906, to be finished by December, 1906. The contract price was \$535,000, to be paid in bonds, the entire bond issue being \$750,000.

About 27,000 acres now in the district is deeded land, extending from near Fort Morgan to about 18 miles northwest and 7 miles south. This is said to be good land, capable of cultivation when water is applied to it. The additional 8,000 acres to be included in the district is government desert land, still to be proved up. The cost per acre last year for interest, maintenance and repairs was \$2.33 per acre.

The land owners of the district had a fair water supply, direct from the river for the season of 1907, but last season were practically without water when it was most needed. Neither the Bijou nor the Empire reservoirs had storage water on hand, neither being in a condition to take it at the proper time. The Bijou reservoir had been having seepage trouble at its outlet and the Empire reservoir did not have a proper waste gate. Up to the present writing (December 4, 1908) these reservoirs have not been brought to a sufficient state of repairs to take in water, the reason alleged being incompetent management, which failed to recognize the requirements and get the reservoirs in proper shape.

Both the Bijou and Empire reservoirs have experienced serious seepage troubles, owing to the sandy character of the soil in which they were constructed. This condition will undoubtedly continue for some time, but those familiar with the situation state that in time the sediment from flood waters will overcome the seepage and the reservoirs will regulate themselves. Residents of the district do not regard the reservoirs as a failure and state that with proper management the district will eventually prove a success. The capacity of the Bijou reservoir, when completed, will be 500,000,000 cubic feet; the capacity of the Empire reservoir when completed will be 2,000,000,000 cubic feet. This latter reservoir might have been filled last year but for a break in a cut, which took a month to repair. As it was only about 18 feet of water was taken in, which was almost entirely lost in seepage.

Crops in the Bijou district were very poor during the past season, though a few farmers did fairly well with beets.

Mr. Galway Layton of Fort Morgan, is secretary of the district. He said he believed it would be well to have some provision in the law by which reports would be made to the State Engineer or some other county or State official, showing conditions in the districts, financial and otherwise.

#### RIVERSIDE IRRIGATION DISTRICT.

The officers of this district are M. S. Richeson of Orchard, president; Frank W. Smyley of Masters and Archie H. Young of Snyder.

The reservoir and ditches were constructed to irrigate about 60,000 acres of land, but there are only about 40,000 acres in the district at present. Four-fifths of this is desert land, some good and some poor. As fast as government land is being proved up it is being included in the district. The capacity of the reservoir is 2,520,000,000 cubic feet. The inlet ditch, which is 11 miles long, has a capacity of 400 cubic feet per second; the outlet ditch is 104 miles long. Camfield & Shields were the contractors.

There are  $4\frac{1}{2}$  miles of dams, 36 feet high at the highest points. These dams are surfaced on the inside with reinforced concrete, 5 inches thick. This concrete extends above the dams in a parapet 14 inches above the crown. This form of construction was adopted to prevent any breaks that might be caused by wave action.

The contract was let by the district May 31, 1907, and was completed the following November, DeReemer & Olson doing the construction work for the contractors. The contract price was \$717,500, payable in district bonds, the bond issue being \$747,500. The bonding per acre is about \$93 at the present time, but when the entire acreage is included it will be about \$18.60 per acre.

The entire storage capacity of the reservoir and ditches was not taken over by the Riverside irrigation district. The district owns 1,201 out of a total of 2,400 rights. Individuals and the Riverside Reservoir & Land Company, of which D. A. Camfield



is president, own the remaining 1,199 rights. The reservoir company expressly maintains control of the reservoir and inlet and outlet ditches, this being a feature of the contract entered into May 31, 1907:

"The party of the first part (The Riverside Reservoir and Land Company) agrees to keep and maintain the inlet ditch to said reservoir and all outlet ditches therefrom, including waste-ways and other works, in good order and condition at all times up to the capacity required for the water rights then sold and outstanding, and shall operate the same, and in case of accident to said reservoir, or the inlet or outlet ditches thereto or therefrom, to repair the same as soon as practicable and expedient, and for such maintenance, repairs and operation, the party of the second part shall annually pay to the party of the first part, on or before the first day of May of each year, an assessment of not more than \$7.50 on each water right, and no further or other charge shall be made under this agreement for the carriage, storage and delivery of said water rights into the South Platte river, provided always that the installments and assessments on this water right in the said reservoir shall be paid when due, according to the terms of this contract and the by-laws and regulations of said company."

The Riverside irrigation district eventually expects to include a large acreage of government land when it has been proved up and held in freehold. An agreement was entered into with the parties who have entered upon this land whereby they will be included in the district as soon as their lands have been proved up, but until that time they are to pay as much per year per acre as though their lands were held in freehold. The bond issue, however, can act only as a lien upon the deeded lands of the district.

#### SAN ARROYO IRRIGATION DISTRICT.

This district is just preparing to begin work, the contract being let to W. S. Abbott of Fort Morgan. J. E. Youngquist is the engineer employed by the district. The officers of the district are Walter Brandes, president; E. Burns and George Glenn. W. A. Dregman of Fort Morgan, is secretary.

The reservoir to be constructed will have a capacity of 750,000,000 cubic feet. It is to be filled by flood waters from San Arroyo creek, impounded by a dam across the bed of the creek. The creek itself is to be utilized for inlet and outlet purposes, and the reservoir will depend on a natural spillway.

The contract price for the work is \$225,000, to be paid for in district bonds, the total issue already voted being \$235,000, a bonding of about \$15 per acre. The contract is to be completed 18 months from September, 1908, 16,000 acres being the total area to be irrigated. Two priority rights will be bought by the district, but its chief supply will be flood waters. The district is located between Fort Morgan and the town of Vallery, eight miles west. About half the land is deeded and the other half government land.

## BADGER CREEK IRRIGATION DISTRICT.

This district is now being formed and will be a flood water proposition irrigating some 12,000 acres of land 14 miles south of Fort Morgan. Half the land to be included in the district is deeded, the other half government land. The capacity of the proposed reservoir will be 432,000,000 cubic feet, the beds of Badger and Beaver creek to be utilized for ditches. It is proposed to bond the district for about \$15 per acre.

## NILES IRRIGATION DISTRICT.

This irrigation district, upon which work is to start soon, will include about 55,680 acres. Thirty thousand acres of this are smooth land of good quality, the remainder being mostly desert land to be proved up later. The contractor has not yet been decided upon, though figures are being made. The bonds, amounting to \$700,000, were voted last August.

The district is located about 16 miles west of Fort Morgan, extending twenty miles south, laying north and south of the town of Wiggins. The officers of the district are E. E. Morse, president; J. D. Mowry and V. A. Clem, all of Wiggins. John Myers of Wiggins is secretary.

Two reservoirs will be constructed with a capacity of 600,000,000 cubic feet. The intake ditch, leading from Bijou creek, will be two miles long, the two reservoirs to be connected, with a distributing ditch from each. The intake ditch is to be built 100 feet across the bottom. The water supply will be almost entirely from flood waters coming down Bijou creek.

## FORT MORGAN IRRIGATION DISTRICT.

The officers of this district are J. P. Curry, president, M. E. Barnes and F. M. Balser, all of Fort Morgan. L. C. Baker of Fort Morgan, is secretary. The district, which comprises about 12,500 acres, lies south and east of Fort Morgan, between the Platte river and Beaver ditch. It is supplied with storage water from Jackson Lake, which was built in the early '80's and has been a very successful reservoir.

The Fort Morgan district owns 850,000,000 cubic feet from Jackson Lake, which has a total capacity of 1,550,000,000 cubic feet. In addition, the farmers of the district own individually 150,000,000 cubic feet, giving the district control of the lake. The balance of the supply in Jackson Lake is owned by the Upper Platte and Beaver ditches.

The Fort Morgan district was organized in 1903 and was about one year in course of construction, the bond issue being \$170,000. The contractors, Camfield & Shields, who with the South Platte Land & Reservoir Company, built Jackson Lake, were paid in bonds for the rights acquired by the district, the bonding price per acre being about \$13.60. The land under the district is



all deeded land and has been successfully cultivated since the district was organized.

#### HILLROSE IRRIGATION DISTRICT.

This district, which is also supplied from Jackson Lake, was organized in 1905. It owns about 200 rights, or approximately 190,000,000 cubic feet per year. In addition, the individuals in the district own about 500 floating rights, which are supplied by the Lower Platte & Beaver Canal Company.

The original and only issue of bonds made by the district was \$70,000, most of which were paid over to acquire the rights named. The district comprises about 11,000 acres of good land, the officers being C. I. Colwell, president; E. C. Coffin and Henry Richers, all of Hillrose. D. D. Monroe of Hillrose is secretary. The water supply of this district has been good, the beet crop last season, which was an off year, averaging about 14 tons per acre.

#### GREEN CITY IRRIGATION DISTRICT.

The officers of this district are John T. Warren of Greeley, president; Steward Sanford and A. V. Warner. It is a small district of about 2,400 acres, located on the south side of the Platte river, south of Masters, under the upper end of the Bijou ditch. Its water supply consists of 20 rights in the Bijou ditch, supplemented by 83,000,000 cubic feet out of the Riverside reservoir. To effect this supply the reservoir discharges the water into the river and supplies early priorities on the river below and then takes water belonging to those priorities at the upper end of Bijou ditch for the Green City district. The district has been successful since its organization.

#### HENRYLYN IRRIGATION DISTRICT.

The officers of this district, recently organized, are Clarence M. Ireland, president, of Hudson; Newton Bowles, of Brighton, and Frank A. Hensley, of Hudson. It comprises about 100,000 acres of land, lying principally south of and along the Burlington railroad, from a little west of Hudson to a point as far east as Roggen, in Adams and Weld counties. About 50 per cent. of the land is deeded and the balance desert land. Much of the land is level and fertile, with a deep loam soil.

This district, which is one of the most ambitious yet organized in Colorado, has voted \$3,000,000 in bonds for the purpose of constructing a large water system for the irrigation of its great area. The contract has not been let, but estimates have been received and it is probable that the Parker-Washington Construction Company of Chicago, will be the contractors.

It is proposed to secure permanent water supply from Williams Fork of the Grand river, McQuery creek, Stellman creek and other tributaries of the Grand on the western slope of the continental divide; also from Clear creek and the South Platte river on the eastern slope. In addition it is proposed to take

flood waters from Lone Tree creek, Horse creek, Lost creek, Jim creek and Kiowa creek. It is planned to construct a series of collection ditches on the western slope and a tunnel tapping the divide, 14,860 feet in length, through which these waters will be discharged into Clear creek. The water is then to be carried down this stream about five miles from the mouth to a ditch to be constructed from there into the Platte river; to be discharged into the last-named stream at a point a few hundred feet above the gate of the Burlington ditch, located at the corner of Riverside cemetery, near Denver. From here the Denver-Hudson canal is to be constructed leading to the lands of the district. The water so brought from the western slope is to be applied to the land directly and also to be stored in a chain of reservoirs having an aggregate storage capacity of 60,000 acre feet. These reservoirs, four in number, are to be known as the Bootleg, Hudson, Lost creek and Jim creek reservoirs, and will also be fed by flood waters from the streams above named.

It is estimated that the land in the district will well repay the bonding price of about \$30 per acre, and numerous engineers have given their opinion that 125,000 acre feet of water will be obtainable for irrigation purposes in the manner outlined.

#### GREELEY-POUDRE IRRIGATION DISTRICT.

This district is being organized by a company of which D. A. Camfield of Greeley, is president. C. F. Tew of Greeley, is attorney for the company. It is proposed to take over an irrigation proposition partly under way by the Laramie-Poudre Reservoirs & Irrigation Company.

About 100,000 acres of land will be included in the district, extending from the towns of Pierce and Nunn on the Union Pacific railroad eastward to Crow creek. About 75 per cent. of the land is deeded, the remaining 25 per cent. being government land, the area varying somewhat in quality but comprising much land of fine quality.

The proposed water supply is to be obtained from the Cache La Poudre, the north fork of the Cache La Poudre and the Laramie river in Colorado. It is proposed to conduct the water by means of a tunnel 15,000 feet in length, through the Laramie-Poudre divide. Water is also to be obtained from McIntyre river, Ranch creek, Mill creek, Spring creek, Fall creek, Rapid creek, West Fork, East Fork, Porter creek, Brinker creek, Nunn Creek, Dead Man creek, living streams on the western side of the divide. Flood water is to be stored in a system of reservoirs having an aggregate capacity of about 5,000,000,000 cubic feet, the reservoirs being Link lakes, Laramie river reservoir, East Fork reservoir, Panhandle reservoir, Mitchell lakes, Douglas lakes, Cobb lake, Eastman lake and reservoirs Nos. 5, 6, 7 and 9. Some of these reservoirs are already in existence and will be enlarged.

It is proposed to issue bonds in the sum of \$4,000,000, \$40 per acre, and a petition has been already partly circulated in the proposed district. About 100 miles of ditch will be built.

#### CONCLUSIONS.

Sufficient time may not have elapsed from which to judge the operation of these districts, and what may properly be expected from them. The difficulties that have been overcome by the first year's operations were not confined solely to those to be expected in bringing the area into cultivation, but were greatly increased by the temporary character and insecure methods of constructing the works of the irrigation system. Even at this early stage renewals and repairs have been found necessary necessitating an additional expenditure of money to bring them to a condition of usefulness, and so the farmers could derive some benefit from them.

From the great prices paid for the amount and class of work done for the districts it is reasonable to expect that the system should be completed and be in good working order for the uses and purposes of storing and distributing water when it is turned over to the district, but in some instances the district has been deprived of water on account of the mistakes discovered when the water was first turned through the canals, due to the inattention given to constructive details.

A great many letters have been received from persons making inquiry regarding the essential elements of an irrigation district, the water supply, the cost of maintenance, annual assessments, duty of water, etc., which cannot be answered from data in the office, as the law does not require the directors of an irrigation district to file a report of their proceedings, or any financial report in any office, except the office of the district.

The recommendations heretofore made as to proposed amendments to the law are herein renewed, and special attention is directed to the suggested mode of procedure to be found on pages 22-23 of the 13th biennial report.

The above report recites that irrigation districts have been formed, or are now proceeding with their formation, involving the issue of bonds to the amount of \$10,000,000.

In view of this great amount of bonds to be issued, which are to be presented to the public for purchase and investment, it is my opinion that the interest and credit of the State are involved, and it should protect its citizens against any possibility of a failure of any enterprise initiated under the provisions of its laws, to which end an examination and report should be made by the State Engineer upon the questions.

1st. The permanency and adequacy of the water in the source of supply, for the full irrigation of the lands in the district, so as not to include any more land than the supply of water obtainable will be sufficient for its proper irrigation, and



so as to reduce to a minimum the prorating or rotation provision of the statute.

2nd. The feasibility of the project, which would also include the capacity of the proposed works of the reservoir, ditches and laterals, as to their adequacy to impound or carry the volume of water necessary for the irrigation of the land included in the district; also the design and material used in construction of the structures appurtenant to the system, together with an estimate of cost of the entire system, showing that a reasonable expenditure will be sufficient for all the purposes of the district and upon which the bond issue is to be based.

If this information was obtained and the report made by an official of the State it would place the bonds upon a much more favorable basis, attract the attention of bond houses and probably secure the sale of the bonds at the price mentioned in the Statute, for cash.

The act of 1905 limits the land that may be organized into an irrigation district to that held by a fee title, and states (sec. 17 Act. 1905): "Said bonds and the interest thereon shall be paid by revenue derived from an annual assessment upon the real property of the district, and the real property of the district shall be and remain liable to be assessed for such payments as herein provided."

It would appear from this report that a large area of government land is included within the boundaries of the districts, this land being held under homestead and desert land filings.

In some, probably most, instances an agreement between the district and entryman is entered into, covering a stipulation that the entryman will do and perform all acts required by law and will make final proof as soon as it is possible to do so; that the agreement shall be taken as a petition to the Board of Directors of the district to include their lands in the district as soon as the lands may become eligible under the law; that the lands shall be considered as a part of the district, and receive water for irrigation in like manner as lands held in freehold, and to same amount, and that payments will be made to the secretary of the district of the same sum of money for taxes and expenses as would be paid if the lands were held in freehold, and until the lands are held in freehold.

I would recommend that the attention of the legislature be directed to this method of including land in an irrigation district formed under the acts of 1905, with the purpose of having an examination made thereof by a proper committee, to the end if found in compliance with the statute, that appropriate amendments may be made to the law so as to include such land within the district without an agreement with every individual entryman having a homestead or desert land filing.

Since the publication of the last biennial report there have been seven new irrigation districts formed. These seven districts have voted a total bond issue of \$7,047,000 on 249,000 acres of land. The amount of bonds sold is \$1,670,000.

Below is a tabulated list of the irrigation districts formed in this state, together with pertinent information concerning them:

NAME OF DISTRICT	Date of Organization	Name and Address of Secretary	Bonds Voted	Bonds Sold	No. acres of land proposed to irrigate	No. acres of land previously irrigated	No. acres of land to be Reclaimed	Votes cast in election for organization
Bent and Prowers	July 23, 1906	A. E. Downer, Lamar	\$1,300,000	None	75,000	None	75,000	20
Bijou	July 1905	Galway Layton, Fort Morgan	750,000	\$700,000	40,000	3,000	37,000	25
Fort Morgan	1904	L. C. Baker, Fort Morgan	178,000	178,000	12,500	12,500	None	43
Grand Valley Irrigation District No. 1	Oct. 26, 1903	H. E. Wagner, Fruita	585,000	None	30,000	1,000	29,000	23
Grand Valley Irrigation District No. 2	Jan. 20, 1904	H. J. Pomroy, Palisade	180,000	None	5,160	None	5,160	12
Green City	June 19, 1906	E. E. Moore, Masters	46,000	40,000	2,000	None	2,000	12
Henrylynn	Oct. 8, 1907	J. H. Ledgerwood, Hudson	3,000,000	None	100,000	None	100,000	42
Hillrose	Feb. 20, 1905	D. D. Monroe, Hillrose	70,000	70,000	12,000	12,000	None	30
Julesburg	July 1904	E. J. Fredricks, Julesburg	465,000	465,000	22,500	7,500	15,000	21
Mesa County	Jan. 12, 1906	R. H. Bancroft, Palisade	100,000	100,000	2,600	100	2,500	15
Montezuma Valley	Dec. 7, 1901	W. F. Mowry, Cortez	795,000	795,000	50,000	15,000	35,000	59
Nile	July 20, 1908	John Myers, Wiggins	700,000	None	13,000	None	13,000	10
North Sterling	Feb. 25, 1907	W. B. Giacomini, Sterling	1,400,000	50,000	70,000	None	70,000	27
Orchard Mesa	Mar. 18, 1904	E. E. Ullock, Grand Jet	900,000	840,000	12,000	800	11,200	81
Otero	1902	Geo. A. Kilgore, La Junta	500,000	460,000	20,000	4,000	16,000	30
Palisade	Oct. 31, 1904	R. H. Bancroft, Palisade	160,000	160,000	5,600	2,800	2,800	141
Park Creek Irrigation District	Sept. 24, 1908	R. Q. Tenney, Fort Collins	72,000	None	5,000	None	5,000	9
Riverside	Mar. 11, 1907	L. W. Beem, Orchard	740,000	720,000	40,000	None	40,000	35
San Arroyo	June 30, 1908	W. A. Dregnan, Fort Morgan	235,000	None	14,000	700	13,300	11
TOTALS			\$12,351,000	\$4,578,000	534,860	59,640	475,220	



## CO-OPERATION WITH THE UNITED STATES.

The United States Geological Survey, Water Resources Branch, has operated and maintained gaging stations on the main streams and tributaries throughout different sections of the State for the past twenty years.

The interest taken in irrigation and power development is evidenced by the great number of filings made in this office for reservoirs, dams, canals, pipe lines, etc., and a number of enterprises of great magnitude are now under construction.

It is manifest that it is of great importance to secure reliable data concerning the stream flow at all seasons of the year.

The hydrographic work done in past years has been chiefly confined to the months of April to November, the object being to furnish information primarily for irrigation purposes, but for power development a knowledge of the winter flow is required, as it is also for storage purposes, and thus thorough and reliable information of the same is essential.

The value of stream gagings depends very largely upon continuous records, extending over a sufficient number of years to cover the conditions affecting the stream flow, and the longer the time, the more valuable the records become.

The cost of obtaining these data to the United States Geological Survey expended in the State of Colorado has been more than \$60,000, and the direct value to the State has been almost beyond calculation.

The dry and intermittent streams of the plains and foothills are now being considered by irrigation companies as a source of supply for storage reservoirs. This is the class of streams upon which practically no records have been taken, and it is quite necessary that they be taken up at once.

Such records, however, involve the expenditure of considerable money, as compared with similar records in more constant streams. In connection with the stream gagings precipitation records should be kept at many places on the watershed above the gaging stations, so that the percentage of the rainfall (and snowfall) which runs off may be determined, and the value of these data will depend upon the length of time the observations are maintained.

This department has assisted the Water Resources Branch of the United States Geological Survey during the past two years in paying the salaries of the station observers, the traveling expenses of the district engineer and assistants and furnishing transportation, and by these expenditures has helped maintain a number of the gaging stations which otherwise would have been discontinued.

A topographic map is essential as a basis for the representation of the nature and resources of the State, and one is being

prepared by the United States Geological Survey, continued from year to year. Such a map is very necessary to the rapid development of its area. There are still large areas of land requiring irrigation, and in order to intelligently reclaim this land topographic maps must be made to show its location, as well as where the water may be secured to irrigate it.

In certain sections of the State the limit of the lands that can be brought under irrigation is nearly reached, unless storage reservoirs can be found on the streams above, and these can only be found economically by having a topographic map, covering the watersheds. It may be possible to find feasible routes for bringing the abundant water supply from the western slope to the arid lands of the eastern slope, when the intervening divide has been completely mapped.

For the development of the mining interests of the State good topographic maps are essential for the prospector to locate his prospect, to show the distance of the same from railroads, where power may be developed for the treatment of the ore, and as a base map for a geologic report on the district. Such a map is also very valuable to the prospector in securing capital to develop his claim, as with such a map in Boston and New York he could explain the conditions as well as on the ground.

The water supply of the State of Colorado is becoming more valuable every year, and in order to develop it to the best advantage maps of large areas should be made, in order to determine the fall of streams, show where reservoirs may be constructed for storage, and to indicate where power may be developed, and the distance to the point of its utilization. In this connection, it might be well to mention that the development of cheap power for pumping purposes is likely to play a very important part in the extension of the irrigated areas.

The question of good roads is becoming more important everywhere, and for the laying out of new roads and improving the grades and straightening the old ones, the topographic map is of the greatest assistance.

The following is a statement of co-operation during the year 1908-9:

Maine .....	\$ 2,500	Iowa .....	1,750
New York .....	8,000	Michigan .....	1,000
Pennsylvania .....	12,000	Missouri .....	1,000
Maryland .....	4,000	Kentucky .....	3,000
West Virginia .....	12,000	Ohio .....	19,000
North Carolina .....	2,500	California .....	12,000
Virginia .....	1,750	Oregon .....	2,500
Mississippi .....	9,000		
Illinois .....	8,000	Total.....	\$100,000

The conditions of co-operation are that the State funds only become available on condition that there is an equal amount

expended from the federal appropriation on the work within the State. The work is executed entirely under the direction of and by the United States Geological Survey, in conformity with an agreement entered into with the State, and so far as practicable the temporary assistants engaged in the work are residents of the State.

Co-operation on the part of any state insures the more rapid completion of the mapping of its area, and the absolute certainty of securing the best maps possible at one-half the expenditure, or less, than the work could be done by the state independently.

It might be well to quote an extract from the report of the State Board of Examiners to the thirty-seventh session of the legislature of California:

"The importance of this topographic work can not be overestimated. Only through co-operation can California hope to make this work uniform and obtain quickly the best results. Through the fact that state money is appropriated, California received full allotment this year. Whereas other states and localities not making appropriations were cut down to a mere existence basis. The stoppage or uneven continuation of such work as this seriously depletes its value. The increasing demand for results and information along these different lines of investigation attests to the usefulness and necessity of such a policy."

On July 1, 1908, approximately 39,000 square miles, or 37 per cent., of the area of the State of Colorado had been mapped by the United States Geological Survey, leaving approximately 65,000 square miles still unsurveyed.

The funds available by the United States Geological Survey are insufficient for the collection of all these data and performing the necessary work, and in order that the State should obtain the benefit of an increased expenditure by the general government for these purposes, it is necessary that co-operation should exist between them.

Such co-operation has been arranged under specific appropriations by several states in the West, and through contracts made with the United States Geological Survey and the local authorities, providing for the various kinds of work and suitable representation and credit to the State authorities.

I would recommend a liberal appropriation, and provide for a like sum by the general government, as by these means a larger sum is available, and by this combination much more can be accomplished, and the results should be satisfactory.

#### CONFERENCE ON THE CONSERVATION OF NATURAL RESOURCES.

By your appointment and accompanying you as one of your conferees, I had the honor and great pleasure of attending the Conference on the Conservation of Natural Resources, held in



the White House, May 13-15, 1908, on invitation of the President, to the Governors of the States and Territories of the United States, as well as to many other distinguished persons, including members of the Cabinet, Judges of the Supreme Court, senators, representatives, presidents of universities, colleges, societies, associations, institutes, trades unions and others.

The President opened the conference by delivering an address to the Governors, saying in part:

"Governors of the several States, and Gentlemen:

"I welcome you to this conference at the White House. You have come hither at my request so that we may join together to consider the question of the conservation and use of the great fundamental sources of wealth of the Nation. So vital is this question, that for the first time in our history the chief executive officers of the States separately, and of the States together forming the Nation, have met to consider it. Nature has supplied to us in the United States, and still supplies to us, more kinds of resources in a more lavish degree than has ever been the case at any other time or with any other people. Our position in the world has been attained by the extent and thoroughness of the control we have achieved over nature, but we are more, and not less, dependent upon what she furnishes than at any previous time of history since the days of primitive man.

"The wise use of all our natural resources, which are our national resources as well, is the material question of to-day. I have asked you to come together now because the enormous consumption of these resources, and the threat of imminent exhaustion of some of them, due to reckless and wasteful use, once more calls for common effort, common action.

"The Nation began with the belief that its landed possessions were illimitable and capable of supporting all the people who might care to make our country their home; but already the limit of unsettled land is in sight and indeed but little land fitted for agriculture now remains unoccupied save what can be reclaimed by irrigation and drainage. We began with an unapproached heritage of forests; more than half of the timber is gone. We began with coal fields more extensive than those of any other nation and with iron ores regarded as inexhaustible, and many experts now declare that the end of both iron and coal is in sight.

"We have become great because of the lavish use of our resources and we have just reason to be proud of our growth. But the time has come to inquire seriously what will happen when our forests are gone, when the coal, the iron, the oil, and the gas are exhausted, when the soils shall have been still further impoverished.

"It is time for us now as a Nation to exercise the same reasonable foresight in dealing with our great natural resources

that would be shown by any prudent man in conserving and widely using the property which contains the assurance of well-being for himself and his children.

"On the average the son of the farmer of to-day must make his living on his father's farm. There is no difficulty in doing this if the father will exercise wisdom. No wise use of a farm exhausts its fertility. So with the forests. We are over the verge of a timber famine in this country, and it is unpardonable for the Nation or the States to permit any further cutting of our timber save in accordance with a system which will provide that the next generation shall see the timber increased instead of diminished. Moreover, we can add enormous tracts of the most valuable possible agricultural land to the national domain by irrigation in the arid and semiarid regions and by drainage of great tracts of swamp land in the humid regions.

"But all these various uses of our natural resources are so closely connected that they should be co-ordinated, and should be treated as part of one coherent plan and not in haphazard and piecemeal fashion.

"Such a policy will preserve soil, forests, water power as a heritage for the children and the children's children of the men and women of this generation; for any enactment that provides for the wise utilization of the forests, whether in public or private ownership, and for the conservation of the water resources of the country, must necessarily be legislation that will promote both private and public welfare; for flood prevention, water power development, preservation of the soil, and improvement of navigable rivers are all promoted by such a policy of forest conservation.

"In delivering the opinion of the Supreme Court of the United States on April 6, 1908, Mr. Justice Holmes said: 'The State as quasi-sovereign and representative of the interests of the public has a standing in court to protect the atmosphere, the water, and the forests within its territory, irrespective of the assent or dissent of the private owners of the land most immediately concerned. \* \* \* It appears to us that few public interests are more obvious, indisputable and independent of particular theory than the interest of the public of a state to maintain the rivers that are wholly within it substantially undiminished, except by such drafts upon them as the guardian of the public welfare may permit for the purpose of turning them to a more perfect use. \* \* \* We are of opinion, further, that the constitutional power of the State to insist that its natural advantages shall remain unimpaired by its citizens, is not dependent upon any nice estimate of the extent of present use or speculation as to future needs. The legal conception of the necessary is apt to be confined to somewhat rudimentary wants, and there are benefits from a great river that might escape a lawyer's view. But the State is not required to submit even

to an aesthetic analysis. Any analysis may be inadequate. It finds itself in possession of what all admit to be a great public good, and what it has it may keep and give no one a reason for its will.'

"These decisions reach the root of the idea of conservation of our resources in the interests of our people."

The address of the President occupied the morning session. Notable and distinguished men had prepared papers upon topical subjects, which they read:

Mr. Andrew Carnegie, the Iron Master—"The Conservation of Ores and Related Minerals."

Dr. I. C. White, State Geologist, of West Virginia—"The Waste of Our Fuel Resources."

Mr. James J. Hill, the Railroad Magnate—"The Natural Wealth of the Land and Its Conservation."

Dr. T. C. Chamberlin, of the University of Chicago, Illinois—"Soil Wastage."

Mr. R. A. Long, President of the Long-Bell Lumber Company, Kansas City, Mo.—"Forest Conservation."

Former Governor G. C. Pardee, of California—"Resources Related to Irrigation."

Hon. H. A. Jastro, President National Stock Growers' Association—"Grazing and Stock Raising."

Dr. G. M. Kober, of Washington University—"Conservation of Life and Health."

Dr. E. R. Johnson, of the University of Pennsylvania—"Navigation Resources of American Waterways."

Dr. H. St. C. Putnam, Consulting Engineer—"Conservation of Power Resources."

The discussions were withheld at each session until the addresses were completed, and then the Governors present were accorded the first opportunity of discussing the subjects, and availed themselves of the privilege, more fully than anticipated, and allowed but limited time to the experts to present the technical side of the subjects.

The personnel of the delegates made the Convention an event of worldwide interest, and perhaps it was the most important convention ever held in the capitol, as never before has there been assembled the Governors of forty-one states to consider the preservation of Nature's gifts for the benefit of posterity.

The deliberations of the conference took a broader view of questions of public policy than was expected, and suggested remedies could not be considered in the too limited time of the conference. The resolutions adopted by the conference embodied the general matters relative to the purposes thereof, and were agreed to by unanimous vote.



One extract:

"We agree that the land should be so used that erosion and soil wash should cease; that there should be reclamation of arid and semi-arid regions by means of irrigation and of swamp and overflowed regions by means of drainage; that the waters should be so conserved and used as to promote navigation, to enable the arid regions to be reclaimed by irrigation, and to develop power in the interests of the people; that the forests, which regulate our rivers, support our industries and promote the fertility and productiveness of the soil, should be preserved and perpetuated; that the minerals found so abundantly beneath the surface should be so used as to prolong their utility; that the beauty, healthfulness and habitability of our country should be preserved and increased; that the sources of national wealth exist for the benefit of all the people, and that the monopoly thereof should not be tolerated." Another: "We agree that further action is advisable to ascertain the present condition of our natural resources and to promote the conservation of the same. And to that end we recommend the appointment by each state of a commission on the conservation of natural resources, to co-operate with each other and with any similar commission on behalf of the federal government."

The other conferees were Hon. Earl S. Cranston of Denver, and Hon. W. L. Hartman of Pueblo.

#### RIO GRANDE PROJECT U. S. RECLAMATION SERVICE.

This project includes the Engle dam, situated about 10 miles west of Engle Station on the A., T. & S. F. R. R. across the Rio Grande in New Mexico.

The high water area will be about 38,000 acres and it is to have a capacity, when full, of 2,000,000 acre feet of water. The principal source of the water supply which is to fill this immense reservoir is from that part of the water shed of the river lying within the State of Colorado. The most recent discussion of the question of the water supply for this reservoir was made in an address at the annual session of the National Irrigation Congress, held in Albuquerque, N. M., Sept. 29-Oct. 3, 1908, by Mr. W. W. Follett, entitled "Irrigation on the Rio Grande." Extracts from this address will be taken. The first part of the address was historical, giving the dates when irrigation first began from the river, and stated that at Juarez, Mexico, the acequia has been in use considerably over 300 years, the El-Paso, Texas, city ditch, at first known as the Ponce acequia, was built in 1827, in the Mesilla Valley, New Mexico, the Dona Ana ditch was built in 1844, the Las Cruces in 1849, and the Mesilla in 1850, while the first ditch was built in the San Luis Valley, Colorado, in 1852.

"Prior to 1885-1886 the Rio Grande at El Paso was practically a perennial stream, of a magnitude generally sufficient to supply the valley lands with water.

"In what way have the waters of the Rio Grande been depleted? To answer this question it will be necessary to consider the conditions higher up the stream.

"In 1879 there was watered from the Rio Grande and its tributaries in New Mexico about 183,000 acres of land, and in the Colorado contributory drainage 70,000 acres. Then gradually increasing in Colorado, until in 1906 it is probable that the New Mexican area was about 180,000, and the Colorado area becomes 375,000 acres. These figures speak for themselves. To the unprejudiced mind they show conclusively what has caused the shortage of water at El Paso Valley, and in a somewhat lesser degree only in the Mesilla valley in New Mexico.

"In 1896 I made a careful study of the amount of water which the additional acreage in the San Luis Valley would use, and wrote a report thereon for the Department of State, concluding as follows:

"It is safe to say that the low water flow of the Rio Grande in dry years has been decreased by the new irrigation of the San Luis an amount equal to at least 1,000 cubic feet per second of water flowing for one hundred days and, as the probable future seepage return is likely to be nearly or quite all offset by increased acreage, that the river has permanently lost this amount of water.

"Twelve years' observation since that time leads to the belief that 1,300 cubic feet per second would be more nearly correct. There is much sandy bed from Colorado to Texas and 637 cubic feet per second is the loss to El Paso from the use of 1,300 cubic feet per second in Colorado during the period of its abstraction, due allowance being made for the time of travel from Colorado to Texas. The conclusion must be reached that the El Paso dry river is caused by the added irrigation in the San Luis valley in Colorado. Thirteen hundred cubic feet per second have been taken out in Colorado in addition to the 1879 irrigation; half of this would have reached El Paso had it been left in the stream.

"There is a way out of the difficulty which does not involve the taking from the San Luis valley settler the water which he is now using. It only requires him to allow flood waters to flow down the stream.

"The Rio Grande project of the United States Reclamation service contemplates the construction of a high concrete dam across the Rio Grande ten miles west of Engle, New Mexico, which will impound 2,000,000 acre feet of water, having an area of 38,000 acres, with a depth of 180 feet at the dam, to irrigate 180,000 acres of land. The estimated cost is \$8,000,000.



GALVANIZED STEEL FLUME ACROSS CHEYENNE CREEK. WATER DISTRICT NO. 67.





"If a full cycle of the river's flow is considered the reservoir may safely be counted upon to serve 200,000 acres of land. Of this 200,000 acres, about 110,000 will be in New Mexico, 65,000 in Texas and 25,000 in the Republic of Mexico.

"On May 21st, 1907, our government entered into a treaty with Mexico by the terms of which it agrees to deliver in perpetuity to Mexico in the river channel above the head of the Juarez acequia, 60,000 acre feet of water each year, beginning as soon as the Engle dam is completed and in service, and Mexico agrees to accept this water as recompense for all damages, past present and future, which it may have suffered or may suffer from our appropriation of the Rio Grande's water. Our congress has appropriated, from general funds, one million dollars toward the cost of the dam, as being the proportionate amount of the total of eight millions which would accrue on account of this 60,000 acre feet per year.

"The balance is to come from the reclamation fund and is to be repaid to the government by the New Mexican and Texan lands, which will be assessed \$40.00 per acre, payable without interest, in ten annual payments, to cover the cost of construction.

"The inquiry is frequently made, why is so large a reservoir built? It may be just to build a small reservoir and return Mexico's water, but why should the United States reclamation service build such an enormous reservoir to reclaim lands in New Mexico which are nearly all owned by private parties, and in Texas, where the United States never did own any land?"

"The reply is: No feasible site for a small reservoir exists; a large one must be built or none at all. The alternative was either to build this big one and incidentally benefit our own citizens, or to take other steps for restoring Mexico's rights—possibly by forcing relinquishment of some of the later rights in the San Luis. It would not have been just to saddle on our general government the whole cost of the scheme merely to return Mexico's water.

"Again it is asked, why so large a reservoir? Two million acre feet are not needed for the irrigation of 200,000 acres."

"The reservoir is designed of so large a capacity for two reasons. The first is, as indicated in the discussion of the duty of this reservoir, because the Rio Grande at Engle is a torrential stream. It has practically no perennial flow which can be depended upon and the floods vary within wide limits from year to year. The mean annual discharge at San Marcial, just above the Engle reservoir, for the past eleven years is 1,170,000 acre feet, yet the total for 1902 was 200,000, and for 1905, 2,400,000.

"Owing to these circumstances, this enormous capacity is needed to provide safely for 200,000 acres of land. The acreage served should be as large as possible so as to make the cost per acre a minimum. This much available land does not exist in



New Mexico, however. One hundred and ten thousand is the maximum of valley land.

"New Mexico cannot build it without the help of Texas and of the United States.

"Another reason why the reservoir is to be built so large is that room must be provided for silt deposit. On a silt-bearing stream, all of the mud coming down will be held in any reservoir in its channel whether all the water is or not, so that it is not best to build a small reservoir.

"The mean annual discharge of the Rio Grande at San Marcial for the last three years has been a trifle over two million acre feet, and the capacity of this reservoir is as small as is economical. It would be better if it were larger.

"Again, the cost of putting in a foundation for a dam at the Engle site to store 100 feet in depth of water would be a large percentage—say 60 per cent. to 75 per cent.—of the cost of one to store 180 feet, while the storage capacity in the first instance would be only 385,000 acre feet, or less than one-fifth of that with the greater depth. It is thus seen that, so far as cost per acre foot is concerned, the high dam is the most economical.

"The Colorado people claim that under their state constitution they are entitled to all of the water which falls on their territory, regardless of prior rights outside of the State on streams which leave it, but their contention does not seem to be sustained by the courts and it surely is not equitable. There is no logical reason why an imaginary line across a stream should give the landowner above that line a right to take the property of the man below it, whether it be a county, state or international boundary. For in an irrigated country, the land has no value without the water and the value of the property rests in the latter. If a man's water is taken from him he is robbed, whether or not an imaginary line crosses the stream of supply between him and the robber.

"In its decision of the celebrated Kansas-Colorado water suit, the supreme court of the United States says: 'Summing up our conclusions, etc.' (See page 165 of this report, where the quotation may be found in full.)

It will be seen that the court did not sustain Colorado's claim to ownership of all the waters within its borders, nor did it sustain the Kansas claim as a riparian owner to the undiminished flow of the stream past its lands. It states in set terms that an equitable division of the waters must be had, but Kansas did not prove sufficient inequality to get a verdict in its favor. You will note that the court says Kansas will be entitled to relief whenever it is shown that the waters of the Arkansas are not being equitably divided.

"A careful reading of the long discussion by the court of the case leads to the conclusion that where both litigants are gov-

erned by the law of appropriation, the prior rights will be protected.

"It is even claimed that a higher type of civilization exists in the more temperate climate of Colorado, and therefore that the people are justified in robbing those lower down. This argument is too puerile to need answer."

"If priorities are to be recognized despite political boundaries, as is indicated by the supreme court decision above cited and also by the action of our general government in agreeing to return to Mexico its water and in appropriating funds therefor, one thing is certain—these prior rights on the Rio Grande below Colorado are going to be protected, and Colorado must decide either to abandon claim to that portion of its unused flood waters which is needed for storage at Engle, or to run the risk of having to defend, and perhaps lose, existing rights acquired subsequently to those lower down.

"There would be no difficulty in proving that there is now an inequitable division of the waters of the Rio Grande, so far as the Mesilla and El Paso valleys are concerned, to the complete satisfaction of the supreme court.

"The Engle reservoir will furnish water for a large acreage of land never before irrigated, and, to that extent, is creating a new priority. The people of lower New Mexico and Texas have just as good a right to do this as have those of Colorado, and this new right having been initiated adequate time must be given for its perfection through the completion of the Engle reservoir and the putting of the water to a beneficial use.

"The people of the San Luis contributory drainage have so largely increased their acreage in the last thirty years that they are now irrigating over five times as much land as they were in 1879.

"The Coloradoan is not asked to relinquish the water he is now using, but to allow to pass such a portion of the unused flood waters as are needed that they may be stored and used to take the place of the perennial waters which he has taken.

"Our general government has pledged its faith to Mexico that the Engle dam shall be built. Experience shows that our federal authorities, although slow, are sure, and it is certain that this pledge will be kept, and that title to such a portion of the unused flood waters of the stream as are needed to fulfill this promise will be perfected."

Statements made by the Hon. Secretary of the Interior regarding the application for reservoir sites on the public domain within the Rio Grande watershed:

"That the Federal government has the right and will interfere in the matter of appropriation of the waters of inter-State streams for irrigation purposes.

"A number of applications were held up for a time on account of our treaty obligations to Mexico, which are also involved in the Rio Grande project, but I showed them that, having arrived at a decision as to the policy to be followed toward Mexico, there would be no longer any delay. I told them, however, that not only the interests of Mexico but also the interests of New Mexico must be protected. I assured them that all applications which did not interfere with acquired rights in New Mexico and with our treaty agreement to supply Mexico with water would be approved, if otherwise in proper shape. Our great water sheds must be considered as units. The destruction or monopolization of the sources of supply at the headwaters of any great stream, is not only injurious to the interests of those who live hundreds or thousands of miles below, but the improper use of the headwaters seriously affects the great irrigation acres below. All of the people within a watershed have rights to the use of the water, which must be recognized and enforced. There must be the closest co-operation in working out the best methods for the highest and most beneficial use of water.

"He stated that until the courts had decided the matter that it was the duty of the government to concede that such streams as the Rio Grande, so far as the use of water is concerned, belonged to the people of the various States and Territories through which they flow. He said that the department has permitted a number of reservoir sites during the last year for the San Luis valley people, and that he thought it had granted as many as it could consistently.

"He stated frankly that reservoir sites here would be allowed whenever the department found such would be consistent with our relation with Mexico, consistent with interests of the people of New Mexico, and that when the same were not for speculative purposes."

The last act of the department of the interior upon an application for right of way for a reservoir, under the act of March 3, 1891, in the San Luis valley is a letter dated November 23, 1908, regarding the Conejos reservoir on Conejos creek, by which the right of way is practically refused.

The conclusions of the assistant secretary of the interior are: "That the waters sought to be utilized have been legally appropriated under the State laws may, for the purposes of this letter, be admitted, but it is thought that these waters are, or may be, needed by the reclamation service, and if this be so the title of the claimants thereto can, by appropriate procedure, be divested. It is the view of the reclamation service, and of this department, that these waters may be so needed, as also possibly to enable the United States to fulfill its treaty obligations to Mexico with reference thereto. That the secretary of the interior has a discretion in the matter of the approval of rights of way under the act of March 3, 1891, there can be little doubt. That it is his



duty to exercise that discretion with reference to applications upon the Rio Grande, and its tributaries, in the State of Colorado and the Territory of New Mexico, I am fully persuaded. The interests of private individuals must be subordinate to the larger interests of the United States. Upon a most careful consideration of the whole question, I have to say that the suspension will be continued for the time being."

The action taken by the government will not injure any of the existing water rights in the San Luis valley, but affects the storage of water for the purpose of extending the period of irrigation to the land already under the ditches and canals, and will prevent the reclamation of additional lands due to the storage of water.

As near as may be determined from the meager reports of the government on this subject, the total acreage of lands claimed to have been irrigated in the United States, in the Rio Grande valley, below the Engle reservoir, previous to the year 1880, was about 70,000 acres, and as the acreage to be served by the construction and filling of this reservoir is 180,000 acres in New Mexico and Texas, there is an area of 110,000 acres that is to be reclaimed and put under irrigation for the first time, upon the completion of the construction work. The water to do this, at these places, would properly irrigate in the San Luis valley in Colorado twice this area, taking in consideration the quantity of water that would be lost by evaporation along the length of the river and in the Engle reservoir, together with the seepage losses in the river between Colorado and Texas.

Under the laws of the State the waters of the Rio Grande, to any amount, even to the whole flood flow, may be diverted and applied to a beneficial use in the irrigation of land in this State.

In the construction of ditches necessarily located on public domain it would be necessary to make an application for a right of way from the department of the interior, and if such application should be refused the act would be the nullification of our State law, as well as refusing the applicant a right given him under the act of Congress of 1891, which provides for rights of way across or upon public lands. The same effect is produced upon the refusal of a permit for the construction of a reservoir upon public domain.

It would be a strange condition of the laws to deny the use of the flood waters in Colorado to the people of Colorado, for the purpose of granting the use of these flood waters to the people of New Mexico and Texas for irrigation.

The large area of new land to be put under irrigation by the Engle reservoir, in New Mexico and Texas, is necessary to enable the reclamation service to justify the expense of its construction, and keep the cost per acre within reasonable limits

and within the ability of the consumer to pay, and in accordance with the provisions of the reclamation act.

It is manifest that the policy of the department of the interior is to prevent the impounding of any greater quantity of water in the Rio Grande watershed than has been already granted in the approved applications for reservoir sites.

As near as can be determined from incomplete data the gross capacity of the entire number of approved reservoirs does not exceed 250,000 acre feet of water.

The loss of water each year from the surface of the Engle reservoir at high water level, due to evaporation (that is, 38,000 acres, and multiplied by 7 feet, the depth of evaporation, would be 266,000 acre feet), will exceed the total capacity of all the reservoirs in the Rio Grande watershed now approved by the department of the interior. This loss due to evaporation also exceeds the 260,000 acre feet (1,300 second feet flow for 100 days) claimed by Mr. Follett as the amount of water that the people of the San Luis valley have taken from the low water flow of the river, due to the new irrigation since the year 1896. It may be considered plausible that should the 1,300 cubic feet per second be allowed to flow down the river channel only a portion would be received in the Engle reservoir, and which would be dissipated in the air, and never get to the lands below El Paso, Texas.

A careful reading of the decision of the United States Supreme Court in the Kansas-Colorado case, extracts from which will be found at pages 158 to 165 of this report, will show conclusively that Colorado will have the right to continue irrigating the land now under ditch, and, as against any other claimant to the waters of the State, can impound this water, and reclaim as great an area as may be then supplied, as no ground of inequality can be sustained by another State on the assumption of a superior right so to do, that involves the reclamation of new territory.

I believe, as a matter of prudence, that the Legislature should provide by appropriation an adequate sum of money for the purpose of collecting data upon the surface flow of the Rio Grande and its tributaries, not only in Colorado, but at other points along the river, even to El Paso, Texas; also the loss of underground waters, and especially at places where there is an excessive loss due to seepage and percolation; also data regarding the deforestation of the watersheds of the Rio Grande and its tributaries in New Mexico; data as to rainfall and run-off of the streams of New Mexico and Colorado tributary to the Rio Grande; whether or not a private land scheme may profit from the building of the reservoir; also as to the necessity of building this enormous dam, taking into consideration the area of land that should be irrigated, and why such an immense volume of water should be stored in the reservoir; together with the data



concerning available reservoir sites in Colorado, the area of land that requires proper irrigation, the area of land that can be reclaimed by storage water, and other pertinent matter regarding the use of the water in Colorado, to be used either in defending or prosecuting a suit to determine the right to the flood waters of the Rio Grande in Colorado.

Very much more might be written on the subject, but sufficient has been mentioned to call the attention of the Legislature to the action of the federal authorities in assuming a control that does not belong to them.

### APPEALS.

On July 18, 1907, C. M. Jump, water commissioner, District No. 2, issued an order to the deputy water commissioner to close certain named ditches taking their supply of water from Big Dry and Woman creeks, which order was executed.

An appeal from the action of the water commissioner was taken to the irrigation division engineer, who sustained the water commissioner.

On August 16, 1907, an appeal from the decision of the irrigation division engineer was presented, and owing to the lateness of the season, a temporary order was given to the irrigation division engineer to allow the usual and former diversion of the water to the ditches for the purpose of saving and maturing the crops.

On September 20, 1907, a hearing was had, evidence introduced in behalf of the petitioner and arguments of counsel closed the hearing of the case.

On October 3, 1907, a decision was made by the State Engineer approving the action of the irrigation division engineer and water commissioner on the ground that the action taken by the water commissioner in closing the headgates of post dated ditches, at the time when other ditches in his water district of earlier priorities were demanding a supply of water, was regular and strictly within the statutory duties imposed on a water commissioner, and necessary by reason of a scarcity of water for the purpose of supplying such demand.

On June 16th, 1908, a similar demand was made to have the headgates of the same ditches taking water from Big Dry creek opened, and upon being refused, an action was commenced in the District Court, asking for an injunction; this was refused, and the case is now pending in the court for trial.

An appeal was taken from the decision of the irrigation division engineer and water commissioner of District No. 6 involving the right to store water during the direct irrigation season in reservoirs, wherein the water diverted was stored, during the night and at other times when not immediately required

to be applied to the land. The claim was not allowed by the officials, and the appeal is now pending in this office.

### COUNTY BOUNDARIES.

In the matter of the disputed boundary line between San Juan and Ouray counties, a report of which was made and published in the 13th biennial report, an action was begun in the District Court sitting in Silverton, San Juan county, by the board of county commissioners of San Juan county, within the statutory period allowed for such cases.

This cause was brought to trial at Silverton during the week ending July 25, 1908, and was taken under advisement and awaiting briefs of counsel, and at this writing has not been decided.

The action was brought as an entirely new case, and in no manner as an appeal from the action and performance of the State Engineer. His doings were not reviewed by the court, and so far as he was concerned, it was conducted as if he had no interest or had done nothing about the disputed boundary.

In my opinion this section of the statutes (chapter 32, section 1162, Revised Statutes 1908) should be amended so that a case should be brought in the District Court before the actual work of surveying and monumenting the line as determined by the board of surveyors or State engineer has actually been done, for the purpose of avoiding a resurvey and the expense thereof, should the decision of the court not confirm that of the board or State Engineer.

A petition was received from the board of county commissioners of Delta county as follows:

Delta, Colorado, Sept. 4, 1907.

"T. W. Jaycox, Esq., State Engineer, Denver, Colorado.

Dear Sir: Whereas the boundary line between the counties of Mesa and Delta is in dispute and perhaps indefinite so that certain territory is claimed by both counties, therefore in accord with paragraph 771, Mills' Annotated Statutes Colorado, the undersigned county commissioners of Delta county, Colorado, do hereby petition you as State Engineer to establish and mark such line as called for by paragraphs 713 and 737, or, if satisfactory to Mesa county, to establish the point on the extremity of Grand Mesa, whence the line deflects southwesterly to the mouth of Rio Dominguez, as may be interpreted from said paragraphs 713 and 737.

R. O. WILMOT,  
GEO. C. WILSON,  
JOE HOGRIEF."

County Commissioners Delta County, Colorado.

Attest: D. S. DOUGHTY,  
County Clerk.

On November 8, 1907, a meeting was held in Grand Junction at which were present representatives from both counties, and it was agreed that the portion of the line to be determined should be from the northwestern corner of Delta county to the mouth of the Rio Dominguez, and that each county should present data and briefs of counsel regarding the claims or arguments supporting their side of the controversy.

During the last week in July, 1908, a trip was made to the Grand Mesa, starting from Delta. The members of the Boards of County Commissioners of Delta and Mesa County and the County Surveyors thereof accompanied me.

An examination was made of the top of the Grand Mesa, opposite the Alexander Lakes, for the purpose of observing the topography, and estimating the difficulties that would be encountered in making a survey. After consideration of the brief of counsel, examination of data regarding the topographical features of the disputed line and such other information available, I made the following report:

August 11, 1908.

"To The Honorable Board of County Commissioners, Delta and Mesa Counties, Colorado.

Sirs: The Honorable Board of County Commissioners of Delta county, under date of Sept .4, 1907, petitioned the State Engineer under provision of section 771-1, Mills Annotated Statutes, to establish and mark a portion of the common boundary line between the counties of Delta and Mesa in accordance therewith.

In pursuance thereof a meeting was held in Grand Junction to consider the claims of each county, and I have also received statements and briefs from the county attorneys of each county presenting arguments in favor of their respective claims and have made an examination of certain portions of the Grand Mesa.

A careful reading of the descriptions of this common boundary line between Delta and Mesa counties as given in the statutes will show that it may be divided into three parts; the first describes the north east corner of Delta county (a point on the boundary line of Mesa county); the second describes a divide between the first and third parts, and the third describes the southwestern extremity of the Grand Mesa.

The point of intersection of the Meridian of 107 degrees 30 minutes west longitude and the divide between the waters of the Grand river and the north fork of the Gunnison river is one of the specific callings in the description of the boundary line, being the northeast corner of Delta county and is easy of accurate determination and location and therefore would control as one point of this boundary line.



I do not believe it will be seriously contended otherwise than that the prong of the Grand Mesa, the rim of which terminates at or within section 24, township 13 south, range 97 west as shown on the maps is the southwestern division of the Grand Mesa, when regarded as a topographical description, and that its termination is the extreme southwestern extremity of the Grand Mesa and also that this point is susceptible of accurate determination and location and it therefore should control as a point or corner in the boundary line between the counties.

The part of the description of this boundary line that is so indefinite as to cause a dispute between the counties reads as follows: 'Thence along (and with) said divide in a southwesterly direction to a point on the extreme southwestern extremity of the Grand Mesa.'

An examination of the statutes creating these counties shows that there is an apparent intention to have this portion of the boundary line follow along and with a divide and that such divide should connect the two points accurately described in the description of the boundary line, but the divide between the waters of the Grand river and the north fork of the Gunnison river extends only to what may be called the southeastern westerly direction to a point on the extreme southwestern extremity of said Mesa.

It is my opinion that the boundary line in dispute should begin at the northeast corner of Delta county, a well defined point, and called for in the description of the line, thence in a southwesterly direction along and with the divide between the waters of the Grand river and the north fork of the Gunnison river, so far as said divide may extend; then it should follow a divide in a southwesterly direction onto and along the Grand Mesa, regardless of what waters said divide may separate, to the southwestern extremity thereof, which also is a well defined point and called for in the description of the line, and situated at or near Sec. 24, T. 13 S., R. 97 W., thence in a southwesterly direction to the mouth of the Rio Dominguez, etc. This opinion sustains the claims of Mesa county regarding the location of the boundary line between the counties.

In reaching this conclusion I have only followed the rule that where known and undisputed monuments are found on the ground they should govern and less definite description should be so construed as to carry out the apparent intention contained in the description of the line.

It is required that the lines shall be run out and established, and plain and substantial mound and marks be erected so as to fix and define such boundary line, which work shall be done by the State Engineer in connection with the county surveyor of each county.

I am prepared to proceed with this work upon notification of the readiness of the county surveyor of each county to participate therein.

Very respectfully,

T. W. JAYCOX,  
State Engineer."

Mr. Richard Whinnerah, Civil Engineer of Ouray, Colorado, was appointed a deputy to represent the State Engineer in making a survey of this disputed boundary, and the county surveyors of both counties were notified to meet at Whitewater on August 20th, 1908.

The party assembled at Whitewater, and outfitted for the work. Mr. F. A. Reed presented a letter from Mr. J. A. Curtis, county surveyor of Delta county, requesting that he be employed, which was done, and thus represented Delta county.

Mr. Charles W. Haskell represented the county surveyor of Mesa county, while the party was made up of men from Grand Junction.

I accompanied the party and examined the southwestern extremity of the Grand Mesa, and determined the location of the point to be used for this calling in the statute, and then returned to Denver.

The survey was made, map and field notes prepared by Mr. R. Whinnerah, and have been forwarded to the respective counties.

I have been informed by members of the Board of County Commissioners of both counties that the line as surveyed and monumented will be accepted as the boundary between the counties.

#### NECESSITY FOR ADDITIONAL EMPLOYEES.

I think, without exception, every Legislature has directed the State Engineer to perform additional work, beyond those enumerated in the statute creating the office, until at this time there is a great variety of employment and matters that occupy his attention, and take more time than at any time past.

The correspondence with the department has practically doubled in the past few years, and requires the time of a deputy and stenographer to properly attend to it, the filing of maps and statements regarding water rights occupy the whole time of two clerks, and requires two clerks to compare the maps so as to be able to certify that they are duplicates, as one map is filed in this office, the other is to be filed with the county clerk of the proper county. A great number of people consult the records, which have to be taken from the vaults, and presented to the persons; the plans and specifications for work to be done under appropriation from the internal improvements fund are to be



shown and explained to prospective bidders. These are a few of the principal duties of the office force, but by no means cover the work, as the answering of personal inquiries concerning matters appertaining to the office require as much of the time of the office force as the other duties.

The field work connected with the surveying of the work under the appropriations made from the internal improvement funds, during the past two years, has mostly been done by local surveyors, and while satisfactory, yet the work could be done more uniformly and to the required extent by a permanent corps, which would require an additional assistant, together with the necessary field force.

The measurement of the streams of the State should be placed upon a permanent basis, locations should be selected, or so prepared that the measurements taken may be used in the establishment of a permanent rating curve or table, and the ratings should be continued at each place a sufficient number of years to obtain reliable data as to the run off.

The irrigation ditches require frequent ratings, as conditions change in the regions of the ditches, so as to afford the water commissioners the information regarding the amount of water to be diverted by each ditch.

These duties can well occupy all the time of two hydrographers, which would be one additional to what is now employed in this work.

The duties of the State Engineer now so fully occupy his entire time, are so varied in character, involve so great interests and the expenditure of large sums of money, that the salary now paid is inadequate for the responsibilities and importance of the office.

The present salary of the State Engineer and deputies was fixed by statute many years ago, when the requirements as to service performed, duties and knowledge of engineering and irrigation necessary to properly handle the work were much less than at present. The business of this office has progressed until it is many times greater than formerly. The great variety of irrigation and engineering questions coming before the office requires a man versed in many branches of the subject to properly perform his duties.

For the above reasons I would respectfully recommend the following salary list and employees of this department:

	Per Year
State Engineer .....	\$4,000.00
Deputy Engineer .....	2,500.00
Deputy Engineer .....	2,500.00
Assistant Engineer .....	2,000.00
Draughtsman .....	1,500.00
Two Hydrographers (each).....	1,200.00
Stenographer .....	1,200.00
Two Filing Clerks (each).....	1,200.00

or a salary list of \$18,500 per year.

### ACKNOWLEDGMENTS.

Special acknowledgment and thanks are hereby tendered to the railroads operating in the State for transportation furnished the State Engineer and assistants, and for valued assistance rendered in the prosecution of the work of this department.

I also at this time desire to express my high appreciation of the hearty interest and efficient co-operation that has been given me in the performance of the duties of this office, by the irrigation officials throughout the State, by the members of the boards of county commissioners, by the executive officers of the State, and for the faithful and efficient service, friendly and pleasant associations, and prompt and commendable attention from the office force of this department.

### STATEMENT OF FEES RECEIVED.

December 1, 1906 to December 1, 1908.

Filing fees, claims to water rights.....	\$5,813.60	
Filing fees, transfer decrees.....	71.00	
Approving plans of dams.....	120.00	
Certifications.....	656.35	
Office Labor.....	803.70	
Miscellaneous.....	802.06	
TOTAL.....		\$8,266.71

### STATE ENGINEER'S SALARY.

T. W. Jaycox, State Engineer.....	\$6,000.00	
		\$6,000.00

## DEPUTIES' AND ASSISTANTS' FUND.

C. W. Beach, Deputy State Engineer.....	\$3,096.00	
G. N. Houston Deputy State Engineer.....	2,616.00	
C. W. Wells, Deputy State Engineer.....	684.00	
H. E. Rockwell, Clerk.....	400.00	
M. H. Griffith, Clerk.....	600.00	
F. Cogswell, Gager.....	255.00	
P. J. Preston, Assistant Engineer.....	22.00	
H. True, Assistant Engineer.....	40.80	
L. M. Hart, Clerk.....	78.00	
R. C. McElravy, Clerk.....	60.00	
TOTAL.....		\$7,851.80

## STENOGRAPHER'S SALARY.

H. Davidson.....	\$2,100.00	
E. M. Williams.....	300.00	
TOTAL.....		\$2,400.00

## DRAUGHTSMAN'S SALARY.

George H. Angell.....	\$2,400.00	
		\$2,400.00

## HYDROGRAPHER'S SALARY.

H. E. Rockwell.....	\$2,000.00	
		\$2,000.00

## FILING CLERK.

M. H. Griffith.....	1,799.96	
		\$1,799.96

## GAGING FUND.

F. Cogswell, Gager.....	\$ 643.55	
C. W. Beach, Deputy State Engineer.....	1,110.65	
Thos. Grieve, Jr., Hydrographer.....	2,417.82	
W. B. Freeman, U. S. G. S.....	808.43	
G. T. Pollard, Assistant Engineer.....	100.00	
Barr & Rose, Livery.....	7.50	
Ben Nehr, Livery.....	14.00	
C. J. Kane & Co., Livery.....	12.00	
Lallie Surveying Instrument Co.....	5.90	
McLean Bros. Livery.....	18.10	
Smith-Brooks Printing Co.....	37.00	
S. E. Arscott, Repair Stop Watches.....	9.00	
J. B. Stewart, U. S. G. S.....	67.05	
P. J. Preston, Hydrographer.....	460.90	
H. W. Catlin, Clerk.....	12.00	
E. J. Sibert.....	2.50	
Whitney Sporting Goods Co.....	12.00	
Dan O'Neil, Livery.....	12.00	
J. M. Dille, Gaging expense.....	35.60	
First Ave. Livery Co.....	12.00	
Alva Sparks, Gage reader.....	77.50	
W. H. Barney, Gage reader.....	42.00	
B. E. Chesebro, Gage reader.....	50.50	
C. E. McKinney, Gage reader.....	12.20	
F. A. Gilley, Gage reader.....	42.25	
Samuel Matlock, Gage reader.....	10.00	
E. A. Watkins, Gage reader.....	10.00	
Minnie Gammon, Gage reader.....	23.10	
<b>TOTAL</b> .....		6,065.55

Balance on hand, December 1, 1906.....	\$1,748.67
Receipts of State Engineer, Dec. 1, 1906, to Nov. 30, 1908.....	8,266.71
Warrants drawn.....	6,065.55
Balance on hand, December 1, 1908.....	3,949.83

## STATE ENGINEER'S EXPENSE FUND.

T. W. Jaycox, State Engineer.....	\$ 792.94	
G. N. Houston, Deputy State Engineer.....	112.28	
C. W. Beach, Deputy State Engineer.....	184.85	
C. W. Wells, Deputy State Engineer.....	32.25	
C. Wells, Stenographer.....	6.00	
Smith-Premier Typewriter Co.....	22.50	
Colorado Typewriter Exchange.....	18.25	
Kendrick Book & Stationery Co.....	25.90	
Hall Blue Print Co.....	9.16	
Denver Photo Material Co.....	232.95	
M. E. Melvin, Stenographer.....	3.00	
H. E. Rockwell, Clerk.....	28.92	
W. & L. E. Gurley, Repair work.....	7.00	
Globe Express Co.....	4.83	
M. E. Williams, Stenographer.....	489.16	
Lallie Surveying Instrument Co.....	32.90	
J. S. Gorman, Livery.....	6.00	
Smith-Brooks Printing Co.....	37.05	
Whitney Sporting Goods Co.....	24.00	
Out West Printing & Stationery Co.....	2.50	
Colorado Photo Supply House.....	5.25	
H. W. Catlin, Clerk.....	189.00	
Clason Map Co.....	5.00	
M. S. Ketchum, Testing materials.....	4.00	
Colorado Tent & Awning Co.....	5.75	
W. H. Kistler Stationery Co.....	69.00	
Colorado Telephone Co.....	72.55	
Wells-Fargo Express.....	8.65	
Thos. Grieve, Jr., Gager.....	107.90	
Hoeckel Blank Book Co.....	39.00	
F. Winkler.....	.75	
Wm. Ainsworth & Sons.....	1.50	
F. A. Gilley, Gage reader.....	29.75	
B. W. Harrison.....	18.00	
P. J. Preston, Assistant Engineer.....	2.80	
F. Cogswell, Assistant Engineer.....	82.70	
R. C. McElravy, Clerk.....	22.95	
Thos. Hunter, Clerk.....	50.00	
TOTAL.....		\$2,786.96



# IRRIGATION DIVISION ENGINEER'S SALARY AND EXPENSE.

IRRIGATION DIVISION No. 1.	
William Rist, Salary.....	\$ 3,000.00
William Rist, Expense.....	428.27
IRRIGATION DIVISION No. 2.	
John M. Jackson, Salary.....	\$ 3,000.00
John M. Jackson, Expense.....	719.99
IRRIGATION DIVISION No. 3.	
D. S. Jones, Salary.....	\$2,612.50
D. S. Jones, Expense.....	688.20
IRRIGATION DIVISION No. 4.	
A. H. Stokes, Salary.....	\$3,000.00
A. H. Stokes, Expense.....	282.08
IRRIGATION DIVISION No. 5.	
A. J. Dickson, Salary.....	\$3,000.00
A. J. Dickson, Expense.....	237.80

## CHAPTER II.

## SANTA FE TRAIL.

## Senate Bill 91, Chapter 70, 1907.

The suggestion of marking the Santa Fe Trail was made by Mrs. W. C. Ferrill at the State Conference, Daughters of the American Revolution, in 1906, during the regency of Mrs. John Campbell, and a committee was appointed composed of a member from each D. A. R. Chapter, Mrs. Frank Wheaton, chairman, to prepare data to present to the General Assembly.

General interest in the cause was still further increased by most able papers on the Santa Fe Trail prepared and read by Mrs. Elmer A. Wixson and Mrs. Ferrill at a State D. A. R. Conference.

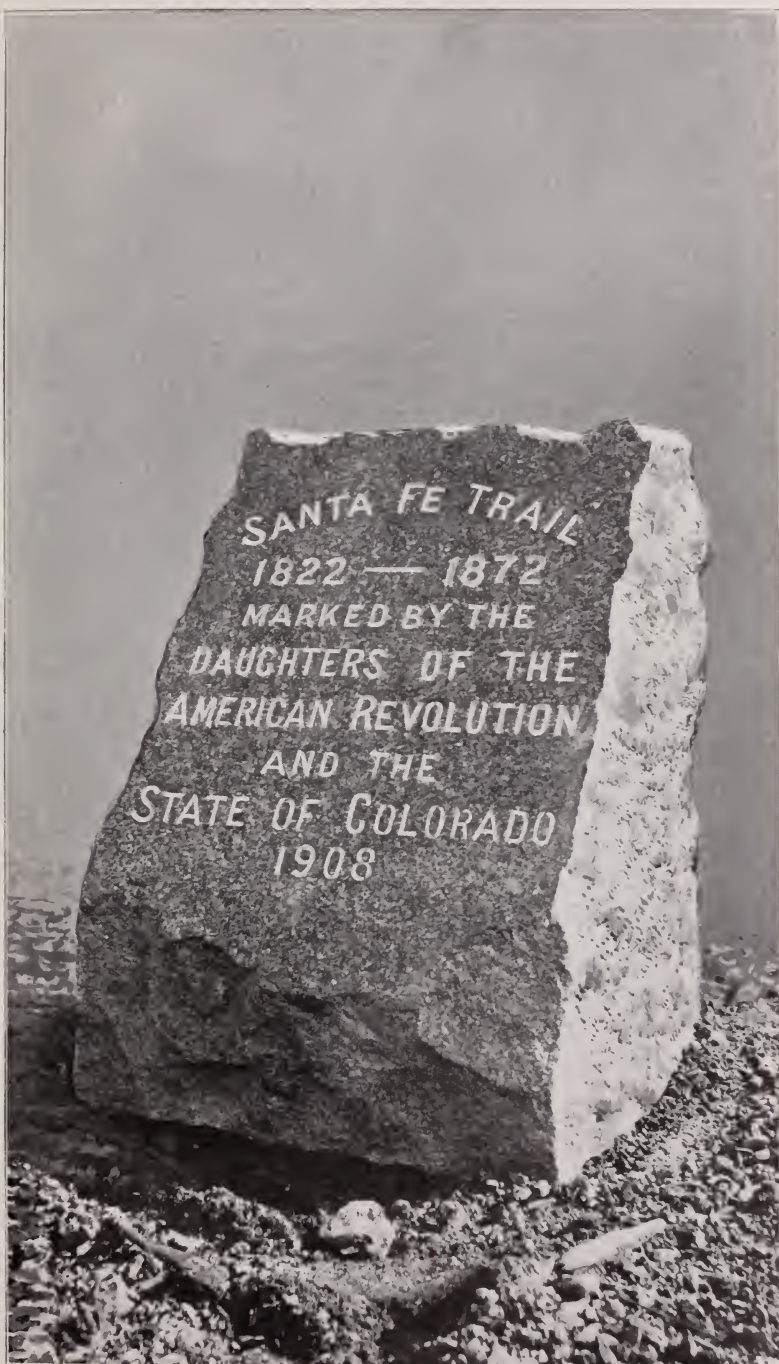
Mrs. Wheaton and committee succeeded in arousing great enthusiasm in marking the Trail, and were able to present important and authentic historical data gained by correspondence with United States Army and Government officials associated with the history of the trail, and also obtained many personal interviews with pioneers who had traveled over this trail, which Mrs. Wheaton has named the "Appian Way of the West."

At the request of the Daughters of the American Revolution in Colorado, a bill was introduced in the Sixteenth General Assembly of the State of Colorado by Senator Parks asking for an appropriation to mark the Santa Fe Trail. Mrs. Wheaton and the committee appeared before the joint committee on finance of the Legislature, and advanced many arguments in favor of marking the Trail; and also conveyed the information that the Daughters of the American Revolution in Kansas had received financial aid from that State in marking the trail up to the State line. Colorado law makers were not lacking in State pride, and the efforts of the Colorado D. A. R. were rewarded by the Assembly enacting Senate Bill 91, bearing the title:

"An act appropriating the sum of two thousand dollars (\$2,000) to pay the expenses of a survey of the Santa Fe Trail and erecting suitable monuments to mark the same, and providing for a penalty for the defacement of such monuments or marks."

The Santa Fe Trail has been marked from State line on the east, up the Arkansas valley, turning near La Junta, southwesterly through Timpas, El Moro and Trinidad to the border of New Mexico.

Twenty-two markers have been placed by the State of Colorado; four by the D. A. R. organization at Lamar and vicinity;



SANTA FE TRAIL MONUMENT.



three by Zebulon Pike Chapter D. A. R. Special markers of larger size have been erected; the most important at Trinidad, from appropriation made by the Assembly, and generously augmented by the Trinidad City Council; one at El Moro by Colorado Chapter D. A. R.; one at La Junta by Arkansas Valley Chapter D. A. R.; one near Las Animas by Pueblo Chapter D. A. R. New Fort Bent, later known as Fort Wise, and the warm spring at Holly are marked by two of the Zebulon Pike Chapter stones. Old Fort Bent is to be marked by the owner of the ranch through which the trail passes. The portion of the Santa Fe Trail crossing the southeastern corner of the State has not yet been marked, and is awaiting the survey.

All the markers have been made at Denver, of Silver Plume granite, and are placed approximately five miles apart.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000. 00
Gilbert Balcomb, survey.....	\$ 197.70	
Western Union Tel. Co.....	.73	
Denver Marble & Granite Co.....	360.85	
Will R. Murphy, salary and expenses.....	138.48	
Jerry Trujillo, livery.....	26.50	
Brisco & Hewitt, designer.....	55.00	
Balance in fund.....	1,220.74	
	\$2,000.00	\$2,000.00

State officials, the Denver & Rio Grande Railroad Co., the Atchison, Topeka & Santa Fe Railway Co., Mayor D. L. Taylor, and the Council of Trinidad, and prominent citizens of the towns and cities through and near which the trail extends, have kindly, and even enthusiastically, given their aid in counsel, money and service.

The work of marking the trail has had the personal attention of Mrs. John Campbell, former State Regent D. A. R., from the inception of the work up to its completion. She has given of her time and strength to this matter without stint.

It is with a deep sense of obligation that the Daughters of the American Revolution in Colorado express their appreciation of the generous appropriation made by the Sixteenth Assembly of the Colorado Legislature, which has enabled them under the able direction of the State Engineer, Hon. T. W. Jaycox, to mark the course of the famous and historic highway known as the Santa Fe Trail, within our border.

"Monuments are object lessons in history."



Earnestly hoping that our work may meet with the approval of the Seventeenth General Assembly, this report is

Respectfully submitted.

ELLA A. McNEIL,  
State Regent for Colorado Daughters  
of the American Revolution.

PUBLIC HIGHWAY—TRINIDAD TO FORT COLLINS.  
(CONVICT LABOR.)

S. B. No. 20, chapter 206, Session Laws, 1907, provided for the construction of a highway beginning at the southern boundary of the State and running north through Trinidad, Walsenburg, Pueblo, Colorado Springs, Denver, Longmont, Loveland and Fort Collins to the Wyoming line.

This is to be constructed by convict labor and \$10,000 was appropriated from the general fund to defray the expense of extra guards and the necessary foremen, supplies and equipment for carrying on the work.

The act provides that the State Engineer shall locate and survey said road, prepare plans and specifications and supervise the construction thereof, and approve all plans for bridges. This is all to be done at the expense of the county in which the road is being constructed.

The act also provides that the immediate supervision of the work shall be under the direction of the penitentiary commission and the warden.

At the request of the penitentiary commission the county commissioners of the various counties through which the road would pass met at this office on March 13, 1908, to consider the matter, and as a result agreed that the work of construction should begin at the southern end, in Las Animas county.

Mr. Mark O. Danford, of Trinidad, was employed by this office to survey the road and inspect the progress of the work as engineer in charge. Surveys were commenced about April 1, 1908. Construction began May 13, and has proceeded continuously ever since. The State funds were exhausted September 7, and since that time the work has been carried on by private subscriptions from the business men of Trinidad.

This road was constructed 16 feet wide where the cross slope exceeded 15 degrees and 20 feet where it was less than this.

Six reinforced concrete culverts, ranging from 6-foot span to 15-foot span, were constructed across the drainage channels from plans prepared by this office. The county furnished the material on the ground and the convicts furnished the labor.

These culverts contained about 175.86 cubic yards of concrete. The cost to the county for material and hauling was

\$736.91. The labor account was one man 680 days, which included excavating and breaking rock. The cost of keeping this man in camp was  $20\frac{1}{2}$  cents per day, or a total cost of \$140.40, which, added to the above, gives \$877.31, or about \$4.90 per cubic yard as the cost of the concrete work. Had this been let by contract it would have cost from \$15.00 to \$20.00 per cubic yard.

Up to September 1, there had been moved:

Solid rock .....	7,592 cubic yards
Loose rock .....	3,164 cubic yards
Earth .....	20,384 cubic yards

and 260 cubic yards of retaining wall built.

A fair contract price for this work would be:

Solid rock, per cubic yard.....	\$ .80
Loose rock, per cubic yard.....	.40
Earth, per cubic yard.....	.15
Wall, per cubic yard.....	2.50

The value of this work at these prices would be about \$11,046.80. In addition to this there was 206 lineal feet of tile for minor culverts which at \$1.25 laid would be \$257.50.

#### ACTUAL COST OF THE WORK.

Appropriated by state.....	\$10,000.00	
Cost of Equipment, less 15 % depreciation or \$4,666.83-700.02..	3,966.81	
Actual cost to the state.....		\$6,033.19
Paid by county,		
Concrete.....	\$736.00	
Pipe.....	330.72	\$1,066.72
Total actual cost.....		\$7,099.91

#### TOTAL VALUE OF WORK DONE AT CONTRACT PRICES.

Culverts, 176 cubic yards at \$20.00.....	\$3,520.00	
Excavation, embankment and wall.....	11,046.00	
Pipe culverts.....	257.50	
		\$14,823.50

This is exclusive of engineering services, which would be the same in either case.

From the above it is evident that the State has saved by this method of road building about 52 per cent. of the value of the work done.

Aside from the moral and physical influence upon the convicts of an out of door life, under a camp managed entirely on the honor system, and the advertising which this State is receiving on this account throughout the country, it would appear from the above that the experiment has been a very successful one.

### INTERNAL IMPROVEMENTS.

The Sixteenth General Assembly appropriated \$85,000.00 for the construction of twenty-eight bridges and \$73,250.00 for the repair and construction of twenty-one wagon roads and one ditch. Of these projects all have been completed with exception of ten. Six of these are now under contract; the construction of two of the remaining four was not possible with the available funds. We have, however, completed eight projects left over from former administrations, making a total of forty-eight projects completed during this biennial period. The total cost of the projects completed under this administration is \$194,690.43, of which the State paid \$142,119.43 and the counties and other parties \$52,571.00. The total expense to the State of carrying out these projects was 4.2 per cent. of total cost. (Table 1.)

The increasing use of heavy agricultural machinery in this State requires that a much heavier type of highway bridge should be built than has heretofore been customary.

In order to meet this demand the office has, during this administration, with only two exceptions, prepared its own plans and specifications for these structures.

The reinforced concrete slab and girder type of bridge of maximum span, 50 feet, has been used wherever possible, on account of its low first cost, in comparison with the arch, and the small maintenance necessary to keep it up.

A typical drawing of this bridge is attached hereto. It is designed for a 16-ton traction engine loading, and reinforced with corrugated bars of high carbon steel.

The Garfield County bridge, 252-foot steel span, the general plans of which are attached, is of a heavier type of structure than any found outside of the larger cities. It is designed for a 12-ton engine.

There have been built during this administration fourteen reinforced concrete, six steel and six wooden pile bridges.

Herewith will be found Table 2, a summary of the total expenditures and number of projects completed under each State Engineer. It will be noted that the total value of the work done and the number of improvements has greatly increased during the last three administrations. The total appropriated amount remaining about the same, the increase in the number of projects has necessarily decreased the available funds for each individual project. In the case of the bridges especially, many of the structures could not have been built had it not been for the county





PART OF WAGON ROAD CONSTRUCTED BY CONVICTS.  
TRINIDAD, COLORADO.



REINFORCED CONCRETE CULVERT BUILT BY CONVICT LABOR ON  
STATE ROAD NEAR TRINIDAD, COLORADO.





interested entering into the contract jointly with the board of construction, agreeing to pay all cost in excess of the appropriated amount. As regards the roads this was not so necessary, as the work could be cut down so as to come within the available funds. This office has made it a policy, however, during this administration, to have the counties in which the roads were to be constructed pay for the necessary surveys. This was done in order that we might use as much of the appropriation as possible on the actual construction.

Table 3 shows the total amount of State funds which have been expended to date on internal improvements in each county, together with the total amount furnished by said county in connection with such improvements.

## DENVER TO PLATTE CANON BOULEVARD.

Senate Bill No. 288, chapter 4, Session Laws, 1907, appropriated \$15,000.00 for the purpose of constructing or aiding in the construction of a boulevard from Denver to Platte canon, the board of construction being the Governor, the State Engineer, the mayor and city engineer of the city of Denver.

After viewing the route the above board decided to further investigate the proposed line along the city ditch. A detailed survey was made of this route from the point where said ditch crosses Broadway, in the town of Englewood, to the north line of Littleton. This was mapped and a preliminary line platted. At a meeting of the board, held June 23d, these maps were considered, and it was decided to take the matter up with the town of Englewood and ascertain if they were willing to construct the boulevard within their limits. As yet they (the town of Englewood) have taken no definite action regarding the matter.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$15,000.00
Frederick Glenn, survey.....	\$ 111.00	
Frederick Glenn, mapping.....	96.00	
G. Wilkins, survey.....	20.00	
Richard Brissenden, survey.....	30.00	
Paul Brissenden, survey.....	20.00	
Hall Blue Print Co.....	5.25	
G. N. Houston, salary and expenses, as deputy in charge of work	28.20	
Balance in fund.....	14,689.55	
	\$15,000.00	\$15,000.00

## BACA COUNTY BRIDGE.

House Bill No. 205, chapter 7, Session Laws, 1907, appropriated \$1,500.00 for the construction of a bridge across Butte creek, Baca county, Colorado.

The board of construction consisted of the State Engineer and the chairman of the board of county commissioners of Baca county, C. H. Davis.

An inspection of the site was made by the board of construction on May 21, 1907. Plans were prepared by this office for a pile bridge of three 23-foot spans, 69 lineal feet. Bids were opened July 19, 1907.

## SUMMARY OF BIDS.

Contractor	Price	Date of Completion
Denver Bridge Co.....	\$1,250.00	Nov. 1, 1907
C. G. Sheely.....	\$12.00 per lin. ft., \$828.00	Dec. 1, 1907
Pueblo Bridge Co.....	\$759.00	Dec. 1, 1907
Canton Bridge Co., Canton, Ohio ....	\$625.00	Nov. 19, 1907
L. H. Manville, Lamar, Colo.....	\$15.00 per lin. ft., \$1,035.00	Nov. 1, 1907

The Canton Bridge Co. being the lowest responsible bidder, the contract was awarded to them.

After the contract was let a considerable additional data was received concerning the maximum high water in Butte creek, and then it was decided to increase the length of the bridge to five spans. The two additional spans were let to the same company at \$11.60 per lineal foot.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$1,500.00
G. N. Houston, salary and expenses, while in charge of the work	\$24.61	
Denver Republican advertising .....	2.40	
Springfield Herald.....	2.25	
C. H. Davis, services and expenses as inspector. ....	88.75	
Canton Bridge Co. Contract .....	1,158.60	
Balance in fund .....	223.39	
	\$1,500.00	\$1,500.00

## BENT COUNTY BRIDGE.

Senate Bill No. 289, chapter 19, Session Laws, 1907, appropriated \$4,000.00 for the construction of a bridge over the Las Animas river, near Las Animas, Bent county, Colorado, the board of construction being the State Engineer and the board of county commissioners of Bent county.

Soundings were made on the site by Mr. Will Murphy, county engineer. These showed no rock at a depth of twenty feet. The county commissioners requested that the old combination span at Hilton be used on the new bridge.

This office then prepared plans and specifications for a 100-foot steel span, to be used in addition to the old span, with concrete pier and abutments.

The work, including moving the old span, was advertised, and the following bids received October 24, 1908:

CONTRACTOR	PRICE	DATE TO BE COMPLETED
Midland Bridge Co., Kansas City, Mo.....	\$9,870.00	March 31, 1909
M. J. Patterson Contracting Co., Denver, Colo.....	\$8,950.	March 1, 1909
Ruth-Flynn Construction Co., Denver, Colo.....	\$6,450.00	Dec. 20, 1908
Pueblo Bridge Co., Pueblo, Colo.....	\$6,400.00	March 1, 1909

On November 5th the county commissioners of Bent county passed a resolution recommending that the contract be awarded to the Pueblo Bridge Co., and agreeing to pay all cost of bridge in excess of the appropriated amount.

Owing to the fact that the county commissioners had not yet obtained the right of way to and from the bridge, the matter of awarding the contract was necessarily delayed until December 3.

Work has not yet begun on the bridge.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Marshal Bros. soundings .....	6.00	
Denver Republican, advertising.....	3.00	
Balance in fund.....	3,991.00	
	\$4,000.00	\$4,000.00

## BENT COUNTY ROAD.

House Bill No. 151, chapter 66, Session Laws 1907, appropriated \$4,000.00 for the purpose of grading, piking and otherwise improving the public wagon road known as the east and west road near Las Animas, Bent county, Colorado, provided the county should expend \$1,000.00 in the same manner at the same time.

The State Engineer and the board of county commissioners of Bent county were named as the board of construction.

Specifications were prepared for a shale surfacing 12 feet wide, 8 inches thick in the center and 2 inches on the side.

The work was advertised and one bid received and opened October 14th, 1907. This bid was from W. T. Walker of Las Animas, who bid 30 cents per lineal foot for a 12-foot width roadway as specified and 25 cents per lineal foot for a roadway 10 feet wide.

The board of construction considered the bid too high compared with the price usually paid in this vicinity. When this was brought to the attention of Mr. Walker he asked to be allowed to withdraw his bid and file another for 23.15 cents per lineal foot for a 10-foot roadway. After due consideration he was allowed to do this and the contract was awarded to him on the revised bid. The surfacing was completed over 17,044 lineal feet of road and final inspection made March 8, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$ 3.23	
C. W. Beach, salary and expenses as deputy in charge of work .	41.15	
G. N. Houston, salary and expenses as deputy in charge of work	9.75	
W. T. Walker, contract.....	3,945.87	
	\$4,000.00	\$4,000.00

## BENT COUNTY ROAD—CADDOA.

House Bill No. 308, chapter 67, Session Laws 1907, appropriated \$750.00 for the purpose of piking, grading or otherwise improving the road between the Santa Fe railroad and the bridge across the Arkansas river at Caddoa, Colorado.

The State Engineer and the board of county commissioners were named as the board of construction.

The work consisted of an embankment about 750 feet long supporting a 12-foot roadway, ballasted with clay and gravel (about 2,000 cubic yards of fill in all).



This work was let to J. C. Inskeep and Joseph Austin of Caddoa, for \$650.00. The work was completed December 29, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$750.00
Denver Republican, advertising.....	\$ 3.90	
C. W. Beach, salary and expenses as deputy in charge of work..	11.35	
E. M. Williams, typewriting.....	7.50	
Inskeep and Austin, contract.....	650.00	
Las Animas County Leader, advertising.....	3.19	
W. R. Murphy, inspector.....	15.50	
Balance in fund.....	58.56	

## BOULDER COUNTY ROAD—JAMESTOWN TO ALLEN'S PARK.

House Bill No. 328, chapter 92, Session Laws 1907, appropriated \$2,250.00 for the construction and repair of the road from Jimtown to Allen's Park, Boulder county, Colorado, the board of construction named being the State Engineer and the board of county commissioners of Boulder county.

The survey was made by A. E. Chase, county surveyor of Boulder county, and paid for by said county.

The work consisted of about 9,000 lineal feet of new road, principally rock work, connecting with the old road at the top and bottom of what is known as Overland Hill.

This is located on the opposite side of the river from the old road and has a maximum grade of 10 per cent.

Bids were received on this work December 28, 1907, as follows:

CONTRACTOR	FOR ROAD COMPLETED 8,000 LINEAL FEET	FOR ROAD FROM STA. 0 TO
Mr. A. E. Noyes, Lawson, Colo.....	\$2,800.00	Sta. 63, \$2,200.00
Louis Solem, Boulder.....	\$2,870.00	Sta. 53, \$2,250.00
Hendry Johnson, Boulder.....	\$2,250.00	

The contract was awarded to Hendry Johnson, the county agreeing to pay all cost of the road in excess of the appropriated amount, not to exceed \$80.00.

The road was completed and accepted April 27, 1908.



## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,250.00
Denver Republican, advertising.....	\$ 4.50	
Boulder County Miner.....	2.66	
G. N. Houston, salary and expenses as deputy in charge of work.....	16.97	
Hendry Johnson, contract.....	2,225.00	
Balance turned back into fund.....	.87	
	\$2,250.00	\$2,250.00

## BOULDER-LARIMER COUNTIES ROAD.

House Bill 483, chapter 93, Session Laws 1907, appropriated \$2,250.00 for the repairing and otherwise improving the wagon road from Lyons in Boulder county to Estes Park in Larimer county, the State Engineer, the county commissioner of the third commissioners district of Boulder county and the county surveyor, Boulder county, being the board of construction. A. E. Chase, county surveyor, made the survey, the county paying for the same.

The work consisted of five sections, aggregating about 3,100 lineal feet, with about one-half rock work. Only one bid was received for the work, that from J. B. Hall of Lyons, Colorado, who proposed to do all the work for \$1,950.00.

This being in the opinion of the board a fair price he was awarded the contract. This work was completed April 30, and a supplementary agreement made with him to cut down the hill near the McMurtry ranch for \$50.00. In addition to this he contracted; on August 15, 1908, to do additional work amounting to \$188.50. This was finally completed about October 1, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,250.00
Denver Republican, advertising.....	\$ 1.54	
Boulder County Herald, advertising.....	1.54	
G. N. Houston, salary and expenses as deputy in charge of work.....	27.41	
George S. Sebern, Inspector.....	15.00	
A. E. Chase, Inspector.....	16.50	
J. B. Hall, contract.....	1,950.00	
J. B. Hall, extra work.....	238.01	
	\$2,250.00	\$2,250.00

## CHAFFEE COUNTY BRIDGE.

Senate Bill No. 122, chapter 5, Session Laws 1907, appropriated \$4,000.00 for the construction of a bridge across the Arkansas river, near Brown's canon, Chaffee county, Colorado, the State Engineer and the chairman of the board of county commissioners of Chaffee county being the board of construction. The board viewed the site and this office prepared plans and specifications for a reinforced concrete bridge of two 40-foot spans, slab and girder type.

The work was advertised and bids received May 13, 1908, as follows:

CONTRACTOR	BRIDGE AND APPROACHES	EXTRA CONCRETE	TIME OF COMPLETION
C. G. Sheely, Denver, Colo.....	\$4,350.00	\$25.00	Dec. 1, 1908
Levy Cons. Co., Denver, Colo.....	\$4,390.00	\$26.00	Dec. 1, 1908
Pueblo Bridge Co., Pueblo, Colo.....	\$4,200.00	\$25.00	Nov. 1, 1908

The contract was awarded to the Pueblo Bridge Company.

The county commissioners of Chaffee county agreed to pay all cost of the bridge in excess of the appropriated amount, not to exceed \$400.00. Owing to the delays from various causes, however, the cost of inspection ran much higher than was anticipated and the county was obliged to pay \$605.55 as their share of the contract.

Mr. P. O. Gaynor and W. R. Bentley were employed as inspectors on the construction. The work was completed about October 6, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$3.41	
Salida Record, advertising.....	2.66	
E. M. Williams, typewriting.....	7.50	
P. O. Gaynor, Inspector.....	112.50	
W. R. Bentley.....	231.50	
G. N. Houston, salary and expenses as deputy in charge of work	44.80	
Hall Blue Print Co., blue printing.....	3.18	
Pueblo Bridge Co., contract.....	3,594.45	
	\$4,000.00	\$4,000.00

## CHEYENNE COUNTY BRIDGE.

House Bill 304, chapter 8, Session Laws 1907, appropriated \$2,500.00 for the construction of a bridge across the Big Sandy river at Kit Carson, Colorado, the board of construction being the State Engineer and the board of county commissioners of Cheyenne county, Colorado.

On June 5th, 1907, the board inspected the river near the above town and selected the point where the old railroad grade crossed the river, just above the town, as being the best site.

Plans and specifications were prepared by this office for a pile bridge of fifteen 23-foot spans, the work advertised, and the following bids received August 16, 1907:

CONTRACTOR	PRICE	TIME FOR COMPLETION
Geo. Clossen .....	\$9.50 per ft.	Feb. 1, 1908
Denver Bridge Co.....	\$6.12	Jan. 1, 1908
C. G. Sheely.....	\$6.47 $\frac{1}{2}$	Dec. 1, 1907
Midland Bridge Co.....	\$2,850.00 total	No date stated

The contract was awarded to the Denver Bridge Company. The bridge was completed and accepted about February 1, 1908.

After completion of the contract it was decided to further protect the approaches at either end by additional wings, one at the north end and two at the south end. The work was let to James Hogan for \$85.00.

A further contract was let to Carl Duval for grading the approaches. This consisted of 750 cubic yards of fill, for which he was paid 20 cents per cubic yard, or total of \$150.00.



REINFORCED CONCRETE BRIDGE AT BROWNS CANON,  
CHAFFEE COUNTY, COLORADO.



CONCRETE BRIDGE NEAR EMPIRE. CLEAR CREEK  
COUNTY, COLORADO.





## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,500.00
Cheyenne County Republican, advertising.....	\$2.85	
Denver Republican, advertising.....	2.10	
J. C. Murphy, Inspector.....	50.00	
G. N. Houston, salary and expense, deputy in charge of work..	34.72	
Thos. Grieve, Expenses Inspector.....	5.30	
Denver Bridge Co., contract.....	2,117.52	
Denver Bridge Co., extra lumber.....	46.08	
James Hogan, contract.....	85.00	
Carl Duval, contract.....	150.00	
Balance turned back into fund.....	6.43	
	\$2,500.00	\$2,500.00

## CLEAR CREEK COUNTY BRIDGE.

Senate Bill No. 246, Chapter 9, Session Laws 1907, appropriated \$2,000.00 for the purpose of constructing a bridge across the South Fork of Clear creek, near Empire, Clear Creek county, Colorado, the board of construction being the State Engineer and the chairman of the board of county commissioners of Clear Creek county.

This office prepared plans and specifications for a thirty-foot arch bridge of reinforced concrete and advertised for bids for the same, which were opened November 13, 1907.

Mr. C. G. Sheely, of Denver, was the only bidder. He proposed to build the bridge for \$1,949.00 and have the work completed by February 15, 1908. He also submitted an alternate design for a steel girder bridge with concrete floor which he proposed to build for \$1,800.00.

These bids were rejected. Alternate plans for a steel girder bridge with concrete floor were prepared by this office and the work readvertised.

Proposals were again opened March 18, 1908, as follows:

CONTRACTOR	BRIDGE	EXTRA CONCRETE	ALTERNATE PLAN	TIME TO BE COMPLETED
Midland Bridge Co.....	\$1,893.00	.....	.....	.....
Donald P. Maxwell, Georgetown....	\$1,400.00	including ap	proaches.	June 1, '08
Chas. Hickman, Empire.....	\$1,648.00	\$11.50	.....	May 13, '08
M. F. Levy Cons. Co., Denver.....	\$1,589.00	\$16.00	\$1,192.00	No Date
Geo. Keyes, Idaho Springs.....	\$1,525.00	.....	.....	No Date
Geo. A. Sears, Denver.....	\$1,547.00	\$25.00	.....	June 15, '08

The contract was awarded to Donald Maxwell, of Georgetown, Colorado, who proposed to construct the reinforced concrete bridge including grading approaches for \$1,400.00. The work was completed June 6, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000.00
Denver Republican, advertising.....	\$ 4.20	
Georgetown Courier, advertising.....	2.10	
F. A. Maxwell, Inspector.....	80.50	
G. N. Houston, salary and expenses as deputy in charge of work.	24.00	
Donald Maxwell, contract.....	1,400.00	
Balance turned back into fund.....	489.20	
	\$2,000.00	\$2,000.00

## CLEAR CREEK COUNTY ROAD.

House Bill No. 116, Chapter 68, Session Laws, 1907, appropriated \$2,000.00 for the repair and construction of the wagon road from Idaho Springs down Clear creek in the vicinity of Floyd Hill.

Frank Maxwell, of Georgetown, made the survey. The work consisted of cutting the grade down and building a reinforced concrete wall across the south fork of Clear creek just below the bridge in order to protect the crossing from the erosion due to high water.

After advertising, the following bids were received and opened September 3, 1907:

CONTRACTOR	AMOUNT	TIME
V. J. Noxon and G. S. Wilkie.....	\$2,685.00	November 5, 1907
Henry Ramstatter, Golden, Colo.....	\$2,540.00	January 1, 1908
A. E. Noyes and Co.....	\$1,875.00	December 1, 1907

The contract was awarded to A. E. Noyes & Co., of Lawson, Colorado, who completed the same about May, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000.00
Denver Republican, advertising.....	\$ 3.61	
Idaho Siftings, advertising.....	3.04	
F. A. Maxwell, surveying and inspection.....	39.60	
C. L. Palmer, inspection.....	14.20	
G. N. Houston, salary and expenses as deputy in charge of the work.....	18.50	
A. E. Noyes, contract.....	1,875.00	
A. E. Noyes, extra work.....	45.00	
Balance turned back into fund.....	1.05	
	\$2,000.00	\$2,000.00

## CONEJOS COUNTY BRIDGE AT CAPULIN.

House Bill No. 114, Chapter 10, Session Laws, 1907, appropriated \$2,000.00 for the purpose of constructing a highway bridge across the Rio La Jara river near Capulin, Conejos county, Colorado.

The board of construction provided by the act was the Governor, the State Engineer and the chairman of the county commissioners of Conejos county.

Plans and specifications were prepared by this office for a fifty-foot span, reinforced concrete bridge, slab and girder type, and bids opened November 13, 1907, as follows:

NAME	BRIDGE	PILES	EXTRA CONCRETE	TIME TO BE COMPLETED
Pueblo Bridge Co., Pueblo, Colo.....	\$2,800.00	58c	\$23.50	May 1, '08
Walter Sharp Bridge Co.....	\$2,400.00	90c	\$18.00	June 1, '08

These bids were rejected as they were far in excess of the appropriated amount.

The work was readvertised and bids again opened January 6.

CONTRACTOR	BRIDGE	PILES PER	EXTRA	DATE
		LIN. FT. DRIVEN	CONCRETE PER CU. YD.	TO BE COMPLETED
Pueblo Bridge Co .....	\$2,350.00 (See Note)	.....	\$10.00	.....
Walter Sharp Bridge Co.....	\$2,288.00 1,988.00 (See Note)	50c	\$12.00	.....

Note:—Pueblo Bridge Company bid on plans submitted by themselves. Walter Sharp Bridge Company's second bid was conditioned on the use of the same net area of steel made up of  $\frac{7}{8}$ -inch bars instead of  $1\frac{1}{4}$ -inch specified.

Pueblo Bridge Company bid on plans submitted by themselves. Walter Sharp Bridge Company's second bid was conditioned on the use of the same net area of steel made up of  $\frac{7}{8}$ " bars instead of the  $1\frac{1}{4}$ " specified.

The contract was awarded to the latter company at \$1,988.00. The county of Conejos agreed to pay all cost of bridge in excess of the appropriated amount not to exceed \$350.00.

Mr. Luther Norland, of La Jara, county commissioner Conejos county, inspected the work of construction as it progressed. Good foundation being found at a reasonable depth it was decided not to drive piles but carry the abutments to the extra depth required. This necessitated the use of about  $13\frac{1}{2}$  cubic yards of extra concrete. Upon final inspection it was found that in removing the forms large pieces of concrete had been broken from the under side of the beams. This was sufficient in one case to expose the reinforcing steel. After the contractor had repaired these defects the bridge was accepted and paid for about September 28, 1908.

#### FINANCIAL STATEMENT.

Appropriated by state .....		\$2,000.00
Denver Republican, advertising .....	\$ 4.20	
La Jara Chronicle, advertising .....	4.95	
G. N. Houston, salary and expenses as deputy in charge of work ..	72.74	
American National Bank, Alamosa, assigned by contractor .....	1,918.11	
	\$2,000.00	\$2,000.00

## CONEJOS COUNTY ROAD.

House Bill 269, Chapter 94, Session Laws 1907, appropriated \$2,000.00 for the construction and repair of the wagon road from La Jara to Sanford and Manassa.

The Governor, the State Engineer and the chairman of the board of county commissioners of Conejos county were designated as the board of construction. The survey was made by C. B. Sampson, county surveyor, under the supervision of this office.

The work consisted principally of grading the roadway up from 12 inches to 18 inches above the seeped ground of the surrounding country.

Plans and specifications were prepared and the work advertised. Bids were opened July 24, 1908, as follows:

Mr. Luther Norland, of La Jara, proposed to do the work for \$1,950.00; Messrs. Crowther, J. H. Whitney, T. B. Whitney and Mortenson proposed to do the same work for \$1,940.00. Being the lowest bidder, the contract was awarded to them.

The road was completed and accepted October 26th, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000.00
Denver Republican, advertising.....	\$ 6.98	
La Jara Chronicle, advertising.....	32.91	
Mrs. E. M. Williams, typewriting.....	7.50	
G. N. Houston, salary and expenses as deputy in charge of work .	15.59	
Crowther J. H. Whitney, T. B. Whitney & Mortenson, contract	1,940.00	
Balance turned back into fund.....	26.02	
	\$2,000.00	\$2,000.00

## CONEJOS-COSTILLA COUNTIES BRIDGE—ALAMOSA.

Senate Bill No. 340, Chapter 13, Session Laws 1905, appropriated \$7,000.00 for the purpose of constructing a highway bridge across the Rio Grande river connecting the counties of Conejos and Costilla near the town of Alamosa, Colorado, the board of construction being the State Engineer and the chairmen of Conejos and Costilla boards of county commissioners.

Senate Bill 213, Chapter 28, Session Laws 1907, appropriated \$4,000.00 additional to construct suitable wing walls and otherwise complete the bridge under the same board of construction.



At the beginning of the present administration the contract for the bridge had been let to the Walter Sharp Bridge Company of El Dorado, Kansas.

This consisted of twelve 42-foot spans, reinforced concrete, slab and girder type bridge, the plans of which are shown in the Thirteenth Biennial Report.

The bridge was practically completed up to and including pier No. 7. Foundations only of pier No. 8 were in and pier No. 9 was built up to the beam line.

Owing to the excessive high water during the summer of 1907 work was delayed until September of that year. Mr. P. O. Gaynor was again put in charge of the work as inspector.

On September 19th, 1907, a supplementary agreement was made with the Walter Sharp Company by which certain changes in the plans which the board deemed necessary for the remainder of the bridge should be made. In brief, this was as follows: The 12th span was omitted, the contractor to give us credit for two-thirds the amount of the concrete in this span in extra concrete in piers and foundations, and place one extra 1-inch bar in each beam of the three spans 9, 10, 11 and two in each parapet of span 9. Piers 10, 11 and 12 were increased from 16 inches to 24 inches in thickness, made solid throughout and an ice breaker constructed on 10 and 11. Foundations of pier 10 were carried 2 feet deeper and piers 11 and 12 each one foot deeper than called for on the plans. The excavation to be done by force account, extra concrete at \$10.00 per cubic yard. Parapets in spans 10 and 11 to have three  $\frac{3}{4}$ -inch rods in each to cost \$40.00 extra in place; the county commissioners agreeing to pay for these changes.

The construction then proceeded in accordance with the modified plans.

This office prepared plans and specifications for wing walls. These consisted of retaining walls on pile foundations 50 feet long (afterwards increased to 60 feet) at the northeast wing and 15 feet each at the other wings. The work was advertised and only one bid received Sept. 24th, 1907, that being from Walter Sharp Bridge Company, they proposing to build the wall as shown complete for \$14.00 per lineal foot. Extra concrete to be placed at \$10.00 per cubic yard. The bridge was completed and final payment made December 16th, 1907.

About May 2nd, 1908, the attention of this office was called to an apparent disintegration of the piers in this bridge. On examination it was found that piers 1 to 8 showed more or less evidence of disintegration from 2 to 6 inches thick at the ground line and extending from  $\frac{1}{2}$  to 6 inches into the piers. It was the opinion of this office that it was caused by frozen concrete which was just thawing out. After removing the disintegrated portions a concrete block about 6 inches thick and

2 feet high was cast around the weakened portion. This was done at the expense of the contractor.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$11,000.00
Denver Republican, advertising.....	\$ 6.08	
Engineering Record, advertising.....	8.40	
Independent Journal, advertising.....	2.85	
M. S. Ketchum, report on original plan.....	25.00	
C. W. Wells, salary and expenses as deputy in charge of work..	54.80	
P. O. Gaynor, inspector.....	678.00	
B. P. Middleton.....	3.91	
Thos. Grieve, Jr., inspector.....	8.85	
G. N. Houston, salary and expenses as deputy in charge of work..	83.67	
Walter Sharp Bridge Co., contract.....	2,500.00	
First National Bank, Raton, N. M., assigned by Sharp Bridge Co.	7,625.00	
Balance turned back into fund.....	3.44	
	\$11,000.00	\$11,000.00

## CUSTER COUNTY ROAD.

House Bill No. 211, chapter 96, Session Laws, 1907, appropriated \$1,500.00 for the repairing and otherwise improving the wagon road from Querida to Whetmore postoffice, the State Engineer and chairman of the board of county commissioners of Custer county, being the board of construction. It also provided that all sums appropriated by the Sixteenth General Assembly, including the appropriation for the Garfield county bridge, should be paid before this should become available.

It being determined that there were ample funds to cover the appropriation, the matter was taken up about March 1, 1908. August Kopp, of Silver Cliff, made the survey under the supervision of this office.

The work consisted of 1,200 lineal feet of new road, with heavy rock cuts and fills, which was let in one contract and a second section of 1,500 lineal feet.

Both contracts were awarded to Mr. Charles Fuller, of Coal Creek, Custer county—section 1 for \$1,000.00, section 2 for \$400.00. Both sections were completed and paid for November 23, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$1,500.00
Denver Republican, advertising.....	4.91	
E. M. Williams, typewriting.....	7.50	
L. M. Hart (2nd section), typewriting.....	7.50	
Charles Fuller, contract.....	1,400.00	
Balance turned back into fund.....	80.09	
	\$1,500.00	\$1,500.00

## DOUGLAS COUNTY BRIDGE—SEDALIA, COLORADO.

Senate Bill No. 324, chapter 25, Session Laws, 1907, appropriated \$4,000.00 for the construction of a highway bridge across Plum creek, Douglas county, Colorado, the board of construction being the State Engineer and the chairman of the board of county commissioners of Douglas county, Colorado.

This replaces the old timber bridge on the main road from Denver to Colorado Springs, just west of the town of Sedalia. Plans and specifications were prepared by this office for a reinforced concrete structure of two 50-foot spans, slab and girder type.

After advertising, as required by the act, bids were received as follows:

CONTRACTOR	AMOUNT	PILES PER LIN. FT. DRIVEN	EXTRA CONCRETE	TIME OF COMPLETION
C. G. Sheely, Denver.....	\$3,695.00	50c	\$19.50	Nov. 1, 1907
National Construction Co., Denver.	\$4,786.00	75c	\$10.85	Dec. 31, 1907
Pueblo Bldg. Co.....	\$4,070.00	55c	\$25.00	Nov. 15, 1907
Walter Sharp Cons. Co.....	\$4,360.00	60c	\$10.00 excavation extra, \$2.00	Jan. 1, 1908

The contract was awarded to C. G. Sheely, of Denver. The contract was signed September 9, and work of driving piles for foundation begun immediately.

The county commissioners of Douglas county agreed, in a resolution dated September 7, 1907, to pay all costs of driving piles in foundations in excess of the appropriated amount. This amounted to \$533.50.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Douglas County Record, advertising.....	\$ 2.47	
Denver Republican, advertising.....	2.85	
John S. Titcomb, Inspector.....	217.00	
G. N. Houston, salary and expense, as deputy in charge of work.....	29.11	
C. G. Sheely, contract.....	3,748.50	
Balance turned back into fund.....	.07	
	\$4,000.00	\$4,000.00

## DOUGLAS COUNTY BRIDGE AT PARKER.

House Bill No. 220, chapter 30, Session Laws, 1907, appropriated \$3,750.00 for the construction of a bridge over Tallman creek, near Parker, Colorado, the board of construction being the State Engineer and the chairman of the board of county commissioners of Douglas county.

Early in March, 1908, the board viewed the site, and this office proceeded to prepare plans and specifications for a 50-foot span reinforced concrete bridge of the slab and girder type.

Upon advertising the following bids were received:

CONTRACTOR	BRIDGE INCLUDING APPROACH	PILES PER LIN. FT. IN PLACE	EXTRA CONCRETE PER CU. YD.	TIME OF COMPLETION
C. G. Sheely, Denver, Colo. ....	\$2,399.00	65c	\$19.50	Aug. 1, 1908
Pueblo Bridge Co., Pueblo, Colo.	\$2,575.00	60c	\$20.00	Sept. 1, 1908
M. F. Levy Cons. Co., Denver, Colo.....	\$2,445.00	70c	\$20.25	Sept. 15, 1908

The contract was awarded to C. G. Sheely, of Denver. Piles were driven for foundations under each abutment. R. T. Hawkey, of Parker, was employed as inspector on the construction. The bridge was completed about July 30, 1908.



## FINANCIAL STATEMENT.

Appropriated by state.....		\$3,750.00
Denver Republican, advertising.....	\$ 1.95	
Record Journal, advertising.....	2.28	
R. T. Hawkey, Inspector.....	120.00	
E. M. Williams, typewriting.....	7.50	
Blue printing.....	2.10	
C. G. Sheely, contract.....	2,399.00	
C. G. Sheely, 58-12 foot piles driven.....	452.40	
Balance in fund.....	764.77	
	\$3,750.00	\$3,750.00

## DOUGLAS COUNTY BRIDGE—CASTLE ROCK.

House Bill No. 464, chapter 12, Session Laws, 1907, appropriated \$5,000.00 for the construction of a bridge across Sellers creek, near Castle Rock, Douglas county, Colorado, the board of construction being the State Engineer and the chairman of the board of county commissioners of Douglas county.

This office prepared plans and specifications for a reinforced concrete bridge of two 50-foot spans, slab and girder type, with approaches.

Bids were received for this work April 17, as follows:

CONTRACTOR	PRICE	EXTRA CONCRETE	PILES PER LINEAL FT.	DATE OF COMPLETION
Abel & Roberts, Omaha, Neb.	\$4,490.00	\$8.00	\$ .65	June 30, 1908
Levy Cons. Co., Denver, Colo.	\$4,650.00	\$18.00	.60	No date
Pueblo Bridge Co., Pueblo, Colo. Awarded .....	\$4,423.00	\$15.00	.52	Sept. 1, 1908
Jones, Wheeler & Cramer Eng. Co., Denver, Colo. ....	\$6,690.00	\$11.00	1.50	July 15, 1908
C. G. Sheely, Denver, Colo. ....	\$1,249.00	\$22.00	1.25	Aug. 1, 1908

Although C. G. Sheely was the lowest bidder on the bridge, his price of \$1.25 per lineal foot, assuming eighty 16-foot piles to be driven in foundations, brought the bid above that of the





REINFORCED CONCRETE BRIDGE, CASTLE ROCK, COLORADO.



REINFORCED CONCRETE BRIDGE, SALIDA, COLORADO.



Pueblo Bridge Co., consequently the contract was awarded to the latter company, they agreeing to complete same by September 1, 1908.

W. R. Bentley was placed in charge of this construction as inspector.

The city of Castle Rock deposited with this office a check for \$300.00, to be used to pay the excess of cost over the appropriation, but as the total cost was \$5,318.80 the county commissioners were obliged to furnish \$18.80 additional.

The work was completed August 6, and the bridge opened for travel about four weeks later.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$5,000.00
Denver Republican, advertising.....	\$ 2.47	
Record Journal, advertising.....	2.28	
M. E. Melvin, typewriting.....	7.50	
Blue Prints.....	5.63	
W. R. Bentley, Inspector.....	204.00	
Pueblo Bridge Co.....	4,778.12	
	\$5,000.00	\$5,000.00

## DOUGLAS COUNTY ROAD.

House Bill No. 382, chapter 60, Session Laws, 1905 (page 98, thirteenth biennial report of the State Engineer), appropriated \$3,000.00 for repairing and otherwise improving the main road from the north line of Douglas county to Sedalia, in the same county. The State Engineer, the county commissioner of the third district, Douglas county, and the county surveyor were named as the board of construction.

At the beginning of the present administration the board had decided to improve the conditions at the 70-foot wooden bridge, about one-fourth of a mile south of the county line, and at the bridge across Spring gulch. Bids had been received on a 30-foot arch bridge for the first site, and a culvert at the latter site. These had been rejected by the board of construction as too high.

This office then prepared new plans and specifications for a 25-foot span reinforced concrete bridge, slab and girder type, to be built at both the above sites, and advertised for bids on same. These were as follows:

CONTRACTOR	BRIDGE NEAR WOLHURST		BRIDGE AT SPRING GULCH
	ARCH TYPE	GIRDER TYPE	GIRDER TYPE
H. T. Craig, Denver, Colo.....	\$2,950.00	\$2 900.00	
Denver Bridge Co., Denver, Colo.....	\$1,995.00	\$1,145.00	\$1,440.00
C. G. Sheely, Denver, Colo.....	\$1,487.00	\$ 993.00 Awarded	\$1,347.75 Awarded
A. W. Payne, Jr.....	\$2,500.00	\$2,000.00	
Midland Bridge Co., Kansas City, Mo.....			\$1,500.00
Walter Sharp Bridge Co., El Dorado, Kan....			\$1,350.00

The contract was awarded to C. G. Sheely for both bridges. Additional bids were asked for grading and filling the approaches to the Spring gulch bridge. On August 10 one bid was received from C. G. Sheely, who proposed to do the work for \$389.00. This work was complete about October 1, 1907.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$3,000.00
Spent previous to this administration.....	\$ 5.89	
Denver Republican, advertising.....	4.05	
Douglas County Record, advertising.....	5.47	
J. C. McAdams, Inspector .....	95.00	
G. N. Houston, salary and expenses as deputy in charge of work.	54.92	
G. P. Stewart, survey.....	68.65	
C. G. Sheely, contracts.....	2,729.75	
Balance in fund. ....	36.27	
	\$3,000.00	\$3,000.00

## DELTA COUNTY BRIDGE.

Senate Bill No. 200, chapter 17, Session Laws, 1907, appropriated \$2,000.00 for the purchase of the bridge across the Gunnison river, together with one and one-half miles of road at the mouth of Tongue creek, Delta county, Colorado, the board of construction being the Governor, the State Engineer and the

chairman of the board of county commissioners of Delta county, Colorado.

This bridge was owned by a private company known as the Gunnison River Bridge Co.

The total purchase price was \$5,000.00, of which Delta county paid \$3,000.00 and the State \$2,000.00.

The board of construction received all the necessary papers transferring the title of said bridge and road to the State of Colorado, and deposited them with the Secretary of State.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000.00
Gunnison River Bridge Co.....	\$2,000.00	
	\$2,000.00	\$2,000.00

## DOLORES COUNTY ROAD—COKE OVENS TO DUNTON.

House Bill No. 27, chapter 56, Session Laws 1903 (page 115, thirteenth biennial report of the State Engineer).

At the beginning of this administration, this office submitted to the Attorney General the matter of using the \$1,000 balance in the fund to complete this road. Under date of June 7, 1907, he submitted his opinion, from which the following is quoted:

“Undoubtedly, the contract of Mr. Meyer is far from complete even at this time, notwithstanding his apparent claim to the contrary. I understand that about \$1,000 of the appropriation is still in the treasury of the State.

“If I correctly understand your inquiry, you desire to know whether the board of construction provided for in the act mentioned can declare the contract of Mr. Meyer at an end on account of his failure to complete, and let a new contract for the completion of the road, using the balance of the appropriation for that purpose.

“The contract itself contains no provision whatever for declaring the contract at an end on account of default or nonfulfillment by the contractor, and upon consideration of the matter I am of the opinion that the board of construction can not safely proceed along the lines indicated by your inquiry.

“I am not to be taken, however, as indicating, either by implication or otherwise, that the contractor, Mr. Meyer, is entitled to any further payment on account of his contract. On the contrary, I am thoroughly convinced that until he fully completes his contract to the satisfaction of yourself and the board of construction he is entitled to no further payment. And, even in case he completes the road, there will then remain to be considered



his liability for delay under the clause of the contract providing for \$25 per day as liquidated damages."

Nothing further has been done with the matter.

#### EL PASO-TELLER COUNTIES ROAD.

House Bill No. 249, chapter 57, Session Laws, 1905 (page 90, thirteenth biennial report of the State Engineer).

At the beginning of this administration the contract for the El Paso county portion had been awarded to H. T. Craig, who completed the work July 2nd, 1907.

Bids were asked for the construction of the Teller county end, to be opened April 22, 1907, the bidder to state the amount of road he would construct for \$1,450.00, beginning at Cameron, Teller county. Only one bid was received, that being from H. T. Craig, who proposed to make the repairs and improvements over 15,800 lineal feet of road. The contract was awarded to him.

He completed this work August 10, 1907.

#### FINANCIAL STATEMENT.

Appropriated by state.....		\$3,500.00
Spent previous to this administration.....	\$ 469.36	
Cripple Creek Times, advertising.....	3.00	
Record Printing and Publishing Company.....	4.18	
G. N. Houston, salary and expenses as deputy in charge of work.....	20.48	
H. T. Craig, El Paso county contract.....	1,550.00	
H. T. Craig, Teller county contract.....	1,450.00	
Balance turned back into fund.....	2.98	
	\$3,500.00	\$3,500.00

#### EAGLE COUNTY BRIDGE.

Senate Bill No. 50, chapter 14, Session Laws, 1907, appropriated \$3,000.00 for the construction of a bridge across the Grand river, near the Wilmot Ranch, Eagle county, Colorado, the board of construction being the Governor, the State Engineer and the chairman of the board of county commissioners of Eagle county, Colorado.

Upon viewing the site it was found that it would require a 135-foot steel span on concrete abutments, and, as the appropriation would not be sufficient to build the bridge and approaches, the county commissioners of Eagle county, under date of September 16, 1908, requested "the State Engineer and Auditor of State that said funds be not turned back into the Internal Improvement fund, but be held over in order that we may, if possible, obtain a further appropriation from the next legislature."

## FINANCIAL STATEMENT.

Appropriated by state.....		\$3,000.00
G. N. Houston, expense of viewing.....	\$ 23.20	
Balance in fund.....	2,976.80	
	\$3,000.00	\$3,000.00

## DELTA COUNTY BRIDGE.

Senate Bill No. 200, chapter 17, Session Laws, 1907, appropriated \$2,000.00 for the purpose of purchasing a bridge located at a point on the Gunnison river near Tongue creek, and one and one-half miles of road at the mouth of Tongue creek.

The act also provided that the Governor, the State Engineer and the board of county commissioners of Delta county should constitute a board to carry out the provisions of the act. The price of this bridge was \$5,000.00, the county of Delta paying the additional \$3,000.00.

Deeds conveying the title to said road and bridge to the State of Colorado were furnished this office and all papers filed with the Secretary of State, February 10, 1908.

## FREMONT COUNTY BRIDGE.

Senate Bill No. 146, chapter 6, Session Laws, 1907, appropriated \$4,000.00 for the construction of a reinforced concrete bridge across the Arkansas river near the town of Portland, Colorado, the board of construction being the State Engineer and the board of county commissioners of Fremont county.

The site selected by the board was about 100 feet south of the east abutment of the D. & R. G. Railroad; the center line making an angle of about 36° to the south with the center line of the railroad. Charles Mitton, county surveyor Fremont county, was employed by this office to make the profile.

The work was advertised, asking for plans and bids for construction at the same time. These advertisements were recalled, on account of an opinion of the Attorney General, rendered July 20th, holding that plans must be adopted first and then bids received for construction later. Consequently a new advertisement was inserted asking for competitive plans for a steel or reinforced concrete bridge, to be submitted August 16, 1907, and which were to be made in accordance with the general specifications issued by this office. Only two plans were received under the advertisement, these being from the Pueblo Bridge Company, who submitted one for a single span of 125 feet; the other for two 63-foot spans, both arch bridges of the Luten type and patented.

The royalty on these bridges was \$1,000.00 for the single span and \$800.00 for the two-span bridge.

After due consideration the board concluded not to accept these plans at that time, as the county commissioners were having some difficulty in getting the necessary right of way.

The matter was not taken up again until February, 1908. This office then prepared plans and specifications for a 125-foot single-span reinforced concrete arch.

Bids for this work were opened March 24th, 1908, as follows:

NAME	BRIDGE	PILES PER EXTRA CONCRETE		DATE TO BE COMPLETED
		LIN. FT. DRIVEN	IN FOUNDATIONS PER CU. YD.	
Commonwealth Cons. Co., Denver, Colo. . . . .	\$14,750.00	70c	\$12.15	Oct. 24, 1908
Portland Cement Co., Portland, Colo. . . . .	\$11,000.00	75c	\$25.00	Dec. 15, 1908
C. G. Sheely, Denver, Colo. . . . .	\$12,213.00	90c	\$25.00	Sept. 1, 1908
Levy Cons. Co., Denver, Colo. . . . .	\$11,875.00	65c	\$13.00	Oct. 1, 1908
Midland Bridge Co., Kansas City, Mo. . . . .	\$13,920.00	60c	\$19.25	Not filled in
Pueblo Bridge Co., Pueblo, Colo. . . . .	\$9,500.00 See Note	90c	\$29.00	Jan. 1, 1909

*Note.*—Bid on plan submitted by company, being two 60-foot arch spans of the Luten type (patented).

The contract was awarded to the Portland Cement Company for \$11,000, the county commissioners of Fremont county agreeing to pay all cost of the bridge in excess of the appropriated amount.

Soundings were made on the site of both abutments, and as a result it was decided to drive piles for foundations, as no rock was discovered near the surface. Under each abutment there were seventy-two piles driven.

During the progress of the work the Portland Cement Company requested that they be allowed to raise the abutments of the bridge four feet, as this would facilitate the use of the false work which they had designed. As the Denver & Rio Grande Railway Company had recently raised the question of the adequacy of waterway in time of flood, it was thought best to allow the proposed change.

The board of construction then entered into a supplementary contract with the company, by which the following additions were agreed upon for the sum of \$800.00:

- (1) Piles under the wing walls on the up-stream side.
- (2) Spring line raised four feet.
- (3) Abutments increased in size.
- (4) Additional filling at approaches.

Arrangements were also made later to drive piles under down-stream wing walls.

The work proceeded under the inspection of Scott Truxton, C. E., recently appointed inspector general of public works of Porto Rico. The bridge was completed about July 20, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$ 15.89	
Canon City Record, advertising.....	16.21	
Scott Truxton, Inspector.....	574.74	
G. N. Houston, salary and expenses as deputy in charge of work	53.00	
Mrs. M. E. Melvin, typewriting.....	7.50	
Portland Cement Co., contract.....	3,332.60	
Balance turned back into fund.....	.06	
	\$4,000.00	\$4,000.00

## GARFIELD COUNTY BRIDGE.

House Bill No. 55, chapter 13, Session Laws, 1907, appropriated \$4,000.00 for the construction of a bridge across the Grand river near Silt, in Garfield county. The Governor, the State Engineer and the chairman of the board of county commissioners of Garfield county were named as the board of construction.

The bill also provided that this appropriation should not be paid until all other appropriations from said funds by the Sixteenth General Assembly should have been paid.

The site selected by the board was at the ferry, just east of Silt.

This office advertised and received competitive plans for a 252-foot steel span bridge, designed for a 16-ton traction engine loading.

Plans were submitted November 25, 1907, by the Southwestern Bridge Company, of Joplin, Missouri; the Midland Bridge Company, of Kansas City, and C. G. Sheely, of Denver. After minor changes in the details the latter plans were accepted and \$100.00 paid for the same. Bids were then asked for and received on these plans February 3, 1908, as follows:



CONTRACTOR	SUPERSTRUCTURE		CONCRETE ABUTMENTS		PILES PER LIN. FT.	TUBULAR PIERS		TIME OF COMPLETION	REMARKS
	WOODEN JOISTS	STEEL JOISTS	ABUTMENTS	EX. CONCR.			PILES		
F. O. Brown	.....	\$14,873.00	.....	.....	.....	\$3,449.00	.....	Irregular	No check en- closed.
C. G. Sheely	.....	11,549.00	\$3,968.00	\$25.00	\$1.00	1,790.00	\$1.50	June 1, 1908	
Pueblo Bridge Co.	\$13,200.00	.....	5,100.00	22.00	.50	2,700.00	.60	Sept. 1, 1908	
M. J. Patterson	10,250.00	12,355.00	3,315.00	15.00	1.50	1,780.00	2.00	Not filled in	{ Bids \$2,800 on concrete pier of own design. { Must have both super and substructure if accepted.
Midland Bridge Co.	10,973.00	13,286.00	2,935.00	18.00	1.10	1,817.00	1.20	June 3, 1908	
Minn. Steel & Mch'y Co.	11,200.00	13,900.00	3,400.00	33.00	1.50	2,080.00	1.50	Aug. 1, 1908	
Geo. E. Sears	11,890.00	.....	4,200.00	22.50	1.00	2,200.00	1.00	Oct. 1, 1908	
Western Bridge & Cons. Co.	12,300.00	.....	4,025.00	26.50	1.00	2,600.00	1.50	Aug. 1, 1908	
La Fayette Eng. Co.	11,300.00	13,800.00	.....	.....	.....	2,300.00	.85	Sept. 1, 1908	
Joliet Bridge & Iron Works	10,780.00	13,090.00	.....	.....	.....	1,660.00	.75	July 1, 1908	

## WOODEN JOISTS AND CONCRETE ABUTMENTS.

Lowest bidders. (1) M. J. Patterson, \$13,565.00, or \$13,650.00, concrete abutments, own design.  
(2) Midland Bridge Co., \$13,908.00.

## STEEL JOISTS AND CONCRETE ABUTMENTS.

Lowest bidders. (1) C. G. Sheely, \$15,517.00.  
(2) M. J. Patterson, \$15,670.00, or \$15,155.00, concrete abutments, own design.

## WOODEN JOISTS AND TUBULAR PIERS.

Lowest bidders. (1) M. J. Patterson Bridge Co., \$11,630.00.  
(2) Joliet Bridge & Iron Co., \$12,440.00.

## STEEL JOISTS AND TUBULAR PIERS.

Lowest bidders. (1) C. G. Sheely, \$13,339.00.  
(2) M. J. Patterson, \$14,135.00.

NOTE.—After opening and reading of the bid of C. G. Sheely, he stated that he had bid on steel joists, although not stated in the proposal.





BRIDGE AT SILT, GARFIELD COUNTY, COLORADO.



As it was evident that the appropriated amount would not be sufficient to build the bridge, the county commissioners had previously agreed to furnish \$10,000.00 in excess of same, making \$14,000.00 available. The county commissioners favored concrete abutments and steel joists for the floor, but as this bid was in excess of the available amount, and it was thought that a lighter structure would answer the purpose and come within the appropriation, the county commissioners, in a special meeting, held February 17, 1908, passed a resolution requesting the board of construction to redesign the bridge for a 12-ton traction engine loading, with steel joists for the floor, and concrete abutments.

This office proceeded to redesign as requested, and again received bids April 3, as follows:

CONTRACT R	SUPER- STRUCTURE	SUB- STRUCTURE	EX. CONCRETE IN FOUNDA- TIONS	PILES PER LIN. FT. IN PLACE	DATE TO BE COMPLETED
Western Bdg. & Cons. Co..	\$11,500.00	\$3,000.00	\$25.00	\$1.50	Jan. 1, '09
The Mo. Valley Bdg. & Iron Co.....	\$9,982.00	\$2,596.00	\$12.00	50.	Sept. 1, '08
La Fayette Eng. Co.....	\$11,790.00	.....	.....	.....	Sept. 1, '08
The Joliet Bdg. & Iron Co..	\$11,600.00	.....	.....	.....	Aug. 3, '08
Midland Bridge Co.....	\$12,600.00	\$3,200.00	\$18.00	\$1.00	Aug. 1, '08
Minn. Steel & Mch'y Co..	\$11,500.00	\$2,950.00	\$20.00	\$2.00	Sept. 1, '08
C. G. Sheely, awarded .....	\$10,186.00	\$2,789.00	\$24.50	\$2.00	Jan. 1, '09

In order to have the bridge completed in time to be used in hauling the crops to the railroad, it was evident that the work on the abutments must be started immediately or high water would seriously interfere with their construction. The Missouri Valley Bridge Company, the lowest bidder, being a foreign corporation, it would be necessary for them to file the proper papers with the Secretary of State before signing the contract, thus delaying the matter, and in addition they did not satisfy the board of construction of their willingness to begin work immediately. While the board was considering the matter, they expressed a desire to withdraw their bid, and were allowed to do so. This left Mr. C. G. Sheely, of Denver, the lowest bidder, and the contract was

awarded to him April 11, 1908, he agreeing to have the work completed by October 1, 1908. Work was commenced immediately, and Mr. P. O. Gaynor placed in charge as inspector. Nineteen cubic yards of extra concrete was used in the foundations.

The abutments were completed June 1, and work suspended until about August 1, when construction of the false work was begun. On September 15, 1908, the bridge was completed, with the exception of the approaches, which were to be built by the county.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$ 11.77	
Glenwood Post, advertising.....	6.36	
G. N. Houston, salary and expenses as deputy in charge of work	75.39	
Hall Blue Print Co., blue prints.....	11.34	
P. O. Gaynor, Inspector.....	269.60	
Mrs. M. E. Melvin, typewriting.....	15.50	
C. G. Sheely, plans.....	100.00	
C. G. Sheely, contract.....	3,510.00	
Balance turned back into fund.....	.04	
	\$4,000.00	\$4,000.00

## GILPIN COUNTY ROAD.

House Bill No. 378, Chapter 98, Session Laws, 1907, appropriated \$2,500.00 for the construction of a wagon road from Tolland, Gilpin county, to American City, Apex, Elk Park, Mammoth, Kingston, in Gilpin county, and Yankee in Clear Creek county. The Governor, the State Engineer and Charles S. Ripley ("one citizen of Tolland to be named by the Governor") constituted the board of construction.

A deputy from this office, accompanied by Mr. Parker, engineer of maintenance of way of the "Moffat road," went over the route as named in the bill, and, as a result, a revision of the survey was ordered.

Mr. Geo. R. Stewart, of Alice, Colorado, who took the original notes, made the resurvey.

As the appropriation was not sufficient to construct the whole road the work was advertised asking the bidders to state how much they would build for the available amount (\$2,450.00). Bids were received August 2, 1907, as follows:

CONTRACTOR	LENGTH OF ROAD	DATE TO BE COMPLETED
Hendry Johnson, Boulder, Colo.....	Stas. 0 to 75, 7,500 lin. feet	95 days from date of signing contract
Harry Hocasana.....	7,920 lin. feet	Oct. 31st, 1907

While considering these bids Mr. Hocasana asked permission to withdraw his bid and have his check returned. The board of construction, believing that it was to the best interest of the State to readvertise, rejected these proposals and asked for further bids to be opened September 19, 1907.

At the second letting only one bid was received, that being from Mr. Hendry Johnson, of Boulder, who proposed to construct 8,900 lineal feet of road for \$2,450.00 and have same completed in ninety days. The contract was let to Mr. Johnson, who commenced work immediately and completed his contract November 19, 1907.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,500.00
Denver Republican, advertising.....	\$ 5.89	
Weekly Register Call, advertising.....	5.70	
G. N. Houston, salary and expenses, deputy in charge of work..	20.92	
Hendry Johnson, contract.....	2,450.00	
Balance turned back into fund.....	17.49	
	\$2,500.00	\$2,500.00

## GUNNISON COUNTY ROAD.

House Bill No. 97, chapter 60, Session Laws, 1903, appropriated \$4,000.00 for the construction of a wagon road from near Irwin, Gunnison county, Colorado, down Anthracite creek to its confluence with Coal creek.

At the beginning of this administration there was \$3,074.11 balance in the fund, the surveys having been made, but no road constructed. The Sixteenth General Assembly then enacted Senate Bill No. 258, chapter 100, Session Laws, 1907, an amendment to the former bill providing that the money should be used to construct the road, as far as possible, beginning at the Irwin end.

Mr. Heiner, the county surveyor of Gunnison county, was employed to reset the original stakes and relocate the line at many points, thereby reducing the cost of construction.



After advertising for bids for a passable road the contract was let to Kasper Pressler, of Mt. Carbon, Colorado, who constructed the road to Station 190.

## FINANCIAL STATEMENT.

Balance on hand.....		\$3,074.11
Denver Republican, advertising.....	\$ 7.44	
Gunnison Republican, advertising.....	5.77	
S. C. Mosher, relocation.....	45.00	
W. A. Mosher & Son, relocation.....	60.00	
G. W. Eastman, livery.....	12.00	
G. N. Houston, salary and expenses as deputy in charge of work.....	47.50	
K. Pressler, contract.....	2,800.00	
Balance in fund.....	95.04	
	\$3,074.11	\$3,074.11

## GUNNISON COUNTY BRIDGE.

Senate Bill No. 71, chapter 61, Session Laws, 1907, appropriated \$4,000.00 for the construction of a bridge over the Gunnison river near the Postoffice of Iola, Gunnison county, Colorado, the board of construction being the State Engineer and the chairman of the board of county commissioners of Gunnison county. The exact location was left to the discretion of the above board. Some difference of opinion existed among the local people regarding the proposed site. Some insisted that the point intended was about two miles above Iola at or near what is at present known as the Ten Mile bridge; others favored the lower site at the county road crossing one-quarter mile above Iola. Petitions were received and considered from both parties. After a thorough investigation of the existing conditions it was decided to follow the wording of the law and place the bridge as near as practicable to the Postoffice at Iola.

The bridge was therefore built at the lower site.

This office prepared plans and specifications for a 125-foot steel span on tubular piers with forty-foot pile approaches at both ends.

Bids for the same were received September 27, 1907, as follows:



REINFORCED CONCRETE BRIDGE AT CAPULIN,  
CONEJOS COUNTY, COLORADO.



STEEL BRIDGE AT IOLA, GUNNISON COUNTY, COLORADO.



CONTRACTOR	PRICE	DATE TO BE COMPLETED
Ruth-Flynn Cons. Co.....	\$5,109.00	March 31, 1908
Pueblo Bridge Co.....	\$4,892.00	April 15, 1908
Denver Bridge Co.....	\$5,000.00	July 1, 1908
National Cons. Co.....	\$5,870.00	May 31, 1908

As these bids were all in excess of the appropriated amount they were rejected and the work readvertised.

Bids were again opened November 13, 1907, as follows:

CONTRACTOR	PRICE	DATE TO BE COMPLETED
Southwestern Bridge Co., Joplin, Mo.....	\$4,350.00 *\$3,990.00	March 15, 1908
Midland Bridge Co., Kansas City, Mo.....	\$4,800.00	April 15, 1908
Pueblo Bridge Co.....	\$4,650.00	April 1, 1908

\*This bid was informal and conditioned on the use of native lumber instead of Oregon fir as specified.

The contract was awarded to the Southwestern Bridge Company, of Joplin, Mo., on their regular bid of \$4,350.00.

The county commissioners of Gunnison county, by resolution dated December 3, 1907, agreed to pay all cost of the bridge in excess of the appropriated amount, not to exceed a total of \$450.00

The contract was signed and bond furnished November 26, 1907.

On January 7, 1908, this office learned that the Southwestern Bridge Company had gone into the hands of a receiver. We were assured, however, by W. B. Kane, the trustee, as well as by the the bondsmen, that the company would complete its contract.

The bridge was completed by them about June 1, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$ 5.32	
Gunnison Republican, advertising.....	1.43	
G. N. Houston, salary and expenses as deputy in charge of work.....	58.01	
Southwestern Bridge Co., contract.....	3,935.00	
Balance turned back into fund.....	.24	
	\$4,000.00	\$4,000.00

## HINSDALE COUNTY ROAD—HENSON CREEK.

Senate Bill 73, chapter 64, Session Laws, 1905, appropriated \$3,500.00 for the extension of the wagon road recently built by the State up Henson creek, Hinsdale county, past Roses Cabin and up Engineer mountain to the San Juan county line; the board of construction being the State Engineer and the board of county commissioners of Hinsdale county.

At the beginning of this administration there was a balance in this fund of \$1,082.11.

Senate Bill 196, chapter 99, Session Laws, 1907, appropriated \$500.00 to be expended under the same board of construction, in improving the same road at the point known as Whetmore hill and from Roses Cabin up Engineer mountain.

W. R. Davey, of Lake City, made the survey under the direction of this office.

The work consisted of constructing a new road up Whetmore hill, on the opposite side of the gulch, with a maximum 4 per cent. grade, and the repairing and otherwise improving the old road from Roses Cabin on. The work was advertised and the contract let to John Henderson, of Lake City, for \$1,500.00.

This work was completed August 7, 1908.

## FINANCIAL STATEMENT.

Appropriated by state, 1905.....		\$3,500.00
Appropriated by state, 1907.....		500.00
Expended previous to this administration.....	\$2,417.89	
Denver Republican, advertising.....	3.52	
Lake City Times, advertising.....	3.44	
Wm. C. Blair, Inspector.....	5.77	
W. R. Davey, Inspector.....	12.00	
G. N. Houston, salary and expenses as deputy in charge of work.....	53.40	
John Henderson, contract.....	1,500.00	
Balance turned back into fund.....	3.98	
	\$4,000.00	\$4,000.00



## WALSENBURG DITCH.

House Bill, No. 284, chapter 56, Session Laws, 1907, appropriated \$2,000.00 for the construction of a ditch for the purpose of diverting the flood waters from the town of Walsenburg; the board of construction named being the State Engineer and the mayor and board of trustees of the town of Walsenburg, Colorado.

W. N. Houser, of the above city, made the survey under the directions of this office.

Plans and specifications were prepared and bids asked for the construction. One bid was received from Messrs. R. Jones and J. W. Stewart, of Walsenburg, who proposed to do the work for \$1,825.00. The contract has not been awarded as yet.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000.00
Denver Republican, advertising.....	\$ 2.66	
Balance in fund.....	1,997.34	
	\$2,000.00	\$2,000.00

## CHAFFEE-EAGLE COUNTIES ROAD—BUENA VISTA TO RED CLIFF.

## LAKE COUNTY PORTION.

Senate Bill No. 347, chapter 53, Session Laws, 1903, page 122, thirteenth biennial report of the State Engineer.

At the beginning of this administration there was a balance of \$1,438.05 in this fund. Messrs. Crawford and Clark, of Leadville made a survey of those parts of this road in Lake county where repairs were most necessary, and the work was advertised.

One bid was received from Zenas Crawford, of Leadville, Colorado, who proposed to do the work from the new road leading to Twin Lakes, opposite Snowden, on the Midland Railroad, north to Lords' ranch house, and about 4,000 lineal feet at the Clinton ranch, north of Leadville, for a total of \$1,400.00.

The contractor has nearly completed the lower section and has been paid \$360.00 on account. An extension of time has been granted him in which to finish his contract to August 1, 1909.

## FINANCIAL STATEMENT.

Balance in fund April, 1907.....		\$1,438.05
Denver Republican, advertising.....	\$ 1.95	
Leadville Publishing Co., advertising.....	2.10	
Zenas Crawford, contract.....	360.00	
Balance in fund.....	1,074.00	
	\$1,438.05	\$1,438.05

## LAKE COUNTY BRIDGE.

House Bill No. 178, chapter 18, Session Laws, 1907, appropriated \$4,000.00 for the construction of a bridge across the Arkansas river at the point where the county road from Leadville to Twin Lakes crosses same; the board of construction being the State Engineer, the chairman of the board of county commissioners, Lake county, and the chairman of the committee on roads and bridges of the same county, who were to select the exact location.

After viewing the present crossing it was decided that a more advantageous site could probably be found lower down.

Negotiations were begun by the county commissioners of Lake county for right of way.

The bridge was finally located near the station, Snowden, on the Colorado Midland Railroad.

This office prepared plans and specifications for two 40-foot spans of reinforced concrete and advertised for bids.

These bids were received and opened September 13, 1907, as follows:

NAME	PRICE	PILING PER CU. FT. DRIVEN	EX. CONCRETE PER CU. YD.	DATE TO BE COMPLETED
Puebl. Bdg. Co., Pueblo, Colo.	\$4,865.00	65c	\$15.00	Nov. 15, '07
C. G. Sheely.....	\$5,250.00	55c	\$29.00	Nov. 15, '07
Pueblo Bridge Co.....	\$4,700.00	for two Luten Patented	spans 40 ft.	Nov. 15, '07
National Cons. Co., Denver, Colo.....	\$4,587.00	50c	\$18.00	Nov. 15, '07
Ruth-Flynn Cons. Co., Den- ver, Colo.....	\$4,676.00	75c	\$18.50	Nov. 15, '07

All bids were rejected on account of the price being far in excess of the appropriated amount.

Plans were furnished this office by the Pueblo Bridge Company for two 35-foot spans, Luten type arch bridge (patented). These were accepted and bids asked on same.

These were received and opened March 6, 1908, as follows:

NAME	PRICE	DATE TO BE COMPLETED
C. G. Sheely, Denver, Colo. ....	\$4,000.00	July 1, 1908
Pueblo Bridge Co., Pueblo, Colo. ....	\$3,980.00	June 10, 1908

The Pueblo Bridge Company being the lowest bidder, the contract was awarded to them.

This bridge was completed October 15, 1908. Lake county paid \$223.80 as its share of the contract price.

## FINANCIAL STATEMENT.

Appropriated by state .....		\$4,000.00
G. N. Houston, salary and expenses as deputy in charge of work	\$ 39.10	
Leadville Printing and Pub. Co., advertising .....	2.40	
Denver Republican, advertising .....	4.80	
Mrs. M. E. Melvin, typewriting .....	7.50	
Pueblo Bridge Co., contract .....	3,756.20	
C. O. Heller, Inspector .....	190.00	
	\$4,000.00	\$4,000.00

## LARIMER COUNTY ROAD—FORT COLLINS TO LOVELAND.

Senate Bill No. 139, chapter 102, Session Laws, 1907, appropriated \$4,000.00 for the repair of the county road from Fort Collins to Loveland, Larimer county, Colorado; the board of construction being the State Engineer and the board of county commissioners of Larimer county.

A. E. Sprague, county surveyor, was employed by this office to make the survey.

The work consisted principally of cutting down grades to a maximum of 4 per cent.

The work was advertised and bids opened October 14, 1907.

S. R. Thompson, of Fort Collins, proposed to construct from Station 175 to Station 330 for \$3,950.00.

James Ross, of Fort Collins, proposed to construct from 175 to 365 for the same money.

The contract was let to the latter party, who completed the road April 27, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$ 2.85	
Courier Printing and Pub. Co., advertising.....	11.06	
G. N. Houston, salary and expenses as deputy in charge of work	10.50	
James Ross, contract .....	3,950.00	
Balance turned back into fund.....	25.59	
	\$4,000.00	\$4,000.00

## LARIMER COUNTY ROAD—BIG THOMPSON CANON.

House Bill No. 4, chapter 101, Session Laws, 1907, appropriated \$4,000.00 for the repairing and otherwise improving the wagon road up the Big Thompson canon to Estes Park; the board of construction being the Governor, State Engineer and board of county commissioners of Larimer county.

The survey was made by A. E. Sprague, county surveyor. The work consisted of cutting down grades, widening and making turnouts, and other scattered repairs, extending from the Handy dam to Estes Park.

The work was advertised and two bids received. One from Louis Solem, of Boulder, who proposed to do the work for \$3,800.00, but whose bid was accompanied by a personal check instead of a certified or cashier's check as required.

The other from Hendry Johnson, of Boulder, who proposed to do the work for \$3,850.00.

Pursuant to an opinion from the Attorney General, the first bid was rejected as being informal, and the contract awarded to Mr. Johnson.

Work was commenced immediately and the road completed early in August, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising .....	\$ 2.10	
Courier Printing & Publishing Co., advertising.....	2.10	
Blue Printing .....	1.78	
E. M. Wilhams, typewriting .....	7.50	
G. N. Houston, salary and expenses, as deputy in charge of work	12.50	
Hendry Johnson, contract .....	3,850.00	
Balance turned back into fund .....	124.02	
	\$4,000.00	\$4,000.00





REINFORCED CONCRETE BRIDGE NEAR SNOWDEN,  
LAKE COUNTY, COLORADO.  
(Luten Type.)



VIEW ON BIG THOMPSON CANON ROAD, LARIMER COUNTY,  
COLORADO.





## MESA COUNTY BRIDGE.

Senate Bill No. 235, chapter 15, Session Laws, 1907, appropriated \$3,000.00 for the purpose of constructing a bridge across the Grand river, at a point south of the town of Fruita, Mesa county, Colorado; the board of construction being the State Engineer and the board of county commissioners of Mesa county.

On June 6, 1906, the town of Fruita and county of Mesa jointly entered into contract with the M. J. Patterson Contracting Company to erect a steel bridge of three 155-foot spans, on tubular piers, at the above point.

It was the intention of this bill to have the appropriation apply on this bridge.

When completed, on March 21, 1907, the board of construction viewed and accepted the same. The total cost of the bridge was \$17,762.90.

At the time the State made its payment the county and town had paid \$12,023.00 on this account, leaving \$5,739.90 then due. On December 5, 1907, this office issued a voucher for \$3,000.00 to the M. J. Patterson Contracting Company, leaving a balance still due from county and town on account of said bridge of \$2,739.90.

## MINERAL COUNTY ROAD AND FLUME.

House Bill No. 160, chapter 69, Session Laws, 1907, appropriated \$8,000.00 for the construction and repair of a flume to carry the waters of Willow creek through the town of Creede, Colorado; the board of construction being the Governor, the State Engineer and the chairman of the board of county commissioners of Mineral county.

Mr. Shrive Collins, of Creede, was employed by this office to make the necessary surveys, and the office prepared plans and specifications for the work.

The work was advertised and bids received as follows: John L. Peters, of Creede, Colorado, agreed to build 550 feet of the crib protection on Upper Creede for \$1,500.00, and the remainder of the work for \$9,786.00, making a total of \$11,286.00. Lewis J. Chapman, of Creede, proposed to do the same work for \$10,902.00.

As these bids were far in excess of the appropriation, it was decided to reject them and readvertise on revised specifications and plans.

The proposed work was divided into sixteen sections, as follows:

Section 1. Minor repairs to crib work above the D. & R. G. crossing in Upper Creede.

Sections 2, 3, 4. Rock-filled crib protection along the wagon road from the D. & R. G. crossing 850 feet down stream.

Section 5. Omitted.

Section 6. A new entrance to the flume of rock-filled crib work, with 3-foot drop and wing walls, all floored with logs.

Sections 7, 8, 9, 10. Minor repairs and drops.

Sections 11, 12, 13. Flume entirely rebuilt, with rock-filled crib work, and floored with logs, including a 4-foot drop at Fourth street.

Sections 14, 15, 16. The present flume was to be cleaned out where filled up, and floored with logs. Minor repairs being made to the sides. Also including a substantial crib outlet at the end.

The work was readvertised, asking for bids on individual sections. These were received as follows:

SEC.	J. L. PETERS FURNISH EVERYTHING	SEC.	L. PEARL AND C. WELLE FURNISH EVERYTHING	COMMISSIONERS FURNISH LOGS
1	\$ 75.00	1	\$ 74.09	\$ 57.25
2	1,650.00	2	409.37	293.56
3		3	409.37	293.56
4		4	409.37	293.56
5		5		
6	600.00	6	490.24	322.52
7	500.00	7	360.00	243.92
8		8	360.00	243.92
9		9	50.00	21.60
10	100.00	10	50.00	21.60
11		11	1,493.00	1,094.75
12	5,475.00	12	1,450.00	1,196.92
13		13	3,708.38	2,651.42
14		14	1,430.00	1,042.40
15		15	794.48	238.40
16		16	771.00	485.04

H. E. Le Zotte put in the following bid for furnishing the logs per lineal foot:

DIA. AT SMALL END INSIDE OF BARK	LESS THAN			
	15 FT. LONG PER LIN. FT.	15 FT. LONG	17 FT. LONG	21 FT. LONG
For logs 6 in. dia.....	4 $\frac{1}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{4}$
For logs 7 in. dia.....	4 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{1}{2}$
For logs 8 in. dia.....	4 $\frac{3}{4}$	4 $\frac{3}{4}$	4 $\frac{3}{4}$	4 $\frac{3}{4}$
For logs 9 in. dia.....	5	5	5	5

The contract was awarded to John L. Peters for Sections 1, 2, 3, 4 and 11, 12, 13 for a total of \$7,200.00, including furnishing of logs. Section 6 being considered an important part of the work, the board of construction began negotiations with the city of Creede with the purpose of having the city pay \$250.00 toward the construction of this section and the State pay the difference, or \$350.00, this being the estimated balance in the appropriation after deducting necessary expenses.

The city of Creede, however, was only willing to do this providing the whole work could be completed before high water. As this was practically impossible the matter was dropped. After work was begun negotiations were resumed, but no satisfactory arrangements were made.

Mr. L. A. Sumner was appointed inspector on the work, which was completed October 10, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$8,000.00
Denver Republican, advertising.....	\$ 8.72	
Creede Candle, advertising.....	8.47	
S. B. Collins, survey.....	206.75	
G. N. Houston, salary and expenses as deputy in charge of work	76.26	
L. A. Sumner, Inspector.....	366.00	
John L. Peters, contract.....	7,200.00	
Balance turned back into fund.....	133.80	
	\$8,000.00	\$8,000.00

## MONTEZUMA COUNTY BRIDGE.

Senate Bill No. 223, chapter 11, Session Laws, 1907, appropriated \$1,000.00 for the construction of a bridge across the Dolores river in Montezuma county, near the point where the

river crosses the north boundary line; the board of construction being the State Engineer and the chairman of the board of county commissioners of Montezuma county. The board viewed the site and this office prepared plans and specifications for two 55-foot spans (A) truss bridge on crib abutments and pier, to be built of native timber.

Only one bid was received, March 13, 1908, for this plan, that being from Bennet & Derby, of Dolores, who proposed to construct same for \$1,375.00.

This bid was rejected and the work readvertised and bids opened June 30, 1908.

CONTRACTOR	PRICE WITH RECTANGULAR PIER	PRICE WITH TRIANGULAR PIER	DATE TO BE COMPLETED
H. H. Jones, Dolores . . . . .	\$1,200.00 No check enclosed	\$1,225.00	Sept. 15, 1908
Treadway & Millard, Dolores . . . . .	\$1,190.00	Informal. Received 10.30 A. M., July 2nd, 1908	
Derby & Jones, Dolores . . . . .	\$1,250.00	\$1,225.00	

The contract was awarded to Derby & Jones, of Dolores, Colorado, for \$1,250.00, the county agreeing to pay the cost in excess of the appropriation, not to exceed \$280.00.

The contract was completed December 20, 1908.

The county paid \$281.28 as their share of the contract.

#### FINANCIAL STATEMENT.

Appropriation by state . . . . .		\$1,000.00
Denver Republican, advertising . . . . .	\$ 4.05	
Dolores Star, advertising . . . . .	3.60	
Mancos Times Tribune, advertising . . . . .	1.21	
Mrs. M. E. Melvin, typewriting . . . . .	7.50	
Louis Paquin, livery . . . . .	3.50	
G. N. Houston, salary and expenses as deputy in charge of work . . . . .	11.82	
Derby & Jones, contract . . . . .	968.32	
	\$1,000.00	\$1,000.00



## MONTEZUMA-DOLORES COUNTIES ROAD.

Senate Bill No. 47, chapter 97, Session Laws 1907, appropriated \$3,000.00 to construct and repair the wagon road from Rico to Dolores.

The State Engineer and the chairman of the boards of county commissioners of Dolores and Montezuma counties were named as the board of construction. The board viewed the road and agreed that the funds should be divided between the two counties—\$1,000.00 to be used in Dolores and \$2,000.00 in Montezuma. Geo. Mills, county surveyor of Montezuma county, made the survey for portion in that county. The work consisted of 4,000 lineal feet of new road to be constructed, including two log bridges, 20-foot and 25-foot spans.

This work was advertised, and one bid received from C. W. Virden, of Bear Creek, Montezuma county, Colorado, who proposed to do all the work for \$980.00. The contract was awarded to him, to be completed December 1, 1908. On October 26 this was extended to January 1, 1909.

This office then prepared plans and specifications for two timber bridges, one of 55-foot span over Bear creek, and one over the Dolores river, consisting of a 46-foot span and a 21-foot span. This work was all in Montezuma county.

Upon advertising two bids were received, one from Milton Virden, of Bear Creek, who bid \$2,000.00 for the whole work, and one from E. M. Millard and O. N. Treadway, who proposed to build the Dolores river bridge for \$685.00, and the bridge at Bear creek for \$515.00, making a total of \$1,200.00, to be completed April 1, 1909.

The contract was let to the latter parties, the county agreeing to pay \$250.00 towards the construction. The contracts have been signed and work begun.

The Dolores county section was advertised and one bid received, but, owing to the early snows, the bid was rejected and the matter postponed until spring.

## FINANCIAL STATEMENT.

	MONTEZUMA COUNTY	DOLORES COUNTY	
Appropriated by state.....			\$3,000.00
Denver Republican, advertising.....	\$ 7.69	\$ 1.95	
Dolores Star, advertising.....	5.70		
Rico News, advertising.....		1.80	
Mrs. E. M. Williams, typewriting.....	5.50	2.00	
Louis Paquin, livery, viewing.....	7.25	3.50	
G. L. Garren, expenses, viewing.....		2.00	
G. N. Houston, salary and expenses as deputy in charge of work.....	15.83	7.80	
Pledged on contract road.....	980.00		
Pledged on contract two bridges.....	950.00		
Unpledged in fund.....	28.03	980.95	
	\$2,000.00	\$1,000.00	

## MONTROSE COUNTY ROAD.

Senate Bill No. 298, chapter 103, Session Laws, 1907 appropriated \$3,000.00 for the construction and repair of a wagon road from the cabins on Dry creek to north side of Dry creek on east side of Uncompahgre plateau, including a bridge at Pinon, all in Montrose county, Colorado. The board of construction named being the State Engineer and the board of county commissioners of Montrose county. The survey of the first section was made by W. E. Hance. This consisted of two miles of road up Dry creek. The work was advertised, and one bid received from Jacob Dobler, Andrew Ubell and Lincoln Vestal, who proposed to do the work for \$775.00. The contract was awarded to them and completed about June 1, 1908.

This office prepared plans and specifications for a wooden bridge of one 50-foot and one 24-foot span across the San Miguel river at Pinon, advertised for bids and awarded the contract to A. S. Delaplaine, who proposed to do the work for \$1,065.00. This was also completed about June 1, 1908.

The second section of the road work, about four miles from Dry creek to Iron spring, was let to Napoleon Leap, of Nucla, who proposed to do the work for \$1,050.00, and have same completed by December 1, 1908, but, owing to the early snows, has not been able to do so. An extension of time to August 1, 1909, has been granted him.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$3,000.00
Denver Republican, advertising.....	\$ 6.23	
Press Publishing Co., advertising.....	6.75	
G. N. Houston, salary and expenses as deputy in charge of work.....	14.90	
Ubell, Dobler & Vestal, contract.....	775.00	
A. S. Delaplane.....	1,090.00	
Pledged to Napoleon Leap on contract.....	1,050.00	
Balance in fund unpledged.....	57.12	
	\$3,000.00	\$3,000.00

## MORGAN-WASHINGTON COUNTIES BRIDGE.

House Bill No. 8, chapter 24, and Senate Bill No. 17, chapter 20, Session Laws, 1907, appropriated \$4,000.00 for the construction of a bridge across the Platte river as near as practicable on the county line between Morgan and Washington counties; the board of construction being the State Engineer and chairmen of the boards of county commissioners of Morgan and Washington counties.

The board selected the site, and this office prepared plans and specifications for a pile bridge. As the Platte at this point is 1,600 feet from bank to bank, and the funds available were not sufficient to build a bridge for the entire width, it was decided to construct thirteen 23-foot spans over the channel on south side and twenty-six 23-foot spans over the north channel. The two sections were to be connected by a fill 750 feet long on the high ground, at the expense of the counties.

Bids were received as follows:

CONTRACTOR	PRICE PER LINEAL FT.	DATE TO BE COMPLETED
Smith & McCarty, Ft. Morgan, Colo. ....	\$5.93	Oct. 1, 1907
John Gilligan & Co., Falls City, Neb.....	\$6.25	Nov. 21, 1907
John Gilligan, Falls City, Neb.....	\$6.39	Sept. 15, 1907
Denver Bridge Co., Denver, Colo.....	\$5.65	Jan. 1, 1908
C. G. Sheely, Denver, Colo.....	\$5.54½	Oct. 1, 1907
Midland Bridge Co., Kansas City, Mo.....	\$6.25	Nov. 21, 1907

The lowest responsible bidder being C. G. Sheely, the contract was awarded to him. The contract was signed July 1, 1907, and the structure completed September 28, 1907, the counties agreeing to pay the cost in excess of the appropriation. The counties paid \$1,070.19 as their share of the contract.

## FINANCIAL STATEMENT.

Appropriation by state.....		\$4,000.00
Akron Pioneer Press, advertising.....	\$ 2.10	
Ft. Morgan Times, advertising.....	2.25	
Denver Republican, advertising.....	2.40	
Mark Gill, Inspector.....	48.00	
G. N. Houston, salary and expense as deputy in charge of work.	22.69	
C. G. Sheely, contract.....	3,922.56	
	\$4,000.00	\$4,000.00

## OTERO COUNTY ROAD.

Senate Bill No. 100, chapter 104, Session Laws, 1907, appropriated \$4,000.00 for the purpose of ballasting a portion of the road from Swink to Fowler, Otero county, Colorado, the board of construction being the State Engineer and the board of county commissioners of Otero county.

Samples of the shale which it was proposed to use for this surfacing were submitted to this office by the county commissioners, and accepted.

Bids were received as follows:

CONTRACTOR	TIME OF COMPLETION	PRICE UNROLLED	PRICE ROLLED
L. C. Swink, Rocky Ford.....	June 1st, 1908	34c per lin. ft.	
F. C. Bassett, Rocky Ford ..	Aug. 1st, 1908	29c per lin. ft.	39c per lin. ft.
W. H. King & Co. . . . .	May 1st, 1908	31c per lin. ft.	

The contract was awarded to F. C. Bassett for unrolled roadway at twenty nine cents per lineal foot.

On June 16 the contractor had completed 13,707 45-100 lineal feet, for which he was paid \$3,975.00.





PILE BENT BRIDGE AT KIT CARSON, CHEYENNE  
COUNTY, COLORADO.



REINFORCED CONCRETE BRIDGE ON RED MOUNTAIN ROAD,  
NEAR OURAY, COLORADO.





## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$ 1.95	
La Junta Tribune, advertising.....	2.66	
G. N. Houston, salary and expenses as deputy in charge of work.....	16.25	
F. C. Bassett contract.....	3,975.00	
Balance turned back into fund.....	4.14	
	\$4,000.00	\$4,000.00

## OURAY COUNTY BRIDGE.

Senate Bill No. 108, chapter 21, Session Laws, 1907, appropriated \$2,500.00 for the construction of a bridge across the Uncompahgre river, on the famous road from Ouray to Silverton, the board of construction being the State Engineer and the board of county commissioners of Ouray county.

This office prepared plans and specifications for a reinforced concrete structure of 37-foot span, slab and girder type, advertised the work, and received bids March 31, 1908, as follows:

CONTRACTOR	PRICE	DATE TO BE COMPLETED
C. G. Sheely, Denver.....	\$3,129.00	July 1, 1908
M. F. Levy Cons. Co., Denver.....	\$2,342.00	Sept. 1, 1908
Pueblo Bridge Co., Pueblo.....	\$3,250.00	Aug. 1, 1908

The contract was awarded to The M. F. Levy Construction Company. Mr. John F. Keleher, of Ouray, was inspector on the construction.

The bridge was completed August 20, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,500.00
Denver Republican, advertising.....	\$ 2.66	
Ouray Herald, advertising.....	2.47	
Mrs. M. E. Melvin, typewriting.....	7.50	
J. F. Keleher, Inspector.....	80.00	
G. N. Houston, salary and expenses as deputy in charge of work.....	63.18	
Hall Blue Print Co., blue prints.....	1.68	
M. F. Levy Cons. Co., contract.....	2,342.00	
Balance turned back into fund.....	.51	
	\$2,500.00	\$2,500.00

## PARK COUNTY BRIDGE.

House Bill No. 122, chapter 29, Session Laws, 1907, appropriated \$2,000.00 for the construction of a bridge over the south fork of the South Platte river, near the point known as Twin Bridges, Park county, Colorado, the board of construction being the State Engineer and the chairman of the board of county commissioners of Park county.

The board viewed the site, and this office prepared plans and specifications for a 40-foot span reinforced concrete bridge, slab and girder type, with pipe hand-rails, including approaches.

The work was advertised and bids received on May 20, 1908, as follows:

CONTRACTOR	BRIDGE AND APPROACHES	PILES PER LIN. FT.	EXTRA CONCRETE PER CU. YD.	TIME OF COMPLETION
Donald Maxwell, informal, bridge without approaches.....	\$2,100.00	.....	\$15.00	Aug. 1, 1908
M. F. Levy Construction Co. ....	\$2,335.00	\$ 1.00	\$23.00	Oct. 15, 1908
C. G. Sheely. ....	\$2,425.00	\$ 1.00	\$25.00	Nov. 1, 1908

The contract was awarded to M. F. Levy Construction Co., the county agreeing to pay all cost of bridge in excess of the appropriated amount, not to exceed \$400.00.

After the contract was signed the county commissioners expressed the desire to do the filling of the approaches themselves, and the contractor agreed to deduct \$185.00 from his contract price on this account.

The bridge was completed about November 5, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000.00
Denver Republican, advertising.....	\$ 3.85	
M. E. Melvin, typewriting.....	7.00	
W. R. Bentley, Inspector.....	166.00	
G. N. Houston, salary and expenses as deputy in charge of work.....	21.01	
M. F. Levy Construction Co., contract.....	1,794.14	
Balance in fund.....	8.00	
	\$2,000.00	\$2,000.00

## PITKIN COUNTY ROAD—LINCOLN GULCH TO LAKE CREEK.

House Bill No. 65, chapter 105, Session Laws, 1907, appropriated \$3,000.00 for the construction of a wagon road from the head of Lincoln gulch to Lake creek; the board of construction being the State Engineer and the chairmen of the board of county commissioners of Chaffee county and Lake county.

From the end of the present State road in Lincoln gulch, near the Ruby mill, there is a good road running up the hill to the entrance of the Ruby mine, and it was decided to use this as part of the proposed construction.

From this point on, however, there were two proposed routes, one over the Red mountain, the other running to the head of the gulch on an easy grade over the Divide and down Lake creek to connect with the present road near the Bulcoch mill. This route was endorsed by the Lincoln gulch mining camp by a resolution, passed August 19, 1906, and considerable work had been done on the line of the road.

After viewing both routes the board decided that the one running to the head of the gulch was the most feasible, and negotiations were opened with both Lake and Chaffee counties with the purpose of having them make the necessary surveys. Not being able to arrange for this, a deputy from this office made the survey about August 5, 1908, and the work was advertised.

Bids were received September 5, 1908, as follows:

E. B. Harland, Twin Lakes...	Sta. 94+60 to 201, \$2,900.00	No check accompanying bid
Louis Solem, Boulder, Colo....	Sta. 93 to 201, \$2,900.00	.....

As the road was all above timber line and the season so far advanced that it would be practically impossible to complete the road this year, it was decided to reject these bids and postpone the work until next summer.

## FINANCIAL STATEMENT.

Appropriated.....		\$3,000.00
Denver Republican, advertising.....	\$ 1.87	
Leadville Publishing Co., advertising.....	1.98	
G. N. Houston, salary and expense as deputy in charge of work	35.65	
E. B. Harland, survey.....	20.24	
Balance in fund.....	2,933.26	
	\$3,000.00	\$3,000.00

## PITKIN COUNTY BRIDGE.

House Bill No. S6, chapter 22, Session Laws, 1907, appropriated \$4,000.00 for the construction of a bridge across Maroon creek, near Aspen, Pitkin county, Colorado; the board of construction being the Governor, the State Engineer and the chairman of the board of county commissioners of Pitkin county.

Upon viewing the site it was evident that the appropriated amount would not be sufficient to construct a bridge. When this fact was brought to the attention of the county commissioners of Pitkin county, they passed the following resolution:

Whereas, The Sixteenth General Assembly appropriated four thousand dollars (\$4,000.00) (House Bill S6, chapter 28, Session Laws, 1907), for the purpose of constructing a bridge across the canon of Maroon creek, Pitkin county, Colorado, and, whereas, the said appropriation is not sufficient to build the proposed bridge; now, therefore, we, the undersigned, hereby request the State Engineer and Auditor of State that the said funds be not turned back into the internal improvement fund, but held over, in order that we may, if possible, obtain a further appropriation from the next Legislature sufficient to do the work.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Deputy G. N. Houston, salary viewing site.....	\$ 6.00	
Balance in fund.....	3,994.00	
	\$4,000.00	\$4,000.00

## PROWERS COUNTY BRIDGE.

House Bill 206, chapter 26, Session Laws, 1907, appropriated \$1,500.00 for the purpose of constructing a bridge over Clay creek, Prowers county, Colorado, about where the line between sections 7 and 8 crosses same; the board of construction being the State Engineer and T. J. Saylor, chairman of the board of county commissioners of Prowers county.

The site was selected and plans prepared for a pile bridge of eight 23-foot spans—184 lineal feet.

Upon advertising the following bids were received



CONTRACTOR	PRICE	DATE OF COMPLETION
Denver Bridge Co.....	\$1,478.00	Nov. 1, 1907
C. G. Sheely.....	\$8.74 per lin. ft.	Dec. 1, 1907
Pueblo Bridge Co.....	\$1,380.00	Dec. 1, 1907
Canton Bridge Co., Canton, Ohio.....	\$1,352.00	Nov. 19, 1907
L. H. Manville, Lamar, Colo.....	\$14.00 per lin. ft.	Nov. 1, 1907

The contract was awarded to the Canton Bridge Company, they being the lowest responsible bidder.

The contract for grading the approaches was let to Erwin Everett for \$60.00.

The construction was inspected by Mr. T. J. Saylor and accepted.

#### FINANCIAL STATEMENT.

Appropriated by state.....		\$1,500.00
Denver Republican, advertising.....	\$ 2.55	
Prowers County News.....	2.85	
Blue prints.....	1.11	
F. E. Irwin, surveying.....	6.00	
G. N. Houston, expenses as deputy in charge of the work.....	29.40	
T. J. Saylor, Inspector.....	25.00	
Erwin Everett, contract.....	60.00	
Canton Bridge Co., contract.....	1,352.00	
Balance turned back into fund.....	21.09	
	\$1,500.00	\$1,500.00

#### RIO BLANCO COUNTY BRIDGE.

Senate Bill No. 85, chapter 32, Session Laws, 1907, appropriated \$4,000.00 for the construction of a highway bridge over the White river near the State line, Rio Blanco county; the board of construction being the Governor, the State Engineer and the chairman of the county commissioners of Rio Blanco county.

The site selected by the board was about one mile from the State line, just above the ranch of Harry Goff, county commissioner of Rio Blanco county. Plans and specifications were prepared by this office for an 80-foot steel span.

Bids were opened for this work September 27, 1907, as follows:

NAME	PRICE	DATE OF COMPLETION
Ruth-Flynn Cons. Co.....	\$4,898.00	March 1, 1908
Pueblo Bridge Co.....	\$4,975.00	April 1, 1908
Denver Bridge Co.....	\$4,750.00	July 1, 1908
National Cons. Co.....	\$5,729.00	June 1, 1908

These bids were all rejected, as they were far in excess of the appropriated amount.

The work was then readvertised and bids received November 13, 1907, as follows:

CONTRACTOR	PRICE	DATE OF COMPLETION
Southwestern Bridge Co., Joplin, Mo.....	\$3,940.00	April 13, 1908
Denver Bridge Co., Denver, Colo.....	\$4,700.00	Aug. 1, 1908
Midland Bridge Co., Kansas City, Mo.....	\$4,767.00	April 15, 1908

The contract was awarded to the Southwestern Bridge Company.

Soon after signing the contract the company went into the hands of a receiver. The trustee appointed by the court, as well as the bondsman, assured us that the contract would be completed. The bridge was completed about September 5, 1908.

#### FINANCIAL STATEMENT.

Appropriated by state .....		\$4,000.00
Denver Republican, advertising .....	\$ 5.70	
White River Review, advertising .....	4.20	
G. N. Houston, deputy in charge of work .....	45.88	
Southwestern Bridge Co., contract .....	3,940.00	
Balance turned back into fund .....	4.22	
	\$4,000.00	\$4,000.00

## RIO GRANDE COUNTY BRIDGE—DEL NORTE.

House Bill 225, chapter 27, Session Laws, 1907, appropriated \$4,000.00 for the construction of a bridge across the Rio Grande river at a point about six miles above Del Norte, Colorado; the board of construction being the State Engineer and the board of county commissioners of Rio Grande county.

The board selected the site and this office prepared plans and specifications for four types of bridges and advertised for bids.

Following is a summary of the bids received:

	DENVER BDG. CO. DENVER, COLO.	PUEBLO BDG. CO. PUEBLO, COLO.	MIDLAND BDG. CO. KANSAS CITY, MO.
Reinforced Concrete, 250 ft. long...	\$5,300.00	\$7,500.00	.....
Steel center span, 125 ft. pile, approaches 125 ft.....	\$3,989.00	\$4,100.00	\$4,550.00
Combination center span, 128 ft. pile, approaches 120 ft.....	\$3,870.00	\$3,750.00	\$4,270.00
Pile Bridge 250 ft. long.....	\$1,594.00	\$1,984.00	\$1,625.00
Date of completion.....	Nov. 15, 1907	Nov. 1, 1907	Dec. 31, 1907

The contract was awarded to the Denver Bridge Co. for the steel center span, with pile approaches, and the contract signed July 16, 1907.

Considerable difficulty was experienced in sinking the tubes for this bridge, and this fact, together with the excessive high water during the summer and fall of 1907, delayed the completion until May, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$ 2.40	
San Juan Prospector, advertising.....	2.85	
G. N. Houston, salary and expense as deputy in charge of work	50.09	
Thomas Grieve, Inspector.....	67.05	
Denver Bridge Co., contract.....	3,877.61	
	\$4,000.00	\$4,000.00

## RIO GRANDE COUNTY BRIDGE—MONTE VISTA, COLORADO.

House Bill No. 6, chapter 14, Session Laws, 1905, page 80. thirteenth biennial report of the State Engineer.

Under the former administration contract for this bridge had been let and construction begun. The contractor had endeavored to construct the south 50-foot arch alone, without providing proper means of taking up the thrust. The pier was pushed over, allowing the arch to fall into the river. The contractor then repaired the south pier and also successfully constructed the 35-foot arch on the south end.

At the beginning of this administration the contractor proceeded to erect the false work for the two 50-foot spans and deposit concrete. The spans were completed all but the spandrell walls, when the high water of July, 1907, undermined the north pier and allowed it to settle and the two arches fell into the river. This scouring around the pier was probably caused by the presence of the old arch span and a sunken water tank in the river, which obstructed the channel and threw the current toward the pier.

The contractor then proposed to construct a steel bridge in place of the attempted concrete structure and the board of construction, after due consideration, entered into a supplementary agreement by which the contractor was released from building the concrete bridge, provided he built the steel structure without any extra or additional cost to the State of Colorado.

In addition to this agreement the county commissioners of Rio Grande county entered into contract with the bridge company to pay \$500.00 extra when the steel bridge was completed.

The contractor then proceeded to remove the remains of the pier and arches which were in the river, and also removed the 35-foot span. He raised the remaining pier and abutments 4 feet and ordered two steel spans for the site.

Upon the arrival of these it was discovered that the contractor had ordered the largest span two feet too short and two feet too wide for the piers.

He proceeded to erect the 105-foot span with the shoes resting on the corners of the pier and abutment, with only about one-third the bearing which was intended. This office was not aware of the conditions until the erection was practically complete.

This office then designed a heavy reinforced concrete coping, extending 16 inches beyond the piers, in order to furnish bearing for the 105-foot span. While the contractor was raising the bridge, in order to construct this coping, the blocking gave way and the span fell over on its side in the river.

The contractor then proceeded to dismantle the bridge and take it out on the banks. On inspection it was found that three new batter posts would be needed. These were ordered by the





DIVER SINKING TUBES FOR DEL NORTE BRIDGE.



STEEL BRIDGE AT DEL NORTE, RIO GRANDE COUNTY, COLORADO.





contractor from the Vulcan Iron Works of Denver, and the bridge finally erected and accepted by this office December 4, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Spent previous to this administration.....	\$ 379.23	
G. N. Houston, salary and expenses as deputy in charge of work.....	34.90	
First National Bank, Raton, N. M.....	3,585.87	
	\$4,000.00	\$4,000.00

## PITKIN-EAGLE-ROUTT COUNTIES ROAD—ASPEN TO YAMPA.

House Bill No. 442, chapter 91, Session Laws, 1907, appropriated \$2,000.00 for the construction of a wagon road from Aspen, in Pitkin county, to Yampa, in Routt county, the board of construction being the State Engineer and the chairmen of the boards of county commissioners of Pitkin, Eagle and Routt counties.

A meeting of the board of construction was called for July 20th at Wolcott, Colorado. Only a representative of this office and the chairman of Eagle county were present. Mr. Male, chairman of Routt county, was consulted over the telephone. It was the sense of those consulted that as the appropriation was so small it should not be split up and one-third used in each county, as had been suggested, but that the whole amount be used at the Routt county end.

Early in July, 1908, Mr. Male, of Yampa, accompanied by a representative of this office, viewed the proposed routes from Yampa west to the divide between Sunnyside creek and Egeria creek, and concluded that the lower of the three routes was the most feasible. This route comes down Egeria creek, across the Five Pine mesa, and connects with the present stage road about three miles south of Yampa. R. E. Chase, of Yampa, made the survey under the direction of this office. The work was advertised and one bid received October 13, 1908. This was from C. M. McGaughey, who proposes to construct all of the work, including the small section near the Grand river, for \$1,850.00, and have it ready for travel by August 1, 1909. This being considered a fair price, the contract was awarded to him.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000.00
Denver Republican, advertising.....	\$ 2.40	
Yampa Leader, advertising.....	1.87	
L. M. Hart, typewriting.....	7.50	
G. N. Houston, salary and expenses as deputy in charge of work	62.80	
Balance in fund.....	1,925.43	
	\$2,000.00	\$2,000.00

## SAN MIGUEL COUNTY ROAD.

House Bill No. 11, chapter 106, Session Laws, 1907, appropriated \$3,500.00 for the repairing and otherwise improving the wagon road from Telluride to the foot of Norwood hill.

The State Engineer, the chairman of the board of county commissioners of San Miguel county and the county surveyor of the same county were named as the board of construction.

The county surveyor, Mr. James S. James, made the survey and the board decided to start at the Telluride end and make the needed repairs as far as possible for the funds available. The work was advertised and on July 11th two bids received. Hendry Johnson, of Boulder, bid \$3,300.00 for the construction of section one, about 10,000 lineal feet. Messrs. Andres & Richards proposed to construct section one for \$2,500.00, or the whole road as far as Station 42, Section 2, about 14,200 lineal feet, for \$3,420.00.

The contract was awarded to Andres & Richards on their last proposal, the work to be completed December 1, 1908, but owing to the early snows they have not been able to finish the work. An extension of time has been granted them to August 1, 1909.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$3,500.00
Denver Republican, advertising.....	\$ 2.85	
Telluride Journal, advertising.....	3.91	
E. M. Williams, typewriting.....	7.50	
George W. Tollman, Inspector.....	7.75	
G. N. Houston, salary and expenses as deputy in charge of work	17.05	
Hall Blue Print Co., blue prints.....	2.46	
Andres & Richards, partial payment on contract	2,650.00	
Pledged on contract.....	770.00	
Balance in fund unpledged.....	38.48	
	\$3,500.00	\$3,500.00

## SEDGWICK COUNTY BRIDGE.

House Bill No. 22, chapter 23, Session Laws, 1907, appropriated \$4,000.00 for the construction of a bridge across the Platte river at Julesburg, Sedgwick county, Colorado.

The board of construction consisted of the State Engineer, the county surveyor (J. O. Thistle) and the board of county commissioners of Sedgwick county. The board selected the site and this office prepared the plans and specifications for a pile bridge.

As the appropriated amount was not nearly sufficient to construct a bridge entirely across the channel, which is 2,300 feet wide at this point, it was decided that the State should bridge the channel on each side and the county construct a fill over the high ground between to connect them. Proposals were asked for thirty-nine 23-foot spans on the south side and fifteen 23-foot spans on the north side, to be thirteen feet four inches wide in the clear.

Bids were opened June 29, 1907, and the contract awarded to C. G. Sheely, of Denver, who was the lowest responsible bidder, the county agreeing to pay all cost of the bridge in excess of the appropriated amount.

NAME OF CONTRACTOR	PRICE PER LIN.	DATE TO BE
	FT. OF BDG.	COMPLETED
Smith & McCarty, Fort Morgan.....	\$5.93	Dec. 1, 1907
John Gilligan Co., Falls City, Neb.....	\$6.45	Jan. 1, 1908
John Gilligan, Falls City, Neb.....	\$6.19	Oct. 1, 1907
Denver Bridge Co.....	\$5.95	Jan. 1, 1908
C. G. Sheely, Denver, Colo.....	\$5.89	Oct. 1, 1907
Midland Bridge Co., Kansas City, Mo.....	\$6.65	No date

After letting the contract it was decided to build the total contract length on the north side, the county to enter into separate contract to complete the bridge for the entire width of river instead of building the fill.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$ 2.10	
Grit-Advocate, advertising.....	1.95	
G. N. Houston, salary and expenses as deputy in charge of work.....	43.52	
C. G. Sheely, contract.....	3,950.00	
Balance turned back into fund.....	2.43	
	\$4,000.00	\$4,000.00

## TELLER COUNTY ROAD.

House Bill 198, chapter 95, Session Laws, 1907, appropriated \$4,000.00 for the construction of a wagon road in Arequa gulch, near Victor, Colorado, the board of construction being the State Engineer and the chairman of the county commissioners of Teller county.

This office employed Mr. Meek, county commissioner of Teller county, to make the survey, the county to pay for same. This office prepared plans and specifications for about 8,000 feet of a 10-foot road and a 60-foot timber bridge across Cripple creek, and advertised for bids. These were opened October 21, 1907. Two proposals were received. One not being accompanied by a certified check on a State or National Bank, as required, and the higher of the two was rejected as informal and was withdrawn later. The other was from Frank W. Frewen, of Victor, who bid \$2,480.00 for the road work and \$1,300.00 for the 60-foot bridge across Cripple creek. The contract was awarded to him. The work was completed and final payment made June 1, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$4,000.00
Denver Republican, advertising.....	\$ 1.95	
Victor Record, advertising.....	3.80	
G. N. Houston, salary and expenses as deputy in charge of work.....	39.66	
Frank W. Frewen, contract.....	3,780.00	
Frank W. Frewen, extra work.....	120.00	
Balance turned back into fund.....	54.59	
	\$4,000.00	\$4,000.00

## WELD COUNTY ROAD.

House Bill No. 6, chapter 107, Session Laws, 1907, provided for the construction and repair of about 17 miles of wagon road



near the town of Ault, Weld county, Colorado, the State Engineer and board of county commissioners of Weld county constituting the board of construction.

The contract was awarded to Daniel Strohl, of Greeley, for \$1,950.00, he being the only bidder.

The work consisted principally of plow and grader work.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000.00
Denver Republican, advertising.....	\$ 1.32	
Greeley Sun, advertising.....	3.42	
G. N. Houston, salary and expenses as deputy in charge of work.....	12.90	
Daniel Strohl contract.....	1,170.50	
County Commissioners Weld Co., assigned by Daniel Strohl.....	779.50	
Balance turned back into fund.....	32.36	
	\$2,000.00	\$2,000.00

## WELD COUNTY BRIDGE.

House Bill No. 1, chapter 31, Session Laws, 1907, appropriated \$1,500.00 for the construction of a bridge across the Cache La Poudre river, in place of the wooden bridge, at the Fifth street crossing near Greeley, Colorado; the board of construction being the State Engineer and the chairman of the board of county commissioners of Weld county.

This office prepared plans and specifications for a reinforced concrete bridge (slab and girder type) of two 50-foot and one 40-foot span.

After advertising bids were received July 23, as follows:

CONTRACTOR	BRIDGE	PILES PER LIN. FT. DRIVEN	EXTRA CONCRETE	TIME TO BE COMPLETED
Pueblo Bridge Co.....	\$6,790.00	58c	\$20.00	Dec. 1, 1907
C. G. Sheely, Denver.....	\$6,690.00	55c	\$19.75	Nov. 15, 1907
Denver Bridge Co.....	\$6,700.00	60c	\$20.00	Nov. 15, 1907
Midland Bridge Co., Kansas City, Mo.....	\$7,400.00	55c	\$18.00	Jan. 1, 1908

As the bids were far in excess of the appropriated amount, they were all rejected. The work was readvertised and bids again opened September 20, 1907.

NAME	BRIDGE WITH	BRIDGE WITH	EXTRA	EXTRA PILES	DATE TO BE COMPLETED
	CONCRETE HAND RAIL	PIPE HAND RAIL	CONCRETE PER CU. YD.	PER LIN. FT. DRIVEN	
National Cons. Co., Denver.....	\$7,238.00	\$7,148.00	\$18.00	70c	Feb. 1, '08
C. G. Sheely, Denver.	\$6,390.00	\$5,965.00 Awarded	\$25.00	50c	Dec. 31, '07
Ruth-Flynn Cons. Co.	\$7,250.00	\$7,200.00	\$22.50	75c	Mar. 1, 1908

The contract was awarded to C. G. Sheely, of Denver, for the bridge with pipe hand-rails. The county commissioners of Weld county agreeing to pay all cost of the bridge in excess of the appropriated amount.

Owing to the nearness of the beet hauling season it was decided not to dismantle the old bridge until November 15, the contractor agreeing to have the new one completed January 1, 1908. Although preliminary work was begun November 1st, owing to the difficulties encountered in sinking the piers it was found necessary to grant the contractor an extension of time to March 1, 1908.

As the work progressed considerable extra work was found to be necessary. Nine hundred and twelve lineal feet of oak piles were driven in the foundations.

The piers were increased from 16 inches to 2 feet in thickness and the foundations of the piers brought up full size to the water line.

The bridge was completed about March 6th and opened for travel a month later.

The total amount paid the contractor was \$7,821.00, of which Weld county's share was \$6,461.00.

#### FINANCIAL STATEMENT.

Appropriated by state .....		\$1,500.00
Denver Republican, advertising.....	\$ 5.63	
Greeley Sun, advertising.....	7.55	
Scott Truxton, Inspector.....	60.64	
G. N. Houston, salary and expenses as deputy in charge of work	65.44	
C. G. Sheely, contract.....	1,360.00	
Balance turned back into fund .....	.74	
	\$1,500.00	\$1,500.00

## EAGLE COUNTY ROAD.

House Bill No. 88, chapter 61, Session Laws, 1905.

House Bill No. 21, chapter 58, Session Laws, 1903, page 99, thirteenth biennial report of the State Engineer.

At the beginning of this administration the contractors had completed about seventeen miles of road. The survey for the remainder of the road to Ruedi was above the Colorado Midland railroad on the same side of the canon.

To construct the road on the line of survey involved great difficulty owing to the danger from rocks and boulders rolling down on the railroad tracks. As carelessness on the part of the employes of the contractor might result in a serious loss of life in a wreck it was thought wise to construct the road on the opposite side of the canon. Deputy C. W. Beach made the survey on this side. This route required two railroad crossings and two bridges. The work was completed September 1st, with the exception of the turnouts. The State, however, paid their share of the contract, but the county withheld their final payment of \$1,500.00 until this matter was settled.

The county paid a total of \$4,000.00 as their share of the contract.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$10,500.00
Spent during 1903 and 1904.....	\$ 1,249.63	
Spent during 1904 and 1905.....	5,986.36	
Clark & Atkinson.....	3,240.00	
G. N. Houston, salary and expenses as deputy in charge of work	16.50	
Balance turned back into fund.....	7.51	
	\$10,500.00	\$10,500.00

## PITKIN COUNTY ROAD—LINCOLN GULCH.

House Bill No. 285, chapter 70, Session Laws, 1905, page 115, thirteenth biennial report of the State Engineer. This road was finally completed and accepted January 14, 1908.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$7,000.00
Spent previous to this administration.....	\$2,940.02	
A. F. Meyers, contract.....	4,000.00	
Henry Beck, Inspector.....	16.85	
John Harkins.....	6.58	
G. N. Houston, salary and expenses as deputy in charge of work	36.55	
	\$7,000.00	\$7,000.00

## BOULDER-GRAND COUNTIES ROAD.

House Bill No. 163, chapter 56, Session Laws, 1905, page 89, thirteenth biennial report of the State Engineer.

Hendry Johnson, of Boulder, the contractor, completed this contract August 28, 1907, and was paid in full. This left a balance in the fund of about one thousand dollars.

Mr. A. E. Chase, county surveyor of Boulder county, made a survey for additional work on the road, and this office received bids for the same August 28, 1908, as follows:

CONTRACTOR	PRICE	DATE TO BE COMPLETED
John S. Patterson, Boulder, Colo. ....	\$950.00	Dec. 1, 1908
L. Solem, Boulder. ....	\$900.00	No date
C. L. Stewart, Boulder. ....	\$890.00	Dec. 1, 1908

The contract was awarded to C. L. Stewart. Owing to the early snows in this section he has not been able to complete his work.

## FINANCIAL STATEMENT.

Appropriated by state. ....		\$5,000.00
Spent previous to this administration. ....	\$2,312.26	
Hendry Johnson, final payment contract. ....	1,660.00	
Denver Republican, advertising. ....	1.54	
E. M. Williams, typewriting. ....	7.50	
G. N. Houston, salary and expenses as deputy in charge of work. ....	11.50	
C. L. Stewart, contract partial payment. ....	790.00	
Balance in fund. ....	217.20	
	\$5,000.00	\$5,000.00

## CONEJOS COUNTY BRIDGE.

House Bill No. 181, chapter 10, Session Laws, 1905, page 73, thirteenth biennial report of the State Engineer.

Owing to the freezing of some of the concrete on the face of the bridge, this work was not accepted until repairs were satisfactorily made. These were finally completed about September 20, 1907.



REINFORCED CONCRETE BRIDGE AT PORTLAND,  
FREMONT COUNTY, COLORADO.



BRIDGE AT PORTLAND IN PROCESS OF CONSTRUCTION.





## FINANCIAL STATEMENT.

Appropriated by state.....		\$3,500.00
Spent previous to this administration.....	\$3,325.98	
C. W. Wells.....	7.45	
G. N. Houston, salary and expenses as deputy in charge of work.....	9.50	
Walter Sharp Bridge Co., contract.....	100.00	
Balance turned back into fund.....	57.07	
	\$3,500.00	\$3,500.00

## MORGAN COUNTY BRIDGE.

Senate Bill No. 138, chapter 7, Session Laws, 1905, page 70, thirteenth biennial report of the State Engineer.

This bridge was completed by C. G. Sheely, the contractor, and accepted by this office May 17, 1907.

## FINANCIAL STATEMENT.

Appropriated by state.....		\$2,000.00
Spent previous to this administration.....	\$ 22.76	
G. N. Houston, expenses final inspection.....	2.85	
C. G. Sheely, contract.....	1,902.98	
Balance turned back into fund.....	71.41	
	\$2,000.00	\$2,000.00

TABLE NO. 2.

Years	State Engineer	Amount of State Funds Expended	Amount of County or Private Funds Expended in connection with state funds	Total cost of projects completed	Bridges built	Roads Constructed or Repaired	Other projects
1889-93	Maxwell, 4 years	\$212,182.27		\$212,182.27	12	10	6
1893-95	Cramer, 2 years	\$ 99,265.74	\$ 5,457.00	\$104,722.74	1	2	4
1895-97	Sumner, 2 years	\$ 72,630.54	\$ 9,821.42	\$ 82,451.96	6	6	4
1899-03	McCune, 4 years	\$201,866.14	\$ 2,042.61	\$203,908.75	9	21	5
1903-05	Carpenter, 2 years	\$ 97,517.40	\$15,466.47	\$112,983.87	10	14	1
1905-07	Jaycox, 2 years	\$138,043.01	\$10,267.38	\$148,310.39	12	18	1
1907-09	Jaycox, 2 years	\$142,119.43	\$52,571.00	\$194,690.43	27	20	1

CHAP.	SESSION LAWS	COUNTY IN WHICH IMPROVEMENT WAS MADE	CHARACTER OF IMPROVEMENT	AMOUNT	AMOUNT PAID	AMOUNT PAID	EXPENSES OF	TOTAL COST OF	UNEXPENDED	NAME OF CONTRACTOR
				APPROPRIATED	CONTRACTORS	CONTRACTOR BY	STATE IN	IMPROVEMENT,		
				BY STATE	BY STATE	COUNTY OR OTHER PARTIES	ADDITION TO COLUMN 6	COLUMNS 6, 7, 8		
4	1907	Arapahoe	Boulevard, Denver to Platte Canon	\$15,000.00			\$310.45	Not built	\$14,689.55	Not completed.
7	1907	Baca	Bridge, pile bents	1,500.00	\$1,158.60		142.01	\$1,300.61	199.39	Canton Bridge Co.
19	1907	Bent (Las Animas)	Bridge, incomplete	4,000.00			9.00		3,991.00	Pueblo Bridge Co., Pueblo, Colo.
66	1907	Bent (Las Animas)	Road, ballasting 17,044 lineal ft.	4,000.00	3,945.87		54.13	4,000.00		W. T. Walker, Las Animas.
67	1907	Bent (Caddoa)	Road, 750 lineal ft. with ballast	750.00	650.00		22.75	672.75	77.25	Inskip & Austin, Caddoa.
92	1907	Boulder (Juntown to Allens Park)	Road, 9,000 lineal ft. new road	2,250.00	2,225.00	\$ 25.00	24.13	2,274.13	.87	Hendry Johnson, Boulder.
93	1907	Boulder-Larimer (Lyons to Estes Park)	Road, 3,100 lineal ft. new road	2,250.00	2,188.01		61.99	2,250.00		J. B. Hall, Lyons, Colo.
56	1905	Boulder-Grand (Arapahoe Pass)	Road	5,000.00	790.00		20.54	810.54	217.20	C. L. Stewart, Boulder.
5	1907	Chaffee (Brown's Canon)	Bridge, reinforced concrete, 2 40-ft. spans, slab and girder type	4,000.00	3,594.45	605.55	405.55	4,605.55		Pueblo Bridge Co.
8	1907	Cheyenne	Bridge, 346 lineal ft.; pile bridge with extra wings; 3 piles to bent, 23 ft. spans	2,500.00	2,398.60		94.97	2,493.57	6.43	Denver Bridge Co.
9	1907	Clear Creek (Eriopire)	Bridge, reinforced concrete arch, 30-ft. span	2,000.00	1,400.00		110.80	1,510.80	489.20	Donald Maxwell, Georgetown, Colo.
68	1907	Clear Creek (Floyd Hill)	Road, repairs	2,000.00	1,920.00		78.95	1,998.95	1.05	A. E. Noyes, Lawson, Colo.
10	1907	Conejos (Capulin)	Bridge, reinforced concrete, 50 ft. span, slab and girder type	2,000.00	1,918.11	231.89	81.89	2,231.89		Walter Sharp Construction Co., El Dorado, Kansas.
91	1907	Conejos (La Jara to Manassa)	Road, 6 miles repairs	2,000.00	1,940.00		33.98	1,973.98	26.02	Messrs. Crowther, Whitney, Mortenson and Whitney.
13-28	1905-1907	Conejos and Costilla	Bridge, eleven 42 ft. spans, slab and girder, reinforced concrete, pile foundations	11,000.00	10,125.00	546.05	871.56	11,542.61	3.44	Walter Sharp Bridge Co., El Dorado, Kansas.
96	1907	Custer	Road, 2,700 lineal ft. new road	1,500.00	1,400.00		19.91	1,419.91	80.09	Chas. Fuller, Coal Creek, Colo.
25	1907	Douglas (Sedalia)	Bridge, reinforced concrete, two 50 ft. spans, slab and girder type, pile foundations	4,000.00	3,748.50	533.50	251.43	4,533.43	.07	C. G. Sheely, Denver, Colo.
6	1907	Douglas (Parker)	Bridge, reinforced concrete, one 50 ft. span, slab and girder type, pile foundations	3,750.00	2,831.40		133.83	2,985.23	764.77	C. G. Sheely, Denver, Colo.
12	1907	Douglas (Castle Rock)	Bridge, reinforced concrete, two 50 ft. spans, slab and girder type, pile foundations	5,000.00	4,778.12	318.80	221.88	5,318.80		Pueblo Bridge Co., Pueblo, Colo.
60	1905	Douglas (Welhurst and Spring Gulch)	Road, two 25 ft. span, reinforced concrete bridges	3,000.00	2,729.75		233.98	2,963.73	36.27	C. G. Sheely, Denver.
17	1907	Delta	Bridge (purchase of bridge already constructed)	2,000.00	2,000.00	3,000.00		5,000.00		
57	1905	El Paso-Teller (Colo. Spgs. to Cripple Creek)	Road, scattered repairs	3,500.00	3,000.00		497.02	3,497.02	2.98	H. T. Craig, Denver
14	1907	Eagle (Wilnot Ranch)	Bridge (not built)	3,000.00				Not built		
6	1907	Fremont (Portland)	Bridge, reinforced concrete arch, 125 ft. span, 16 ft. roadway	4,000.00	3,332.60	8,467.40	667.34	12,467.34	.06	Colorado Portland Cement Company.
13	1907	Garfield (Silt)	Steel bridge, 252 ft. span, concrete abutments, 16 ft. clear roadway	4,000.00	3,518.80	9,921.70	481.20	13,921.70	.04	C. G. Sheely, Denver, Colo.
98	1907	Gilpin (Tolland to Am. City)	Road, 1.7 miles new road, 8 ft. wide	2,500.00	2,450.00		32.51	2,482.51	17.49	Hendry Johnson, Boulder.
60-100	1903-1907	Gunnison (Anthracite Creek)	Road, 3.6 miles new wagon road	4,000.00	2,800.00		*1,105.05	3,905.05	95.04	Kasper Pressler, Mt. Carbon.
61	1907	Gunnison (Iola)	Bridge, 125 ft. steel span, 80 of pile approach, tubular piers	4,000.00	3,935.00	15.00	64.76	4,414.76	.24	Southwestern Bridge Co., Joplin, Mo.
64-99	1905-1907	Hinsdale (Henson Creek)	Road, scattered repairs	1,582.11	1,500.00		78.13	1,578.13	3.98	John Henderson, Lake City.
56	1907	Huerfano (Walsenburg)	Ditch, 2,500 lineal ft. ditch	2,000.00	Incomplete		2.66	Incomplete	1,997.34	Jones and Stewart, Walsenburg, Colo.
53	1903	Lake (Chaffee Eagle); (Buena Vista to Red Cliff)	Road	3,000.00	360.00		4.06	Incomplete		Zenas Crawford, Leadville, Colo.
18	1907	Lake (Snowden)	Bridge, reinforced concrete, two 35 ft. arches, Luten type	4,000.00	3,756.20	223.80	243.80	4,223.80		Pueblo Bridge Co., Pueblo, Colo.
102	1907	Larimer (Ft. Collins to Loveland)	Road, 19,400 lineal ft. of grading	4,000.00	3,950.00		24.41	3,974.41		Jas. Ross, Ft. Collins.
101	1907	Larimer (Big Thoropson Canon)	Road, scattered repairs	4,000.00	3,850.00		25.98	3,875.98	124.02	Hendry Johnson, Boulder.
15	1907	Mesa (Fruita)	Bridge, steel on tubular piers, three 155 ft. spans, built by county	3,000.00	3,000.00	14,762.90		17,762.90		M. J. Patterson Contracting Company.
69	1907	Mineral (Creede)	Road and flume, stone filled crib work and crib protection to roadway	8,000.00	7,200.00		666.20	7,866.20	133.80	John L. Peters, Creede, Colo.
11	1907	Montezuma	Bridge, timber, two 55 ft. spans, (A) trusses	1,000.00	968.32	281.68	31.68	1,281.68		Derby & Jones, Dolores, Colo.
97	1907	Montezuma-Dolores (Dolores to Rico)	Road, 4,000 lin. ft. new road, 4 timber bridges, 20 ft. span, 25 ft. span, 55 ft. span and 46 and 21 spans	3,000.00	Incomplete		61.02	Incomplete	2,938.98	C. W. Virden, Bear Creek, Colo. Treadway and Millard, Dolores, Colo.
103	1907	Montrose-Dry Creek	Road, 6 miles repairs and new road; timber bridge, 50 and 24 ft. spans	3,000.00	2,915.00		27.88	2,942.88	57.12	Ubel, Dobler & Vestal, A. S. Delaplane Bldg., Napoleon Leap.
24-20	1907	Morgan-Washington	Bridge, 900 lineal ft. Pile bridge, 3 piles to a bent, 23 ft. spans	4,000.00	3,922.56	1,070.19	77.44	5,070.19		C. G. Sheely, Denver, Colo.
104	1907	Otero (Swink to Fowler)	Road, ballasting 1,370 lineal ft. road	4,000.00	3,975.00		20.86	3,995.86	4.14	F. C. Bassett, Rocky Ford.
21	1907	Ouray (over Uncompahgre)	Bridge, reinforced concrete, one 37 ft. span, slab and girder type	2,500.00	2,342.00	130.00	157.49	2,629.49	.51	M. F. Levy Construction Co., Denver.
29	1907	Park (Twin Bridges)	Bridge, reinforced concrete, one 40 ft. span, slab and girder type	2,000.00	1,794.14	355.86	197.80	2,347.80	8.00	M. F. Levy Construction Co., Denver.
105	1907	Pitkin-Chaffee (Lincoln Gulch to Lake Creek)	Road, not built	3,000.00			66.74	Not built	2,933.26	
22	1907	Pitkin (Maroon Creek)	Bridge, not built				6.00	Not built	3,994.00	
26	1907	Prowers (Clay Creek)	Bridge, pile bents	1,500.00	1,412.00		66.91	1,478.91	21.09	Canton Bridge Co. and Erwin Everett
32	1907	Rio Blanco (near state line)	Bridge, one 80 ft. steel span, tubular piers one end and concrete the other	4,000.00	3,940.00		55.78	3,995.78	4.22	Southwestern Bridge Co., Joplin, Mo.
27	1907	Rio Grande (Del Norte)	Bridge, 125 ft. span steel bridge, with 125 ft. pile approaches, tubular piers	4,000.00	3,877.61	111.39	122.39	4,111.39		Denver Bridge Co.
14	1905	Rio Grande (Monte Vista)	Bridge, one 105 ft. steel span, one 35 ft. steel span, concrete piers	1,000.00	3,585.87	1,708.43	414.13	5,708.43		Walter Sharp Bldg Co., El Dorado, Kansas.
91	1907	Routt (Pitkin, Eagle, Routt, Aspen to Yampa)	Road	2,000.00			74.57	Incomplete	1,925.43	C. M. McCaughey, Yampa, Colo.
106	1907	San Miguel (Telluride to Norwood Hill)	Road, 14,200 lineal ft. repairs	3,500.00	2,650.00		41.52	Incomplete	808.49	Thos. Richards and Wm. Andres, Telluride, Colo.
23	1907	Sedgwick (Julesburg)	Bridge, 1,265 lineal ft. pile bridge, 3 piles to bent, 23 ft. spans	4,000.00	3,950.00	3,500.85	47.57	7,498.42	2.43	C. G. Sheely, Denver, Colo.
95	1907	Teller (Arequa Gulch)	Road, 8,000 lineal ft.; 10 ft. road and 60 ft. timber truss bridge	4,000.00	3,900.00		45.41	3,945.41	54.59	F. W. Frewen, Victor.
107	1907	Weld (near Ault)	Road, improvement on 17 miles of road	2,000.00	1,950.00		17.64	1,967.64	32.36	Daniel Strohl, Greeley.
31	1907	Weld (Greeley)	Bridge, reinforced concrete, slab and girder type, two 50 ft. spans and one 40 ft. span, pile foundations	1,500.00	1,360.00	6,461.00	139.26	7,960.26	.74	C. G. Sheely, Denver.
					\$133,946.51		\$8,172.92			

\*\$925.89 of this expended on survey 1903 and 1904.

Total amount of state funds expended, \$142,119.43

Total amount of funds from other sources, \$52,571.00.

Total cost of work completed during this administration, \$194,690.43.

Total expense to state in carrying out these projects, \$8,172.92 or 1.2 per cent of the total cost.

Name		Address		Occupation		Religion		Political Party		Social Status		Other	
Mr. J. H. Smith		123 Main St.		Teacher		Methodist		Republican		Middle Class		Single	
Mrs. A. B. Jones		456 Oak St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. C. D. Brown		789 Elm St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. E. F. Green		101 Pine St.		Nurse		Baptist		Democrat		Middle Class		Married	
Mr. G. H. White		202 Cedar St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. I. J. Black		303 Birch St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. K. L. Gray		404 Spruce St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. M. N. Hall		505 Willow St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. O. P. Young		606 Ash St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. Q. R. King		707 Hickory St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. S. T. Lee		808 Walnut St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. U. V. Scott		909 Cherry St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. W. X. Adams		1010 Maple St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. Y. Z. Baker		1111 Elm St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. A. B. Carter		1212 Oak St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. C. D. Evans		1313 Pine St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. E. F. Green		1414 Cedar St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. G. H. White		1515 Birch St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. I. J. Black		1616 Spruce St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. K. L. Gray		1717 Willow St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. M. N. Hall		1818 Ash St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. O. P. Young		1919 Hickory St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. Q. R. King		2020 Walnut St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. S. T. Lee		2121 Cherry St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. U. V. Scott		2222 Maple St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. W. X. Adams		2323 Elm St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. Y. Z. Baker		2424 Oak St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. A. B. Carter		2525 Pine St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. C. D. Evans		2626 Cedar St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. E. F. Green		2727 Birch St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. G. H. White		2828 Spruce St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. I. J. Black		2929 Willow St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. K. L. Gray		3030 Ash St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. M. N. Hall		3131 Hickory St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. O. P. Young		3232 Walnut St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. Q. R. King		3333 Cherry St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. S. T. Lee		3434 Maple St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. U. V. Scott		3535 Elm St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. W. X. Adams		3636 Oak St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. Y. Z. Baker		3737 Pine St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. A. B. Carter		3838 Cedar St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. C. D. Evans		3939 Birch St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. E. F. Green		4040 Spruce St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. G. H. White		4141 Willow St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. I. J. Black		4242 Ash St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. K. L. Gray		4343 Hickory St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. M. N. Hall		4444 Walnut St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. O. P. Young		4545 Cherry St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. Q. R. King		4646 Maple St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. S. T. Lee		4747 Elm St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. U. V. Scott		4848 Oak St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. W. X. Adams		4949 Pine St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. Y. Z. Baker		5050 Cedar St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. A. B. Carter		5151 Birch St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. C. D. Evans		5252 Spruce St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. E. F. Green		5353 Willow St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. G. H. White		5454 Ash St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. I. J. Black		5555 Hickory St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. K. L. Gray		5656 Walnut St.		Farmer		Presbyterian		Republican		Lower Class		Married	
Mrs. M. N. Hall		5757 Cherry St.		Retailer		Catholic		Democrat		Middle Class		Married	
Mr. O. P. Young		5858 Maple St.		Doctor		Methodist		Republican		Upper Class		Single	
Mrs. Q. R. King		5959 Elm St.		Teacher		Baptist		Democrat		Middle Class		Married	
Mr. S. T. Lee		6060 Oak St.		Engineer		Protestant		Republican		Upper Class		Single	
Mrs. U. V. Scott		6161 Pine St.		Homemaker		Catholic		Democrat		Working Class		Married	
Mr. W. X. Adams													



TABLE NO. 3.

Table Showing the Approximate Amount of Internal Improvement Funds and Funds from County or Other Sources, Expended in Each County, 1889 to Date.

County	Total State funds expended in county	Total funds from county or other parties expended in county in connection with State funds
Arapahoe.....	\$ 3,490.56	.....
Archuleta.....	8,557.00	.....
Baca.....	1,276.61	.....
Boulder.....	14,836.36	\$ 25.00
Bent.....	4,681.75	.....
Chaffee.....	19,587.29	605.55
Clear Creek.....	34,549.70	1,292.61
Cheyenne.....	6,113.39	.....
Conejos.....	28,002.83	1,204.91
Costilla.....	11,349.61	273.03
Custer.....	13,417.22	.....
Delta.....	20,735.75	3,000.00
Dolores.....	11,202.93	728.50
Douglas.....	33,566.18	852.30
El Paso.....	32,569.63	4,000.00
Eagle.....	30,817.78	4,000.00
Fremont.....	4,000.00	8,467.40
Grand.....	43,745.54	.....
Garfield.....	82,001.78	11,651.70
Gilpin.....	10,979.61	155.00
Gunnison.....	13,626.69	415.00
Hinsdale.....	8,825.47	.....
Huerfano.....	.....	.....
Jefferson.....	9,852.34	64.50
Las Animas.....	51,429.71	.....
La Plata.....	16,914.09	200.00
Larimer.....	27,650.09	606.18
Logan.....	4,496.19	.....
Lake.....	5,842.91	223.80
Mesa.....	68,896.71	26,405.54
Mineral.....	25,850.91	.....
Montrose.....	36,854.79	.....
Montezuma.....	10,157.36	1,970.18

TABLE NO. 3.—Concluded.

Table Showing the Approximate Amount of Internal Improvement Funds and Funds from County or Other Sources, Expended in Each County, 1889 to Date.

County	Total State funds expended in county	Total funds from county or other parties expended in county in connection with State funds
Morgan.....	11,848.44	535.00
Ouray.....	8,146.73	776.73
Otero.....	14,279.86	3,523.00
Park.....	10,520.52	355.86
Phillips.....	2,193.71	.....
Pitkin.....	22,310.97	.....
Pueblo.....	12,492.52	5,000.00
Prowers.....	16,938.99	6,310.56
Rio Blanco.....	17,803.28	400.00
Rio Grande.....	16,648.27	1,784.30
Routt.....	45,311.31	2,406.18
Saguache.....	31,894.15	.....
San Juan.....	12,500.00	2,096.72
San Miguel.....	14,661.52	.....
Sedgwick.....	3,998.00	3,500.85
Summit.....	14,568.23	.....
Teller.....	17,258.85	.....
Washington.....	9,991.42	535.00
Yuma.....	5,473.17	.....

## CHAPTER III.

ABSTRACT OF DECISIONS OF THE SUPREME COURT  
SINCE THE PUBLICATION OF THE LAST BIENNIAL  
REPORT OF THIS OFFICE.

FARMERS UNION DITCH CO. VS. RIO GRANDE CANAL CO., 37 COLO. 513,  
86 PAC. 1042 JULY 2, 1906.

A statutory adjudication of water rights had been concluded in Dist. No. 20 in 1891. The appellant and the appellee appeared at the proceeding and entered their respective claims. The appellant now seeks to have the decree of 1891 set aside on the ground that it can now establish an additional priority, which it could not establish at the time of the original proceedings, claiming that by doctrine of relation the right should relate back to the time of the commencement of the ditch.

Held that appellant's position was untenable. Where water rights have been adjudicated they are not subject to modification for the purpose of establishing an additional priority, which could not be established at the time of the original decree.

TEW VS. POWAR, 37 COLO. 292, 86 PAC., REP. 342, JULY 2, 1906.

The plaintiff claimed that he had a prescriptive right to the use of a lateral across the defendant's land, and he petitions for a temporary injunction to restrain the defendant from interfering with the use of the lateral during the irrigating season of 1900, and that on final hearing the temporary injunction be made perpetual. The trial court rendered a decree denying the prescriptive right, but granting the temporary injunction, and also giving the defendant judgment for costs except those incident to the temporary injunction. Appellant now claims that the sole issue presented by the pleadings was the alleged prescriptive right, and that, therefore, that part of the judgment granting the injunction was error.

Held that the denial of a prescriptive right was not necessarily inconsistent with the finding that the plaintiff had a right to a temporary injunction. Also appellant can not now object to a variance between the pleadings and the proof, when he failed to call the attention of the trial court to such variance.

GRAND VALLEY IRR. CO. VS. FRUITA IMP. CO., 37 COLO., 483, 86 PAC. REP., JULY 2, 1906.

Plaintiff sues the defendant for wrongful sale by the latter of 1,750 shares of stock in the defendant company held by the plain-

tiff. The charter of the company provides that assessments may be made for expense of maintenance of the ditch, etc., but that if any stockholder wants water delivered beyond the end of the original ditch, that that stockholder must bear the entire increased expense. The charter also provides that notice of assessment must be given each stockholder and such notice must be published in one daily paper. The directors of the company levied an assessment of 80 cents per share, but in an injunction proceeding it was determined that the assessment was excessive and that part of it was intended for the construction of an extension of the ditch in order to supply a stockholder beyond the end of the original ditch. Later the directors levied an assessment of 65 cents per share, and on failure of the plaintiff to pay his stock was sold. The plaintiff claims that the sale was illegal, because, as he alleges, the assessment was illegal.

Held that the decree in the injunction proceedings did not necessarily show that the second assessment was illegal. The burden was on the plaintiff to prove that, and the evidence offered by the defendant to the effect that the stockholder beyond the end of the original ditch had contracted to pay the entire cost of extension, was admissible to prove that the assessment was for a legal purpose. Also if the plaintiff received actual notice of the assessment by mail, the failure to publish such notice in the daily paper would not invalidate the sale.

ASHENFELTER ET AL. VS. CARPENTER ET AL., 37 COLO. REP., 534, DEC. 3, 1906.

The act of 1899 and the act of 1903 require that the one who wishes to change his point of diversion must follow a prescribed procedure in order to obtain a decree, which will be binding on others, and which the water commissioners will be compelled to obey.

Here the appellants had perfected a change before these acts were passed, and therefore they claim that they can maintain an action against the water commissioner to compel him to recognize their right without complying with the provisions of these acts.

Held, a change in point of diversion before 1899 did not give any vested rights to such change. The courts have recognized such a right, but always with the limitation that the rights of others will not be injured. The acts of 1899 and 1903 are simply remedial, and prescribe a method by which a decree may be obtained which will bind others. They deprive no one of a vested right to a change, but only prescribe the way to obtain a decree that will recognize that right. And so, until determined in an appropriate proceeding, the question of whether others are injured or not remains unsettled, and appellants can not have their change made perfect in the absence of proper proceedings to bring in the parties who would be affected by such change.

GUTSHALL VS. CARPENTER ET AL. NEW CACHE LA POUDDRE IRRIGATING CO. VS. ARTHUR IRRIGATING CO., 37 COLO. REP., 530, DEC. 3, 1906.

On similar facts they announce the same proposition of law as found in the case above. .

BLAKE VS. BOYE, 38 COLO. REP., 55, JAN. 7, 1907.

Appellee seeks to quiet title to a right of way for a ditch across appellant's land. Record shows that at time appellant took the land the ditch had not been constructed, and that he took without notice, either actual or constructive, of any ditch.

Held, a right of way for a ditch is an easement. A bona-fide purchaser without knowledge, or actual or constructive notice of the existence of an easement, takes title to the land relieved of the burden of the easement.

EVANS VS. SWAN, 38 COLO. REP., 92, DEC. 3, 1906.

This was an action brought by the plaintiff to have made more definite and certain the decree of the District Court of Garfield county in proceedings instituted under the statutes of 1879 and 1881. The decree determined that the plaintiffs were owners of part of the priority awarded to the Oasis ditch, but the exact amount given them is a matter of dispute.

Held, this action must be dismissed. The object of the statutes of 1879 and 1881 is to determine simply the relative priorities of the different owners of a ditch to any particular amount of water. It does not determine as between themselves the rights of the different owners of the ditch to any particular amount of water. Such rights must be determined in an appropriate action brought for that purpose.

BAER BROS. LAND AND CATTLE CO. VS. WILSON, 38 COLO. REP., 101, DEC. 3, 1906.

Plaintiff brings action for permission to change the point of diversion of water. The rule of law is that one is entitled to change the point of diversion, if the rights of others are not thereby injured, but that in the absence of special findings the lower court must be presumed to have found that the rights of others would be injured, when they denied the plaintiff's application.

CRIPPEN VS. GLASGOW 38 COLO. REP., 104, DEC. 3, 1906.

Glasgow initiated proceedings to change the point of diversion to a place higher up a stream. Crippen filed objections and gave as his grounds—not that his own land, which is below the point of the original diversion, but that the land of others, lying between the old and the new points would be injured by reason of the failure of sub-irrigation.

Held, that he could not object on that ground.



COMBS VS. FARMERS HIGH LINE CANAL AND RESERVOIR CO., 38 COLO. REP., 420, JAN. 7, 1907.

The Rocky Mountain Ditch Co. carries water to the plaintiffs. In 1884 the District Court of Arapahoe county rendered a decree settling the priorities of the Rocky Mountain Ditch Co. and the High Line Canal and Reservoir Co. The plaintiff now seeks, as against the defendants, their titles as appropriators and consumers.

Held, that the subject-matter here was *res judicata*, having been determined by the decree of 1884. That decree settled the relative priorities of the ditches, and the High Line ditch was found to be prior to the Rocky Mountain. And while no ascertainment is made as to who are consumers under any particular ditch, necessarily the relative rights of ditch owners and all consumers are determined. The decree is rendered only for the completed appropriation, which consists both of a diversion by the carrier and a beneficial use by the consumer. So the decree embodies not only the rights of the carrier, but also the rights of the consumer, and is binding as well upon the consumer as the carrier. A ditch company is the trustee and representative of the consumer for the protection of rights of the latter, and the owner of the ditch was in the proceedings in 1884 regarded as the agent of the consumer. Subject-matter attempted to be litigated here is *res judicata*.

WADSWORTH DITCH CO. VS. BROWN, 39 COLO. REP., 57, JAN., 1907.

Brown, a stockholder of the Wadsworth Ditch Co., here seeks to have the point of his diversion changed from the Wadsworth to lands lying under the Farmers High Line ditch. Appellant objects to this petition, alleging (1) that the proposed change would injuriously affect its corporate vested rights; (2) that petitioner was not a proper party; (3) that no notice, as required by statute, was given.

Held, that the law of 1903, in regard to change in point of diversion, includes mutual ditch companies and shareholders who are consumers. Petitioner's stock, however, will still be liable for assessment for expense of maintaining the ditch, and still be subject to the by-laws of the Wadsworth Ditch Company. A change may be made under a decree imposing these conditions. Petitioner was not a stockholder, but he had made a contract to purchase stock from a present holder, on condition that the point of diversion might be changed, and as such he is within the statute and is entitled to bring this action. Notice of proceedings should be published in one paper in the county in which the proceedings should be properly brought, and failure to do this is an objection available to appellants. Remanded for further proceedings in harmony with views herein expressed.

BOARD OF COUNTY COMMISSIONERS OF MONTEZUMA COUNTY VS. THE MONTEZUMA WATER & LAND CO., 39 COLO. REP., 167, JAN., 1907.

By statute the power is given the county commissioners to fix a reasonable maximum rate for compensation for water to be delivered from irrigating ditches. But when the rate fails to give the ditch company a reasonable profit for its services its enforcement may be enjoined. The power to regulate can not go so far as to compel the ditch company to conduct its business at a loss.

AHERN VS. DIRECTORS HIGH LINE IRR. DISTRICT, 39 COLO. REP., 409, JAN., 1907.

In appeal from the decree rendered in a special proceeding to have the District Court confirm the validity of the organization of a water district, and to confirm the acts of the county commissioners.

Held, that the jurisdiction of a board of county commissioners to organize a water district is lacking, if either the notice or the petition is unsigned. Where the notice comes first and is followed by a signed petition, the signatures to the petition can not be regarded as signatures to the notice. The object of publication of notice is to notify the land owners of the time and place the petition will be presented, therefore a notice addressed to the county commissioners is misleading and fatally defective.

When the petitioners seek to have confirmed by the court the validity of their organization, it must be established by the common law rules of evidence, and the statute on which the proceeding is based, must be reasonably construed. When an issue is made concerning the qualifications of the signers of the petition, the petitioners must prove such qualifications, and they can not rely on the fact that the board of county commissioners was satisfied with the proof made. All issues must be proved by evidence actually produced before the court, and a copy of evidence heard before the commissioners is inadmissible.

Although great weight is given the findings of the board as to what lands should be included in the district, yet such a finding may be reviewed, when it is shown that there was an abuse of power in that the board referred the matter to a committee of the petitioners, even though the commissioners acted in good faith.

FRAVERT VS. BOARD OF CO. COMM. OF MESA CO., 39 COLO. REP., 71, JAN., 1907.

The plaintiff here is the water commissioner in Water District No. 39. He alleges that part of the land under his control is in Mesa county, and that, therefore, that county is liable to him for part of his compensation.

Held, that by Session Laws of 1887, District No. 39 did embrace part of the land in Mesa county. On the same day, how-

ever, another act was passed which created District No. 42, and provided that it should consist of all the lands in Mesa county taking water from the Grand and the Gunnison rivers. That act creating District No. 42 was a later expression of the will of the Legislature, and hence the plaintiff, having no jurisdiction out of his own district, can not claim compensation for services rendered in Mesa county.

BOARD OF CO. COMM. OF MONTEZUMA CO. VS. WHEELER, 39 COLO. REP.,  
207, JAN., 1907.

In an action by a superintendent of irrigation against a county to recover compensation for his services, a complaint is not defective if it simply fails to allege that the counties enumerated are all the counties in the district. Such facts are matters of defense. In the absence of proof to the contrary, the testimony of the plaintiff to the effect that no bill had been rendered against counties in which there had been no adjudication, and that there were three counties in which services had been rendered, is sufficient to charge any county with its pro rata share. A superintendent becomes an official *de facto*, when appointed by the Governor, and when his oath and bond have been filed, even though the county commissioners have never requested his appointment. His title to the office can not be attacked in an action by him to recover compensation. He is not, however, entitled to recover interest on his claim against the county.

FT. LYON CANAL CO. VS. ARKANSAS VALLEY SUGAR BEET & IRRIGATED  
LAND CO., 39 COLO. REP., 332, JAN., 1907.

The parties here are both appropriators from the Arkansas river, the plaintiff's headgate being in District No. 17, and that of the defendant in District No. 67. By regular statutory proceedings the priorities of District No. 17 were determined in June, 1895, and those of District No. 67 in July, 1895. Plaintiff now brings suit against the defendant to have determined their relative rights.

Held, that the former adjudications were a bar to this action, even though that in the proceedings in each district appropriators in the other were not parties. Sections 2434 and 2435 apply to appropriators in different water districts, and those sections provide that any appeal from a decree must be instituted within four years.

O'NEIL VS. FORT LYON CANAL CO., 39 COLO. REP., 487, APRIL, 1907

In 1895, by proper proceedings, it was decreed that the Ft. Lyon Canal Co. was entitled to two priorities—No. 3 for appropriation made in 1887, and No. 5 for appropriation made in 1887,

at which time an extension to the original ditch was commenced. The plaintiff now claims that priority No. 3 belongs to lands under the original ditch, and that water flowing into the ditch by virtue of that priority should not be pro rated with consumers under the extension.

Held, that the decree in the adjudication determined simply the priorities of several ditches, and not the priorities of consumers, among themselves, under any one ditch. An appropriation is not complete until beneficial use is made of the water, and the purchase of land under the original ditch does not give the purchaser a priority over one who has made a prior use of water on land lying under the extension. Also, when a consumer takes water from a ditch company under a contract containing a pro-rating clause, he is bound by the terms of same.

RIPLEY VS. PARK CENTER LAND AND WATER CO., 40 COLO. REP., 129, APRIL, 1907.

One who, by the prosecution of mining claims, liberates water which was imprisoned, and would not otherwise have found its way to a natural stream, may conduct that water to a natural stream, and then farther down stream divert it into his headgate, provided he does so with intent to appropriate, and is, in fact, the first appropriator. Such contributions to a natural stream are the subject of appropriations. (Section 3177, Mills'.)

BOWMAN VS. VIRDIN, 40 COLO. REP., 247, APRIL, 1907.

The owners of water rights on the same stream may make temporary loans of water to each other, provided the rights of no other appropriator is injured. A complaint for interference with right to loan is fatally defective, if it does not allege that water so loaned can and will be used without injury to vested rights.

SEVEN LAKES RESERVOIR CO. VS. THE NEW LOVELAND AND GREELEY IRRIGATION CO., 40 COLO., 382, APRIL, 1907.

The owner of a priority for direct irrigation is entitled to store the water so owned by him, and to use it later in the season on crops requiring irrigation at that time. He can not, however, divert and store the water in any greater amount, or at any other and different time, than he could if he were using the water immediately upon its diversion.

FARMERS HIGH LINE CANAL & RESERVOIR CO. VS. NEW HAMPSHIRE REAL ESTATE CO., 40 COLO., 467, APRIL, 1907.

The New Hampshire Real Estate Co. was the owner of land lying under the appellant's ditch, and it now brings action against the appellant for damages resulting to appellee's lessees



on account of failure of appellant to furnish water to lessee. The complaint sets forth a contract made between appellee's grantor as party of the third part, and appellant's grantor as party of the first and second part, which provides: "And the said party of the first part, jointly and severally, for themselves and each of them, their successors, assigns, transferees and vendees forever do hereby covenant with the several parties of the third part, to each severally, and to his or her heirs, executors and assigns, vendees, and transferees, that each and every one of the transferees shall have the right to receive and have delivered so much water as may in fact be necessary, etc."

Held, the above contract created a covenant running with the land, and the recording of the contract constituted constructive notice of the easement. The appellee's ownership and the easement being established, there is enough privity to enable the burden to run as well as the benefit.

TURBS VS. ROBERTS, 40 COLO. REP., 498, APRIL, 1907.

The defendant subsequently settled on land, which a previous settler had abandoned after constructing an irrigating ditch. The defendant built laterals from this ditch and diverted water.

Held, that whatever right the defendant had to the use of water is measured by the amount he diverted through the laterals, and applied to a beneficial use before the plaintiff acquired any rights. Remanded because of error in admission of evidence and lack of sufficient evidence to support the decree.

ROBERSON VS. THE PEOPLE, 40 COLO. REP., 119, APRIL, 1907.

Appellant here was guilty of interfering with the water commissioner in that he opened two headgates after they had been closed by the commissioner.

Held, that appellant was guilty of a misdemeanor. (Mills' Ann. Statutes, 2385, 2386.) He was not guilty of contempt of court, however, as the water commissioner is not an officer of the court.

LOWER LATHAM DITCH CO. VS. BIJOU IRRIGATION CO., 41 COLO. REP., 213, SEPT., 1907.

Appellee (petitioner below) seeks to have the point of his diversion changed from District No. 2 to District No. 1. Appellant in District No. 2 objects, on the ground (1) that vested rights of consumers in District No. 1 would be injured; (2) that the District Court was without jurisdiction, since the petition seeks a change from one district to another.

Held, that appellants are concerned only as to the effect the change would have on their rights, and can not interpose as an objection that consumers other than themselves would be injured.



By Session Laws of 1899 the District Court had jurisdiction, upon compliance by the petitioner and the court with regulations in regard to notice to consumers in District No. 2. The resulting decree would be binding on consumers in that district, and prima facie binding on consumers in District No. 1, to become binding in case the decree was not questioned within the statutory period.

O'BRIEN VS. KING, 41 COLO. REP., 487, SEPT., 1907.

Appellant had, by a decree rendered in 1883, been awarded a right to two cubic feet of water per second of time. Appellee now seeks to restrain appellant's diversion, averring that appropriation when made was intended for purpose of irrigating two acres only. The lower court admitted evidence in support of these averments.

Held, that court below erred in the admission of this evidence. The question whether appellant had abandoned his right, in whole or in part, should have been restricted to acts subsequent to the decree. All evidence of antecedent acts was improperly admitted, and such evidence should not have been used to prove a subsequent abandonment or non-use.

DOWNEY VS. TWIN LAKES LAND & WATER CO., 41 COLO. REP., 385, SEPT., 1907.

Downey had, by purchase, become entitled to a water right for forty acres lying under appellee's ditch, but the appellee refused to allow him to construct a headgate, claiming that by the regulations of their corporation they could refuse a headgate for a water right for less than eighty acres.

Held, that Session Laws of 1887 provide that persons in control of ditches shall maintain same "in good order, and shall construct the necessary outlets in the banks for a proper delivery of the water to persons who have rights to use of water." Such construction to be at the expense of the consumer, and where it is practicable for two or more consumers to use the same headgate they shall do so. Reversed, and remanded with instructions to render judgment for the appellant.

ALAMOSA CREEK CANAL CO. VS. NELSON, 98 PAC. REP., 1112, FEB. 3, 1908.

When the plaintiff alleges an abandonment by a prior appropriator the burden of proof is on him to prove an abandonment. Evidence of acts antecedent to a decree awarding a certain amount of water to an appropriator is inadmissible as proof of a subsequent non-use, or as a denial of the appropriator's right to the amount awarded him. Such matters are by the decree rendered res judicata. Every abandonment, however, is made up of two essential elements—non-use and intention. And when a

subsequent non-use has been established by sufficient legal evidence, then it is permissible to introduce evidence of acts antecedent to the decree in order to show the intention of the appropriator.

FORNWALD VS. NELSON, 93 PAC. REP., 1115, FEB. 3, 1908.

Precisely the same question of law is involved here as in the preceding case, and the foregoing decision is followed.

TOWN OF STERLING VS. PAWNEE DITCH EXTENSION CO., 94 PAC. REP., 339, MARCH 2, 1908.

The appellee brought suit against the appellant to quiet title to certain waters. The complaint alleges that appellee is the prior appropriator, and that as such it has built and maintained a ditch to supply its consumers with water for irrigating and domestic purposes; and that the town of Sterling bought the land embracing the source of supply of the appellee's appropriation with the intention of piping water to the town.

Held, that the appellant was not entitled to take the water without making just compensation. Rights to the use of water are property, and as such are protected by the Constitution. And the constitutional provision, giving the right of appropriation for domestic purposes preference over other purposes does not give a town the right to take water without full compensation to the first appropriator. The right to divert water for domestic purposes does not depend on locus of use, so here the appellee is not disentitled because he is not a riparian owner. Remanded because of certain deficiencies in complaint, with leave to amend same.

WELLINGTON VS. BECK, 95 PAC. REP., 304, APRIL 6, 1908.

The right of a second appropriator to water, all of which is already appropriated, is limited to only such water as may not be necessary to the first appropriator, and the second appropriator has not at all times a right to any particular amount of water.

PETERSON VS. PAYNE 95 PAC. REP., 301, APR. 6, 1908.

Where the junior appropriator on a tributary stream seeks to divert water as against the senior appropriator on the main stream, on the ground that the water, if allowed to continue in its natural channel would not reach the headgate of the senior appropriator, the burden is on the junior appropriator to establish his case by satisfactory evidence.

CONLEY VS. DYER, 95 PAC. REP., 304, APR. 6, 1908.

A contingent decree, awarding a certain amount of water on condition that all of the same be put to a beneficial use within a

reasonable time, constitutes merely an inchoate right, which does not become perfect, unless the appropriator does make a beneficial use of all the water within a reasonable time. What is a reasonable time is a question of fact. The term "abandonment" is applicable only to a completed appropriation, so the question of whether or not a contingent right has become perfected is not a question of abandonment.

KIMBALL VS. NORTHERN COLORADO IRR. CO., 94 PAC. REP., 333  
MARCH, 1908.

In an action to quiet title to water rights a complaint is sufficient which simply alleges ownership. A contract made between the defendant and the plaintiff's predecessor in title provided that defendant should furnish water upon receipt of an annual rental, paid in advance. It also provided that, in case of failure to pay for two successive years, the right to receive water should end. The rental lapsed for several years, and then the plaintiff became owner of the land. The plaintiff and the defendant made a contract, by which the plaintiff was to receive water, but without prejudice to the defendant's right to insist on the past waiver.

Held, that nevertheless the defendant's conduct amounted to a waiver. Facts showed that some time previous the defendant had accepted the note of one of the former grantees of the land in satisfaction of the arrears.

CACHE LA POUDRE DITCH CO. VS. HAWLEY ET AL., 95 PAC. REP., 317,  
APRIL, 1908.

This was an action brought by the plaintiff against the water commissioner of District No. 3, the superintendent of Division No. 1 and the State Engineer, the purpose of which was to compel the recognition of plaintiff's claim to part of a priority awarded to a certain ditch. Plaintiff bases his alleged right on his ownership of nineteen shares in a ditch company, which had been decreed a certain priority. The fact was that certain shareholders in the ditch company had made a contract to sell their stock to the plaintiff. The contract provided that the vendors were to continue in possession of their certificates and to divert water to the same extent as formerly, and the plaintiff was to have the right to divert the difference between the amount actually needed by the vendors and the maximum represented by the certificates. The New Cache la Poudre Irr. Co. petitioned for permission to intervene, alleging that it owned a right junior to the ditch company, but senior to the plaintiff.

Held, that the contract above was invalid, as it required water rights to do a double duty. Here the water commissioner committed no tort in refusing the plaintiff water. It is not the

duty of a water commissioner to make any distribution among the users from the same ditch, but it is his duty to turn into the ditch no more water to which it is entitled under a decree than is actually necessary to consumers, and to refuse water to anyone not entitled thereto.

The Code allows any party to intervene who has an interest in the litigation; so here the New Cache la Poudre Irr. Co. may intervene, even though the effect of intervention is to inject new facts into the issue.

LAGUNA CANAL CO. VS. ROCKY FORD DITCH CO. 95 PAC. REP., 287,  
APRIL, 1908.

In 1889 the appellants started to construct their ditch. In 1894 an adjudication of water rights was made in District No. 17, at which the parties were present. Since that time the appellant has made a beneficial use of an additional amount of water, and in 1902 he asked for an enlarged priority dating back to 1889. The appellee filed an objection, alleging an intermediate decree of 1900. The appellant was denied an enlarged priority dating back to 1889, but was given another priority of date 1894. Appellant appeals from this decree. Held, that the question here, viz., appellant's right to have his priority date back to 1889 was res judicata.

WOODS VS. SARGENT, 95 PAC. REP., 932, MAY 4, 1908.

Both parties here were owners of the Bolles & Manney ditch, and this action is brought to determine their respective rights. In 1890 there was an adjudication, and the ditch was decreed a right to 123 inches of water. Plaintiff contends that the interest of each consumer is measured by the amount of land on which he was using water at the time of the decree, and he offers in evidence the findings of the referee, which showed that the plaintiff had forty-five acres under cultivation, and the defendant only twelve. Defendant on the other hand contends that since there were five owners at the time of the decree, that each is entitled to one-fifth of the amount awarded.

Held, that the finding of the referee was admissible in evidence. The decree did not determine the relative priorities of each consumer, yet since an appropriation is not complete without a beneficial use, the decree must be based on the entire number of acres under irrigation at the time of the decree. So the right of the parties must be determined by the amount of water that each used, and not according to their ownership of the ditch.

WINDSOR RESERVOIR AND CANAL COMPANY VS. LAKE SUPPLY  
DITCH COMPANY.

(Not yet reported.)

Appellee commenced the construction of the Douglas reservoir in 1901, and completed it in 1902. In 1903 the appellee con-



tracted to sell the site to the appellant, reserving in the contract their own priority. Appellee never filled the reservoir or made any use of it, but the court entered a decree for the capacity of the reservoir in the appellee's favor, and allowed them to transfer it to other reservoirs. Appellant five days later was decreed an equal appropriation. Appellant now claims that no priority should have been awarded appellee.

Held, that no completed appropriation was ever made by the appellee, so clause in the contract purporting to reserve an appropriation saved nothing to the appellee. It was error to grant two separate reservoir priorities of the same capacity and date to the same reservoir.

A decree to a reservoir is restricted to one filling and does not allow appropriators to take the number of cubic feet that may be run into the reservoir as the result of several successive fillings and emptyings.

Consumers will not be allowed to exchange water in such a way as to convert a junior into a senior appropriator.

FINLEY ET AL. VS. NEW CACHE LA POUDDRE IRRIGATION COMPANY.

(Not yet reported.)

Appellants are stockholders in mutual ditch companies, which have been decreed a priority for immediate irrigation. Near the lateral ditches of appellants are natural depressions, into which they have been accustomed to impound their pro rata share in order to store temporarily water to be used a few days later in irrigation.

Held, that in a proceeding, the object of which was to adjudicate the relative rights of various reservoirs, the appellants have not established a status essential to be shown by one who seeks a reservoir priority.

MCLEAN VS. FARMERS HIGHLINE CANAL AND RESERVOIR COMPANY.

(Not yet reported.)

The superintendent of division No. 1 directed the commissioner of district No. 7 to close down the appellee's headgate, in order that a ditch in district No. 2 might obtain water to supply its priority. Appellee sued out a temporary injunction. An injunction was granted compelling the officials to leave 180 cubic feet of water in district No. 7.

Held, that the injunction should have been denied. There was a lack of indispensable parties, because consumers in district No. 2 were the real parties in interest. Also there was a lack of sufficient evidence to show that the officials were exceeding their authority. Remanded with instructions to dissolve the injunction.



## KANSAS-COLORADO IRRIGATION SUIT.

Since our last biennial report, the Kansas-Colorado irrigation suit, of which a synopsis was given at pages 28 to 30, has been decided by the Supreme Court of the United States, and the people of Colorado have just cause to rejoice at the conclusion reached by the court.

The successful termination of this suit meant much to our people, for the very life of the State depended upon the recognition by this high tribunal of our right to use the waters of our natural streams for irrigation. While the court, had it so desired, might have determined other questions of grave moment submitted to it by the briefs and arguments of the various counsel, the points decisively passed upon are amply sufficient to relieve the State from any uneasiness on the score of its right to the equitable use of the waters of its natural streams for the irrigation of lands within its borders.

In addition to recognizing this general principle, which really was Colorado's main contention, the opinion further holds:

(1) That the Supreme Court of the United States is the proper tribunal for determining disputes of this character arising between the different states.

(2) That Congress has no power to legislate concerning the division of the waters of an interstate stream as between two states.

(3) That a State has full control over all non-navigable streams within its borders, and can determine whether riparian or irrigation rights shall prevail therein.

(4) The further points decided can be gathered from the following synopsis of the opinion as rendered by Mr. Justice Brewer:

"While we said in overruling the demurrer that 'this court, speaking broadly, has jurisdiction,' we contemplated further consideration of both the fact and the extent of our jurisdiction, to be fully determined after the facts were presented. We therefore commence with this inquiry. And first of our jurisdiction of the controversy between Kansas and Colorado."

"Turning now to the controversy as here presented, it is whether Kansas has a right to the continuous flow of the waters of the Arkansas river, as that flow existed before any human interference therewith, or Colorado the right to appropriate the waters of that stream so as to prevent that continuous flow, or that the amount of the flow is subject to the superior authority and supervisory control of the United States. Colorado denies that it is in any substantial manner diminishing the flow of the Arkansas river into Kansas. If that be true then it is in no way



STEAM DREDGE AT WORK ON OUTLET, TWIN LAKES RESERVOIR.  
WATER DISTRICT NO. 11.



VIEW SHOWING CONSTRUCTION OF ANTERO RESERVOIR DAM  
AND PUDDLE TRENCH.



infringing upon the rights of Kansas. If it is diminishing that flow has it an absolute right to determine for itself the extent to which it will diminish it, even to the entire appropriation of the water? And if it has not that absolute right, is the amount of appropriation that it is now making such an infringement upon the rights of Kansas as to call for judicial interference? Is the question one solely between the States or is the matter subject to national legislative regulation, and, if the latter, to what extent has that regulation been carried? Clearly this controversy is one of a justifiable nature. The right to the flow of a stream was one recognized at common law, for a trespass upon which a cause of action existed.

"The primary question is, of course, of *national control*. For, if the nation has a right to regulate the flow of the waters, we must inquire what it has done in the way of regulation. If it has done nothing the further question will then arise, what are the respective rights of the two States in the absence of national regulation?"

"If in the present case the national government was asserting, as against either Kansas or Colorado, that the appropriation for the purposes of irrigation of the waters of the Arkansas was effecting the navigability of the stream, it would become our duty to determine the truth of the charge. But the government makes no such contention. On the contrary, it distinctly asserts that the Arkansas river is not now and never was practically navigable beyond Fort Gibson in the Indian Territory, and nowhere claims that any appropriation of the waters by Kansas or Colorado affects its navigability."

In support of the main proposition it is stated in the brief of its counsel:

"That the doctrine of riparian rights is inapplicable to conditions prevailing in the arid region; that such doctrine, if applicable in said region, would prevent the sale, reclamation and cultivation of the public arid lands, and defeat the policy of the government in respect thereto; that the doctrine which is applicable to conditions in said arid region, and which prevails therein, is that the waters of natural streams may be used to irrigate and cultivate arid lands, whether riparian or non-riparian, and that the priority of appropriation of such waters and the application of the same for beneficial purposes establishes a prior and superior right."

"In other words, the determination of the rights of the two States *inter se* in regard to the flow of waters in the Arkansas river is subordinate to a superior right on the part of the national government to control the whole system of the reclamation of arid lands. That involves the question whether the reclamation of arid lands is one of the powers granted to the general government. As heretofore stated, the constant declaration of this court from the beginning is that this government is one of enumerated powers."



"The government, then, of the United States can claim no powers which are not granted to it by the constitution, and the powers actually granted must be such as are expressly given or given by necessary implication." (Story, J., in *Martin vs. Hunter's Lessee*, 1 Wheat. 304, 326.)

"The government of the United States is one of delegated, limited, and enumerated powers." (*United States vs. Harris*, 106 U. S. 629, 635.) Turning to the enumeration of the powers granted to Congress by the eighth section of the first article of the constitution, it is enough to say that no one of them by any implication refers to the reclamation of arid lands.

"We must look beyond section 8 for congressional authority over arid lands, and it is said to be found in the second paragraph of section 3 of article 4, reading: 'The Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States; and nothing in this constitution shall be so construed as to prejudice any claims of the United States, or of any particular State.'

"The full scope of this paragraph has never been definitely settled. Primarily, at least, it is a grant of power to the United States of control over its property. That is implied by the words 'territory or other property.' It is true it has been referred to in some decisions as granting political and legislative control over the territories as distinguished from the States of the Union. It is unnecessary in the present case to consider whether the language justifies the construction. Certainly we have no disposition to limit or qualify the expressions which have heretofore fallen from this court in respect thereto. But clearly it does not grant to Congress any legislative control over the States, and must, so far as they are concerned, be limited to authority over the property belonging to the United States within their limits."

"The proposition that there are legislative powers affecting the nation as a whole which belong to, although not expressed in the grant of powers, is in direct conflict with the doctrine that this is a government of enumerated powers. That this is such a government clearly appears from the constitution, independently of the amendments, for otherwise there would be an instrument granting certain specified things made operative to grant other and distinct things. This natural construction of the original body of the constitution is made absolutely certain by the tenth amendment. This amendment, which was seemingly adopted with prescience of just such contention as the present, disclosed the widespread fear that the national government might, under the pressure of a supposed general welfare, attempt to exercise powers which had not been granted. With equal determination the framers intended that no such assumption should ever find justification in the organic act, and that if in the future further powers seemed necessary they should be granted by the people in the manner they had provided for amending that act. It reads:



'The powers not delegated to the United States by the constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.' Its principal purpose was not the distribution of power between the United States and the States, but a reservation to the people of all powers not granted. The preamble of the constitution declares who framed it, 'we, the people of the United States;' not the people of one state, but the people of all the States, and article 10 reserves to the people of all the States the powers not delegated to the United States. The powers affecting the internal affairs of the States not granted to the United States by the constitution, nor prohibited by it to the States, are reserved to the States respectively, and all powers of a national character which are not delegated to the national government by the constitution are reserved to the people of the United States."

"This very matter of the reclamation of arid lands illustrates this: At the time of the adoption of the constitution within the known and conceded limits of the United States there were no large tracts of arid land, and nothing which called for any further action than that which might be taken by the legislature of the State, in which any particular tract of such land was to be found, and the constitution, therefore, makes no provision for a national control of the arid regions or their reclamation. But, as our national territory has been enlarged, we have within our borders extensive tracts of arid lands which ought to be reclaimed, and it may well be that no power is adequate for their reclamation other than that of the national government. But if no such power has been granted, none can be exercised."

It does not follow from this that the national government is entirely powerless in respect to this matter. These arid lands are largely within the territories, and over them by virtue of the second paragraph of section three of article four heretofore quoted, or by virtue of the power vested in the national government to acquire territory by treaties, Congress has full power of legislation, subject to no restrictions other than those expressly named in the constitution, and therefore, it may legislate in respect to all arid lands within their limits. As to those lands within the limits of the States, at least of the western States, the national government is the most considerable owner and has power to dispose of and make all needful rules and regulations respecting its property. We do not mean that its legislation can override State laws in respect to the general subject of reclamation. While arid lands are to be found, mainly if not only in the western and newer States, yet the powers of the national government within the limits of those States are the same (no greater and no less) than those within the limits of the original thirteen, and it would be strange if, in the absence of a definite grant of power, the national government could enter the territory of the States along the Atlantic and legislate in respect to improving by irrigation or otherwise the lands within their borders. "But it is useless to pursue

the inquiry further in this direction. It is enough for the purposes of this case that each State has full jurisdiction over the lands within its borders, including the beds of streams and other waters."

"A State may determine for itself whether the common-law rule in respect to riparian rights or that doctrine which obtains in the arid regions of the west of the appropriation of waters for the purposes of irrigation shall control. Congress cannot enforce either rule upon any State."

"When the States of Kansas and Colorado were admitted into the Union they were admitted with the full powers of local sovereignty which belonged to other States, (*Pollard vs. Hagan*, supra; *Shively vs. Bowlby*, supra; *Hardin vs. Shedd*, 190 U. S. 508, 519,) and Colorado by its legislation has recognized the right of appropriating the flowing waters to the purposes of irrigation. Now the question arises between two States, one recognizing generally the common law rule of riparian rights and the other prescribing the doctrine of the public ownership of flowing water. Neither State can legislate for or impose its own policy upon the other."

"As Congress can not make compacts between the States, as it can not, in respect to certain matters, by legislation compel their separate action, disputes between them must be settled either by force or else by appeal to tribunals empowered to determine the right and wrong thereof. Force, under our system of government, is eliminated. The clear language of the Constitution vests in this court the power to settle those disputes. We have exercised that power in a variety of instances, determining in the several instances the justice of the dispute."

"One cardinal rule, underlying all the relations of the States to each other, is that of equality of right. Each State stands on the same level with all the rest. It can impose its own legislation on no one of the others, and is bound to yield its own views to none."

"Before either Kansas or Colorado was settled the Arkansas river was a stream running through the territory which now composes these two States. Arid lands abound in Colorado. Reclamation is possible only by the application of water, and the extreme contention of Colorado is that it has a right to appropriate all the waters of this stream for the purposes of irrigating its soil and making more valuable its own territory. But the appropriation of the entire flow of the river would naturally tend to make the lands along the stream in Kansas less arable. It would be taking from the adjacent territory that which has been the customary natural means of preserving its arable character. On the other hand, the possible contention of Kansas, that the flowing water in the Arkansas must, in accordance with the extreme doctrine of the common law of England, be left to flow as it was wont to flow no portion

of it being appropriated in Colorado for the purposes of irrigation, would have the effect to perpetuate a desert condition in portions of Colorado beyond the power of reclamation."

"If the two States were absolutely independent nations it would be settled by treaty or force. Neither of these ways being practicable it must be settled by decision of the court."

"The scope of our inquiry is not limited to the simple matter of whether any portion of the waters of the Arkansas is withheld by Colorado. We must consider the effect of what has been done upon the conditions in the respective States and so adjust the dispute upon the basis of equality of rights as to secure as far as possible to Colorado the benefits of irrigation without depriving Kansas of the like beneficial effects of a flowing stream."

"May we not consider some appropriation by Colorado of the waters of the Arkansas to the irrigation and reclamation of its arid lands as a reasonable exercise of its sovereignty and as not unreasonably trespassing upon any rights of Kansas. And here we must notice the local law of Kansas as declared by its Supreme Court, premising that the views expressed in this opinion are to be confined to a case in which the facts and the local law of the two States are as here disclosed."

"Kansas recognizes the right of appropriating the waters of a stream for the purposes of irrigation, subject to the conditions of an equitable division between the riparian proprietors and she can not complain if the same rule is administered between herself and a sister State. And this is especially true when the waters are, except for domestic purposes, practically useful only for the purposes of irrigation."

"Under the laws of Colorado irrigating ditches have been established in this district and the amount of water which each may take from the river decreed. In addition some reservoirs have been built for storing the surplus waters which come down in times of flood, and this adds largely to the amount available for irrigation. The storage capacity of six of these reservoirs is shown to be 8,527,673,652 cubic feet. The significance and value of these reservoirs can be appreciated when we remember that the Arkansas, like many other streams, has its origin in the mountain districts of Colorado, and that by the melting of the snows almost every year there is a flood. The amount of water authorized to be taken by the ditches from the river is, as alleged in the bill, 4,200 cubic feet, and from its affluents and tributaries 4,300 feet. (Whenever this term is used in reference to the flow of water it means the number of cubic feet that pass in a second.) The average flow of the river as it comes out of the Royal Gorge at Canon City is, as shown by official measurements for a series of years, 750 cubic feet. So that it appears that the irrigating ditches are authorized to take from the Arkansas river much more water than passes in the



channel into the valley. It is not clear what surplus water, if any, comes out of the tributaries. There are some twenty-five of them, the average flow from four of which, into the Arkansas, is 313 cubic feet."

"It appears that prior to 1885 there was comparatively little water taken from the Arkansas for irrigation purposes—certainly not enough to make any perceptible impression on the flow of the river—but about that time certain corporations commenced the work of irrigation on a large scale, with ditches, some of which might well be called canals. Thus, in 1884, work was commenced on ditches capable of carrying off 450 cubic feet; in 1887 others capable of carrying off 1,481 cubic feet, and in 1890 still others carrying 1,705 cubic feet. Most of these were completed within two years after the commencement of the several works. By the year 1902, according to the report of the Census Bureau of the United States, there were 300,115 acres, in 4,557 farms, actually irrigated.

"The counties in Colorado from Canon City, eastward through which the Arkansas runs, are Fremont, Pueblo, Otero, Bent and Prowers. Tables were prepared by the defendants from various census reports showing the population, number of acres cultivated and total value of farm products in these several counties for the years 1880, 1890 and 1900. These tables disclosed a very marked development in the population, area of land cultivated and amount of agricultural products. Whatever has been effective in bringing about this development is certainly entitled to recognition, and should not be wantonly or unnecessarily destroyed or interfered with. That this development is largely owing to irrigation is something of which from a consideration of the testimony there can be no reasonable doubt. It has been a prime factor in securing this result, and before at the instance of a sister State this effective cause of Colorado's development is destroyed or materially interfered with it should be clear that such sister State has not merely some technical right, but also a right with a corresponding benefit."

"The official figures taken from the United States census reports tend strongly to show that the withdrawal of the water in Colorado for purposes of irrigation has not proved a source of serious detriment to the Kansas counties along the Arkansas river. At one time there were some irrigating ditches in these western counties of Kansas, which promised to be valuable in supplying water and thus increasing the productiveness of the lands in the vicinity of the stream, and it is true that those ditches have ceased to be of much value, the flow in them having largely diminished.

"It can not be denied, in view of all the testimony (for that which we have quoted is but a sample of much more bearing upon the question), that the diminution of the flow of water in

the river by the irrigation of Colorado has worked some detriment to the southwestern part of Kansas, and yet when we compare the amount of this detriment with the great benefit which has obviously resulted to the counties in Colorado, it would seem that equality of right and equity between the two States forbids any interference with the present withdrawal of water in Colorado for purposes of irrigation.

"Summing up our conclusions, we are of the opinion that the contention of Colorado of two streams can not be sustained; that the appropriation of the waters of the Arkansas by Colorado, for purposes of irrigation, has diminished the flow of water into the state of Kansas; that the result of that appropriation has been the reclamation of large areas in Colorado, transforming thousands of acres into fertile fields and rendering possible their occupation and cultivation when otherwise they would have continued barren and unoccupied; that, while the influence of such diminution has been of perceptible injury to portions of the Arkansas valley in Kansas, particularly those portions closest to the Colorado line, yet to the great body of the valley it has worked little, if any, detriment, and regarding the interests of both states and the right of each to receive benefit through irrigation, and in any other manner from the waters of this stream, we are not satisfied that Kansas has made out a case entitling it to a decree. At the same time it is obvious that if the depletion of the waters of the river by Colorado continues to increase, there will come a time when Kansas may justly say that there is no longer an equitable division of benefits, and may rightfully call for relief against the action of Colorado, its corporations and citizens in appropriating the waters of the Arkansas for irrigation purposes.

"The decree which, therefore, will be entered, will be one dismissing the petition of the intervenor, without prejudice to the rights of the United States to take such action as it shall deem necessary to preserve or improve the navigability of the Arkansas river. The decree will also dismiss the bill of the state of Kansas as against all the defendants, without prejudice to the right of the plaintiff to institute new proceedings whenever it shall appear that through a material increase in the depletion of the waters of the Arkansas by Colorado, its corporations or citizens, the substantial interests of Kansas are being injured to the extent of destroying the equitable apportionment of benefits between the two states resulting from the flow of the river. Each party will pay its own costs."



## CHAPTER IV.

## REPORTS OF DIVISION ENGINEERS, 1907-1908.

Denver, Colo., November 25, 1907.

Mr. T. W. Jaycox.

State Engineer.

Denver, Colo.

Dear Sir—I submit a summary of water commissioners' reports for the year 1907, and a statement of amounts of water stored in reservoirs in the various districts of this division. Some commissioners were unable to make complete reports, but, from the data which could be obtained, results are shown as follows:

Water stored prior to May 1, 12,634,368,000 cubic feet, with three districts not reported.

Water stored during the entire season, 19,294,918,000 cubic feet. Of this storage about 10,500,000,000 cubic feet was used for irrigation.

There was stored, in 1905, 13 billion; in 1906, 16 billion; in 1907, over 19 billion cubic feet, and preparations are now under way for greatly increased storage next year.

In most districts a great portion of the water stored was not required for irrigation, and is still held in storage. Most of the water stored in District No. 1 was wasted into the Platte river.

The water supply in all districts has been much greater this year than is usual; all the late ditches were well supplied except during about two weeks in July. In District No. 47 the streams were reported to be higher than has been known during the last twenty years, and the hay crop of this district, and also of District No. 23, is the largest ever known in these districts.

On account of reports from some districts not being complete the totals shown in the tabulated statements do not agree with those given in my reports for the years 1905 and 1906.

Crops grown without irrigation in districts which have reported this class of crops are as follows:

DISTRICT NO. 2—

Wheat, 1,500 acres, yield from 11 to 32 bushels per acre.

Alfalfa, 200 acres, 2 tons per acre.

## DISTRICT NO. 3—

The crop almost an entire failure, owing to drouth in June, and to severe hailstorms in July.

## DISTRICT NO. 4—

Wheat, 3,966 acres, yield 10 to 45 bushels per acre.

## DISTRICT NO. 5—

Wheat, 2,000 acres, average yield, 20 bushels per acre.

## DISTRICT NO. 6—

Wheat, 3,110 acres, 10 to 40 bushels per acre; average 20 bushels per acre.

Oats, 135 acres, average 23 bushels per acre.

Corn, 145 acres, average 28 bushels per acre.

## DISTRICT NO. 9—

Wheat .....1,000 acres, average 20 bushels per acre.

Rye ..... 100 acres, average 15 bushels per acre.

Oats ..... 800 acres, average 30 bushels per acre.

Barley ..... 100 acres, average 22 bushels per acre.

Potatoes .... 50 acres, average 65 bushels per acre.

## DISTRICT NO. 64—

## Logan County.

18,000 acres in cultivation.

Wheat, average 25 bushels per acre.

Corn, average 25 bushels per acre.

Oats, average 30 bushels per acre.

## Washington County.

10,000 acres in cultivation.

Corn, average 20 bushels per acre.

Wheat, average 20 bushels per acre.

The yield of wheat raised without irrigation was not as great as that of the year 1906. The shortage was caused by drouth in June, and hailstorms in July. Rains which came in July were too late to fully mature crops which had not been injured by hail.

In general, all crops have been very good, and the year a prosperous one for farmers.

I am under obligations to you and your assistants, and to all water commissioners of the division for courtesies, consideration and help in many ways, and I will not forget my genial associates and companions in trouble—the division engineers. I know the knocks they have had to take, and the puzzling questions they have been up against. If they desire any sympathy I have plenty of it for them. I am grateful for their encouragement and for all I have learned from them. I wish to thank you all.

Very respectfully yours,

WM. RIST,

Division Engineer Irrigation Division No. 1.

IRRIGATION DIVISION NO. 1.  
RESERVOIRS.  
Tabulated Statement of Water Commissioners' Reports on Water Stored in Reservoirs, 1907.

DISTRICT	AMOUNT STORED PRIOR TO MAY 1ST. CUBIC FEET	AMOUNT STORED DURING SEASON CUBIC FEET	AMOUNT USED CUBIC FEET	REMARKS
1	2,000,000,000	2,000,000,000	524,498,800	Stored in Boyd Lake, 1,400,000,000. None drawn. Outlet not constructed.  Of this amount 450,000,000 cu. ft. was stored in small private reservoirs,  Including Marston Lake used by Denver Union Water Co. for domestic purposes. Including Cheesman Lake held over from 1906. The amount used was for domestic purposes. No reservoirs in district. No reservoirs in district. No reservoirs in district.
2	.....	883,604,000	449,486,000	
3	3,308,000,000	3,158,000,000	.....	
4	1,758,000,000	3,606,092,000	1,841,092,000	
5	785,449,000	785,449,000	407,249,000	
6	286,000,000	557,200,000	249,000,000	
7	.....	601,042,000	600,992,000	
8	117,504,000	117,504,000	117,504,000	
9	.....	1,205,452,000	.....	
23	3,565,638,000	3,565,638,000	75,613,000	
46	.....	.....	.....	
47	.....	.....	.....	
48	.....	.....	.....	
64	800,000,000	800,000,000	800,000,000	Total amount used about 10,500,000,000 cubic feet.
65	13,777,000	14,937,000	.....	
	12,634,368,000	19,294,918,000 442,950 acre feet.	5,065,434,800	

# IRRIGATION DIVISION NO. 1.

## Tabulated Statement of Water Commissioners' Reports, 1907.

DISTRICT	Capacity of canals	Length of main ditches, miles	Length of laterals, miles	Amount of water carried from reservoirs in cu. ft.	No. of acre-ft. used by canal for season	Total number of acres that can be irrigated	ACRES OF CROPS IRRIGATED										SPECIAL CROPS		COST, DOLLARS			
							Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Sugar Beets	Other Crops	Peas	Small fruit	Total Irrigated	Superintendence	Repairs	Improvements		
1	1,821	189	196	524,498,800		93,700	15,807	11,422	18,151			784	11,658	1,030			46,365	4,875	11,375	8,975		
2	2,801	313	223	449,486,000	407,250	98,893	22,246	4,262	37,054	380	3,395	4,049	6,859				78,245	12,505	7,103	16,688		
3		367				254,680	43,103	9,602	75,890	3,128	2,181	28,252	31,343	6,621			200,120					
4	1,552	220	118			104,94	25,840	2,075	59,060	525	190	5,700	17,175	1,730			102,205	22,75	6,450			
5	1,073	234	126	407,249,000	103,621	99,966	26,418	6,214	41,902	1,138	362	2,725	6,962	1,510	2,170		89,406	4,289	6,825	15,125		
6	1,300	264	20	249,000,000	110,183	83,202	19,626	10,129	32,547	2,048	1,215	354	1,990	4,686			72,813	7,350	5,985	2,950		
7		248			115,640	152,618	28,146	5,738	4,550	4,556	12,112	910	2,660	28,277		6,903	122,324	1,895	3,120	15,000		
8		296	210	117,504,000		88,432	13,378	2,009	12,009	3,085	2,018		595	3,511			36,343	20,806	21,496	11,600		
9	218	93	50		150,203	14,452	6,477	55	4,725	173	1	3	74	580			10,772					
23		154				19,842		19,842									19,842		6,005			
46		108	4			49,922		31,770	86								31,856					
47		121	31			38,280		25,850	100	180	5	7	1				22,843			19,505		
48	563	50	42		57,894	4,720		2,745										2,832	47	830		
64	3,270	284	318	800,000,000		108,430	15,786	33,185	14,735	106	1,110	2,347	8,423	250			73,924	6,040	5,930	10,550		
65	85	19			21,170	3,959	457	1,520				25	27	597			1,575	290	465	1,800		
	12,686	2,963	1,347	2,547,737,800	966,261	1,216,041	217,284	166,418	300,809	15,319	21,809	45,156	87,767	48,792	2,170	6,903	908,633	83,357	74,801	103,023		





Denver, Colo., November 30, 1908.

MR. T. W. JAYCOX,  
State Engineer,  
Denver, Colo.

Dear Sir—I hand you herewith my annual report for the year 1908, together with a report upon water stored in reservoirs and data concerning irrigation districts formed during the last two years.

The water supply during this year has been much less than usual, being only from one-half to two-thirds of the usual amount, excepting in districts 46 and 47, which are in North Park, where the supply from the North Platte river and its tributaries was greater than usual, and no trouble was experienced to obtain plenty of water for the irrigation of lands depending upon these streams.

In the South Platte river and its tributaries the short supply and the small amount of rainfall were the cause of small crops, and resulted in much difficulty and trouble for the water officers, and in considerable litigation between ditch companies, but the prospects now are for better conditions and better satisfaction during the coming year. District No. 1 received only half the water necessary for complete irrigation, and some other districts were not much better supplied.

Of the tributaries of the South Platte river, the Cache la Poudre river furnished the best supply. But few crops suffered greatly for water in district 3, which this stream supplies.

The ditches from the Big Thompson creek, in district 4, were also fairly well supplied, but the water stored in reservoirs, together with the rainfall in districts 3 and 4, added greatly to their water supply. In the other districts also the stored waters and rainfall contributed very much to the needed supply.

Considerable difficulty was had by a number of water commissioners to prevent the illegal storage of water. Some ditch companies, although they had partially irrigated their early crops, believed the Seven Lakes decision gave them the right to store their ditch appropriations, or use them for direct irrigation, as they might choose, and some believed they were given the right to store their ditch appropriations, even when their crops did not require irrigation and junior ditches did need the water.

The result of the controversy was that but little, if any, water was unlawfully stored. I advised the water commissioners that the decision did not confer the right to store a ditch appropriation when the water was needed for direct irrigation, unless the lands upon which the water had formerly been applied for early crops had been abandoned from such early and direct irrigation. I also furnished three water commissioners with copies of the court decision.

## CROPS RAISED WITHOUT IRRIGATION.

DISTRICT	CROP	ACRES	AVERAGE YIELD
			BUSHELS PER ACRE
1	Corn.....	1,200	20
	Barley.....	200	15
	Cane.....	500	.....
2	Corn.....	555	25
	Barley and wheat.....	600	15
64	Corn.....	37,500	20
	Wheat.....		18
	Oats.....		25
	Potatoes.....		75

No lands under ditches included.

NEW LAND BROUGHT UNDER CULTIVATION DURING  
THE YEAR.

DISTRICT	ACRES
1 .....	3,800
64 .....	2,500

I am thankful to you and your assistants, and to the water commissioners, for courtesies and assistance given to me.

Very respectfully yours,

WM. RIST,  
Division Engineer, Irrigation Division No. 1.

## IRRIGATION DISTRICTS FORMED DURING THE YEARS 1907 AND 1908.

WATER DIST.	NAME	DATE OF ORGANI- ZATION	NAME AND ADDRESS OF SECRETARY	BONDS VOTED	BONDS SOLD	NO. ACRES PROPOSED TO IRRIGATE	PREVIOUSLY IRRIGATED	ACRES TO BE RECLAIMED	VOTES CAST AT LAST ELECTION
1	Riverside.....	3-11, '07	L. W. Bean, Orchard, Colo.....	740,000	720,000	40,000	None	40,000	35
1	Nile.....	7-20, '08	John Myers, Wiggins, Colo. ....	700,000	None	13,000	None	13,000	10
1	San Arroya.....	6-30, '08	W. A. Dregman, Ft. Morgan, Colo.	236,000	None	14,000	700	13,300	11
2	Henrylyn.....	10-8, '07	J. H. Ledgerwood, Hudson, Colo...	3,000,000	None	100,000	None	100,000	42
3	Park Creek .....	9-24, '08	R. Q. Tenney, Ft. Collins, Colo....	72,000	None	5,000	None	5,000	9
64	North Sterling ..	2-25, '07	W. B. Giacomini, Sterling, Colo. ...	1,400,000	50,000	70,000	None	70,000	27

# IRRIGATION DIVISION NO. 1. RESERVOIRS.

## Tabulated Statement of Water Commissioners' Reports on Water Stored in Reservoirs, 1908.

DISTRICT	AMOUNT STORED PRIOR TO MAY 1ST CUBIC FEET	AMOUNT STORED DURING SEASON CUBIC FEET	REMARKS
1	Not reported	716,319,000	
2	500,000,000	500,000,000	
3	Not reported	4,658,000,000	
4	3,020,000,000	3,268,000,000	
5	159,886,000	557,504,000	
6	119,000,000	166,800,000	
7			
8	Not reported	Not reported	
9	165,092,000	382,892,000	
23		3,535,000,000	
46			
47			
48			
64	700,000,000	700,000,000	
65	31,138,000	33,490,000	
Totals reported	4,695,116,000	14,518,005,000	333,280 acre feet.

With the exceptions noted above, nearly all water stored was drawn and used chiefly to irrigate late crops and alfalfa. In those districts where amounts stored are not reported, the Water Commissioners have not been able to obtain the information.

Stored in Boyd Lake, 1,600,000,000; drawn, 253,000,000; held over, 1,347,000,000. The outlet is not yet cut deep enough to draw all the water.

2,500 acres partially irrigated from Castlewood Reservoir.

Including 261,360,000 cubic feet stored in Marston Lake by Denver Union Water Co. and used by City of Denver.  
1,050,000,000 drawn from Cheesman Lake, of which 223,000,000 was used by the Northern Colorado Irrigation Co.  
No reservoirs in district.

No reservoirs in district.

No reservoirs in district.

Stored in Jumbo Reservoir, 700,000,000; drawn, 500,000,000; held over, 200,000,000.

# IRRIGATION DIVISION NO. 1.

## Tabulated Statement of Water Commissioners' Reports, 1908.

District	Capacity of Canals	Length of Main Ditches, Miles	Length of Laterals, Miles	Amount of water carried from reservoir in cubic feet	Number of acre-feet used by canal for season	Total number of acres that can be irrigated	ACRES OF CROPS IRRIGATED								SPECIAL CROPS				COST, DOLLARS			
							Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Sugar Beets	Other Crops	Celery	Cabbage	Garden Peas	Small Fruit	Total Irrigated	Superintendence	Repairs	Improvements
1	3,708	274	184	716,319,400	166,184	106,040	22,115	3,920	19,384	220	42	1,173	10,128	1,125	73	786	2,170		58,107	9,230	23,000	23,600
2	2,564	299	365	460,000,000	174,266	97,344	20,897	4,491	28,353	333	2,713	4,596	8,153	1,634					69,996	12,930	12,257	6,400
3			379			254,680	41,820	9,710	77,910	3,125	2,415	29,645	31,710	7,555					203,890			
4	1,561	223	119	1,971,000,000		107,295	27,440	1,965	41,955	570	400	5,680	19,045	1,950					102,605			
5	1,069	234	132	528,955,782	86,105	99,966	26,442	6,450	40,188	1,138	372	2,768	8,303	1,555					89,406	5,870	5,875	7,825
6	1,384	270	81	136,000,000	7,991	83,902	20,092	9,407	32,964	2,184	1,148	307	2,544	4,887					74,651	8,080	2,825	140
7		235			81,216	14,670	28,732	4,823	33,562	4,656	2,346	945	2,575	12,644				7,851	119,841			
8		299	225		53,965	68,652	14,742	2,010	9,016	3,089	1,698		463	3,030					35,195	12,792	13,170	4,239
9	248	95	72			13,685	4,587	73	4,667	155	130		66						10,141	3,610	3,975	4,245
23	833	140	51		63,208	19,240		7,610	50					20					7,710		660	
46	880	132			106,921	46,130		28,485	65										32,115			
47		204	24		141,544	52,385		37,105	139	140				52					37,648		47,020	
48	558	57	42		46,563	3,910		2,761												1,500	2,884	700
61	2,735	266	310	500,000,000	147,400	118,790	15,140	54,713	13,225	134	305	1,973	10,730	427					72,490	6,515	6,260	630
65	111	30		33,491,440		4,380	718	1,795				34	13	301					2,864		1,385	
	15,621	3,137	1,608	4,345,766,622	1,450,363	1,222,869	222,725	175,348	301,508	15,744	21,869	47,129	93,720	35,183	73	786	2,170	7,851	916,659	119,341	47,779	435

\*Timothy and Clover, 435 acres.

In some districts a portion of the ditches are not reported by Water Commissioners, for the reason that they have not been able to make or obtain a record of them.





HON. T. W. JAYCOX,

State Engineer,  
Denver, Colo.

Dear Sir—The annual reports of the several water commissioners of Irrigation Division No. 2, and a tabulation of the same, are submitted herewith.

The unexpected has again happened, and we are glad to record that there has been plenty of water for direct irrigation, as well as for storage purposes. Contrary to the usual rule, it did not become necessary to close down storage reservoirs at any time. Consequently, at the close of the season, all reservoirs were practically full of water, except in rare cases, where they were not in shape to receive water.

This condition has not only been very satisfactory to farmers, but has made the duties of the water officials much less arduous than usual and decreased the number of complaints from water users, so that we close the fiscal year of 1907 in a most satisfactory manner.

Crops are generally good. Cantaloupes, of which there were raised over 7,000 acres in three water districts, were not up to their usual standard, being damaged by too much rain in the latter part of the season.

The tonnage of sugar beets, while not so large as hoped for early in the season, will no doubt be above the average. There is an increase of acreage of about 10,000 acres, so that it is expected that the season for manufacturing sugar will be a long-drawn-out one at each of the six factories in the Arkansas valley.

More new irrigation projects have been commenced this year, a filing having been made for a reservoir site in almost every dry creek and gulch that delivers flood waters to the Arkansas, and the average farmer on the stream, who has a direct decree for water therefrom, begins to wonder where his water is to come from if all these enterprises are carried out, and all the water that naturally reaches the river is intercepted before it reaches the stream.

This office has this season, as last, furnished to water users the daily river reports, showing the gauge heights and volume of water passing through the various river stations, as well as gauge heights and volume of water carried by the several canals. This has been done at the expense of the Arkansas Valley Ditch Association, as it was last year. I wish to reiterate what I said in my last annual report, with reference to the State making a sufficient appropriation for expenses, so that this matter of daily reports may be taken care of by the State. These reports, as has been demonstrated, are necessary, in order that the best service may be had, and if the State undertakes to supervise the distribution of water from its natural stream it should, in all reason, make a

sufficient appropriation to do it satisfactorily, without it becoming necessary to call upon individuals or organizations for contributions.

Another matter in connection with these daily reports, and that is because of the constant changing conditions at river stations there is little dependence to be put in the reports unless there are frequent gaugings. I am strongly of the opinion that sufficient appropriation should be made, so that the State Engineer's office may be able to make these gaugings as often as necessary to insure reliable reports, and, if required, keep one man employed on the river all the time during the summer season.

I wish to thank you and the members of your office force for your many courtesies and assistance during the season of 1907.

Respectfully submitted,

JOHN M. JACKSON,  
Irrigation Division Engineer, Div. No. 2.

# IRRIGATION DIVISION NO. 2.

## Tabulated Statement of Water Commissioners' Reports, 1907.

District No.	Amount of Appropriation, sec. ft.	Capacity of Canal	Length of Main Ditch, Miles	Length of Laterals, Miles	Number of days water carried from reservoir	Amount of water carried from reservoir, acre-ft.	Average daily amount of water during season, sec. ft.	Number of acre-ft. used by canals for season	Total number of acres that could be irrigated	CROPS IRRIGATED FROM CANALS IN ACRES										Superintendence	Repairs	Improvements
										Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Cantaloupes	Sugar Beets	Other Crops	Total Irrigated			
10		313.00	106.00	45.00		642	199.00		12,274	3,539	1,575	2,541	278	199			556	46	11,734	Not reported.		
11	1,119.59	1,529.00	321.00	380.00			497.00		31,875	4,579	11,237	5,987	297	271	544		5	3,170	26,090	Not reported.		
12	583.74	721.00	241.40	66.75			379.10	117,291	31,369	8,572	1,287	553	3,194	338	32			2,436	16,712	\$2,155.00	\$6,802.00	\$5,590.00
13	1,750.90		205.00				269.93		17,534	2,012	11,498		15	22	5			3,982	17,534	Not reported.		
14	2,101.09	2,247	271.75	292.00	45	21,420	685.50	239,752	134,715	31,535	10,423	23,668	5,758	3,341	210	2,469	17,440	8,517	103,361	11,438.00	17,450.00	7,758.00
15	214.15	298.00	141.34				153.45		10,663	3,482	1,681	659	223		3		15	1,043	7,106		3,166.50	
16	690.53	1,376.00	349.50	214.00			483.00		39,898	17,632	3,589	2,465	156	137	108			1,022	25,709		10,340.00	325.00
17	2,107.32	3,725.00	328.00	1,136.00			1,171.00	341,917	151,132	59,470	2,071	2,723	3,018	400	30	3,930	30,388	5,569	134,199	18,480.00	17,625.00	188,790.00
18	266.63		83.75				169.00		9,934	2,167	1,463	25	38	11	43			1,902	5,649	Not reported.		
19	632.94	414.00	170.00				172.00		27,837	7,890	3,775	2,557	191	510	8		250	627	15,808		5,530.00	1,440.00
*49																						
*66																						
67	633.72	2,070.00	243.00	206.50	65	23,149	452.00	281,728	115,110	14,728	32,933	15,673	539			648	8,427	1,165	75,513	11,205.00	1,840.00	33,442.00
Total	10,409.61	12,693.00	2,160.74	2,340.25	110	45,211	4,669.98	980,688	582,241	155,606	84,532	82,851	14,607	5,229	983	7,047	57,081	30,079	439,415	\$43,578.00	\$62,753.50	\$237,345.00

\*No commissioners.





Pueblo, Colo., Nov. 30, 1908.

HON. T. W. JAYCOX,

State Engineer,

Denver, Colo.

Dear Sir—A more complete contrast than that between the irrigation seasons of 1907 and 1908 could not be well imagined.

While the year 1907 was marked, because of its abundant supply of water both in its streams and from copious rains, 1908 was equally distinguished because of its scarcity of water for irrigation as well as its slight rainfall.

This condition required the most judicious use of water by farmers in order that crops should receive the full benefit of the water available and it also required greater care and diligence on the part of the water officials so that the best results might be had; in consequence the Water Commissioners have been unable in many instances to give the necessary time and attention to collecting statistics and material for the annual reports, and in some cases have been delayed beyond the limit required by the statutes for making the return.

In comparing the total of the commissioners' reports of this division for 1907 and 1908, we find that there is about 28,000 acres more in cultivation this year than last, and of this increased acreage more than 25,000 acres is in alfalfa and 5,000 acres in cereals, while there is a decrease in sugar beets of about 5,000 acres.

It would take up too much space to recount in detail even a small part of the troubles visited upon the water officials by reason of the scarcity of water this season or a small number of the questions that arose that had probably never been thought of before, but it is clearly in the limits of justice to say that the Water Commissioners in almost all instances showed themselves to be patient, discriminating and capable, and with the assistance of the division engineer and now and then with the wiser councils of the State Engineer, we have been able to get through the season in a fairly satisfactory manner and with little or no litigation.

The short supply of water has operated as a hardship on those who had late ditches; it has also taught a valuable lesson and again demonstrated the old saw, that "It is an ill wind that blows nobody good."

For the past few years there has been so much water that users have become careless and have not always used it when it could be had and when necessary to insure a crop in an ordinary season. One of the most profitable times to irrigate land in this division is during the winter season, but, although this is well known to most farmers in the valley, because of the past few seasons furnishing so much water, winter irrigation has been neglected.

The writer knows of several cases, under late ditches, where there was little or no water to be had after planting time; comparatively good crops were raised where the land had been irrigated during the winter and even under ditches where there was plenty of water to be had during the growing season, the crops were very much superior where the ground had been irrigated during the winter. One farmer told me that on a forty-acre tract that had been well irrigated during the winter he cut two and one-half tons per acre of alfalfa the first cutting, and that on the adjoining forty acre tract, with equally good soil and with an equally good stand, but which had not been irrigated during the winter, he cut only about half the tonnage as on the former. With this knowledge fully impressed upon the farmer it looks reasonable that he will take advantage of the winter irrigation hereafter and thus insure a crop when water is scarce and insure a larger crop even when there is plenty of water.

This season has also brought to the minds of those who depend on irrigation for crops the desirability of storage reservoirs as a supplemental supply to direct irrigation. As an illustration of the benefits to be derived from such reservoirs, I wish to call your attention to the Great Plains reservoir system. This system of reservoirs is the property of the Great Plains Reservoir Company, and has an available capacity of about 180,000 acre feet, and at the beginning of the season they were full of water. The land under these reservoirs is irrigated for the most part by the Amity canal, there being in ordinary seasons plenty of water in the river available for the irrigation of these lands without drawing on the reservoirs. This season, however, there not being sufficient water for direct irrigation through the Amity canal, there was used out of the Great Plains reservoirs a total of 60,000 acre feet, or 378 cubic feet per second for eighty days, thus insuring the best of crops and still there was a large surplus remaining in the reservoirs for future use. With winter irrigation thoroughly carried on and with additional storage reservoirs any danger from shortage of water will be largely overcome.

Many new enterprises were started by way of storage reservoirs, flood canals, etc., this season.

The Beaver Park Land and Water Company has constructed a large canal on Beaver creek, which is built of wooden pipe and open ditch, the open ditch being lined with cement. This enterprise is intended to reclaim several thousands of acres of land in Fremont county, and when the system is completed will embrace the construction of two large reservoirs.

The Otero District reservoir being constructed on Clear creek near Granite, Colo., will be completed and ready for storing water when the flood season opens next year.

This will be the third large reservoir constructed on tributaries of the Arkansas river and designed to use the river as a



PLACING OF REINFORCED CONCRETE SLOPE PAVING.  
JACKSON LAKE RESERVOIR. WATER  
DISTRICT NO. 1.



carrier for delivering its water to the headgate of a canal many miles down the stream.

For one who has had experience in distributing waters so carried, it is easy to see the complications that must follow the multiplying of the mountain reservoirs and yet they are very desirable property to have in connection with a direct river right, and the difficulties arising because of apparent conflicting interest of direct irrigators, and reservoir owners will no doubt be properly cared for by new and equitable legislation.

Because of the absence of snow and insufficient rainfall last season there was practically no storage season, but the heavy snowfall upon the mountains this fall has already insured a generous supply of water, both for direct irrigation and storage for next season, and we can safely prophesy a splendid crop and an abundant harvest for the year 1909.

In delivering to you my report, together with the compiled reports of the Water Commissioners of Irrigation Division No. 2, I wish to thank you and them, as well as the members of your office force, for the many courtesies and kindnesses received.

Respectfully submitted,

JOHN M. JACKSON,  
Irrigation Division Engineer Division No. 2.



## ANNUAL REPORT, 1907.

Center, Colo., November 15, 1907.

Hon. T. W. Jaycox,

State Engineer, Denver, Colo.

Dear Sir—I have the honor to present to you my regular annual report as irrigation engineer of the Rio Grande division, also the reports of all water commissioners within the division excepting that from district No. 35.

This division has experienced a most prosperous year in all respects. The stream flow has been large and steady and at no time has there been a scarcity of water for direct irrigation. The streams reached their high point on June 30, a much later date than usual; heretofore it has been during the early days of June.

Annual reports from the several water commissioners show a successful season and favorable conditions.

District No. 20—Comprising the Rio Grande and its direct tributaries, has been operated by Mr. R. W. Maddox, a new commissioner, but a very successful and experienced river man. He has had no litigation and the crops are the best ever raised over the entire area.

District No. 21—Mr. G. S. Lovett has been handling the waters of the Alamosa and La Jara, which comprise this district, and he has had more water than he knew what to do with throughout the entire season.

District No. 22—This is the extreme south end of the valley, watered by the Conejos and San Antone rivers. A new commissioner is in charge here, Mr. B. W. Harrison, but he has been very successful in his work and faithful in reporting. Much water has run down these streams that could not be used—the ditches could not carry it.

District No. 24—This district has had a surplus of water for the entire season. The commissioner, Mr. Sanchez, has been acting and reporting regularly, but no difficulties have arisen.

District No. 25—This is the first season in years that this territory has had sufficient water for direct irrigation. Mr. Cargo, the commissioner, has had a most successful season, with but few disputes to settle and all crops are good.

District No. 26—The Saguache and its tributaries. Mr. Zack Clark has been very successful for a new commissioner and has made regular and complete reports. Water has been plentiful.

District No. 27—Comprising the La Garita and Carnero creeks, which have afforded more water than could be used for direct irrigation, has been in charge of Mr. Chavez, the old commissioner.

# IRRIGATION DIVISION NO. 2.

## Tabulated Statements of Water Commissioner's Report, 1908.

District No.	Amount of Appropriation, sec. ft.	Capacity of Canals	Length of Main Ditch, Miles	Length of Laterals, Miles	Number of days water carried from reservoir	Amount of water carried from reservoir, acre-ft.	Average daily amount of water during season, sec. ft.	Number of acre-ft. used by canals for season	Total number of acres that could be irrigated	CROPS IRRIGATED FROM CANALS, IN ACRES										Superintendence	Repairs	Improvements
										Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Cantaloupes	Sugar Beets	Other Crops	Total Irrigated			
10		313	106	45			126.50		13,590	3,815	5,355	3,302	321	342			60	40	13,238			
11	1,119.59	1,529	257	113					40,364	4,699	10,283	5,560	235	155	469		4	2,051	23,456			
12	774.69	1,308	241	48			309.24	111,790	34,957	8,616	1,475	1,053	4,813	342	43		3	2,115	18,460	3,585.00	\$4,549.00	\$105,660.00
13	1,759.90		205				206.20		14,945	1,360	10,660		13	27	2			2,678	14,740			
14	1,878.50	2,443	262	202	40	10,262	534.50	154,090	134,390	39,626	10,468	23,422	5,996	3,127	5		15,652	6,341	104,637	12,115.00	10,761.00	13,500.00
15	214.15	296	118	88					11,396	3,768	2,104	1,178	212		4			197	7,463		2,862.50	2,600.00
16	636.50	897	356	214			639.00		37,845	16,124	3,117	1,200	91	94	65		30	1,759	22,480		4,609.00	
17	2,407.32	3,725	328	1,138			1,093.00	199,615	157,752	61,520	7,070	30,656	3,619	470	30	3,150	25,559	8,503	140,577	12,670.00	14,650.00	110,250.00
18	266.63		82						8,272	2,068	1,603	25	58	11	50			1,872	5,687			
19	623.94	637	181	60			260.00	28,616	18,710	8,619	3,180	2,720	180	496	4		297	531	16,036	500.00	3,606.00	1,800.00
*49																						
*66																						
67	821.00	2,070	244	206	80	60,000	416.80	123,194	109,018	26,361	39,467	18,460	589	501			10,290	3,915	99,583	10,720.00	6,700.00	7,600.00
Total	10,502.22	13,218	2,380	2,114	120	70,262	3,585.24	618,305	581,229	176,576	91,782	87,576	16,139	5,565	672	3,150	51,895	30,002	466,357	\$39,590.00	\$47,749.50	\$241,410.00

\*No commissioners.



District No. 35—The commissioner here has not been acting and this office has no report or data from this territory except. as in passing over or through it, I have gathered enough information to justify estimates on the amount of water, crops, etc.

A tabulation of the most complete items in the water commissioners' reports show totals as follows:

Number of priorities in the division.....	1,049	
Section feet of water appropriated in the division.....	12,272	
Miles of main ditches in division.....	1,954	
Average number of days water was used in division.....	120	
Average daily amount of water used in division.....	4,420	
Number of acres that can be irrigated in division .....	556,000	
Number acres alfalfa in division .....	10,854	
Number acres natural grass in division .....	212,215	
Number acres cereals in division .....	100,110	
Number acres orchards in division .....	197	
Number acres market gardens in division .....	827	
Number acres potatoes in division .....	5,105	
Number acres field peas in division .....	125,061	
Number acres irrigated in division.....	454,369	
Cost of superintendence of all ditches.....		\$15,578
Cost of repairs.....		10,718
Cost of improvements .....		49,343

Reservoirs—A reservoir has been completed on the La Jara, a large one is under process of construction on the Alamosa and numerous smaller ones have been located on the watershed of the Rio Grande, where the rulings of the government allow filings for those up to 1,000 acre-feet capacity.

The hydraulic-fill dam being put in on the Alamosa is being watched by engineers from all parts of the country and will be an everlasting monument to the engineers having it in charge.

Subirrigation—The subirrigating area has expanded along the borders of the valley and nearly 30,000 acres of land has been brought under cultivation that heretofore has been too dry to successfully grow and mature good crops.

Drainage—Steps have been taken to reclaim seeped and alkali lands by systematic drainage. Several complete drainage systems have been laid out and two are being carried forward at present, although slow progress is being made on account of the extremely wet season and the inability to secure help and funds.

I was in the field personally with several of the commissioners in the height of the irrigating season and I wish to

assure you of the faithful performance of all duties by them and their cheerful obedience to all instructions issued from your office as well as from this one. They have been prompt in making their reports and have familiarized themselves with every detail of their work.

In closing this report I wish to express my thanks to you, your deputies and your office force for the courtesies shown to me during the season just passed and my appreciation of the loyalty and good will that exists among all connected with our work.

Respectfully submitted,

D. S. JONES,  
Irrigation Engineer, Rio Grande Division.



Irrigation Division No. 3.  
For the Irrigation Season of 1907.

DIST. NO.	NAME OF WATER COMMISSIONER	Numbers of Priorities	Amount of Appropriation, sec. ft.	Capacity of Canals	Length of Main Ditch, Miles	Length of Laterals, Miles	Average num- ber of days water carried from natural stream	Average daily amount of water during season, sec. ft.	Total number of acres that can be irri- gated	CROPS IRRIGATED FROM CANAL IN ACRES							COST, DOLLARS			
										Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Field Peas	Total Irrigated	Superin- tendence	Repairs	Improve- ments
20	R. W. Maddox . . . . .	365	3,260	4,742	1,068	168	150	1,975	260,750	3,331	107,910	60,146	25	72	3,320	92,253	267,057	\$13,780	\$7,570	\$31,673
21	G. S. Lovett . . . . .	106	2,110	1,530	218		80	450	75,000	795	16,755	8,700		160	660	3,605	30,675	25	572	26
22	B. W. Harrison . . . . .	144	4,589		366		180	1,100	122,072	3,290	24,712	22,990	113	476	727	22,490	74,798	890		6,890
24	J. P. Sanchez . . . . .	64	306	510	57		140	300	26,767	574	7,006	5,379	36	103	222	3,748	17,068	883	1,343	10,685
25	Frank Cargo . . . . .	135	948		92		90	200	29,215	513	24,485	1,273	5		59	162	26,797			
26	Z. T. Clark . . . . .	135	595		74		130	170	28,031	2,117	20,299	799	14	14	47	983	24,273		1,102	75
27	Feles Chavez . . . . .	51	47		24		100	50	4,165	84	1,048	323	4	2	20	320	1,801		111	
35	Max Atencio . . . . .	49	310		55		90	175	20,000	150	10,000	500			50	1,200	11,900			
Totals		1,049	12,065		1,954		120	4,420	566,000	10,854	212,215	100,110	197	827	5,105	125,061	454,369	\$15,578	\$10,718	\$49,343



## ANNUAL REPORT, 1908.

Center, Colo., November 20, 1908.

HON. T. W. JAYCOX,

State Engineer of Colorado.

Dear Sir—I herewith hand you my annual report as irrigation engineer for the Rio Grande division, the annual reports of the several water commissioners, and a tabulation of the same for the entire division.

During the irrigation season of 1908 we have had a very uniform flow of water, no extreme high water or excessive floods, and at no time has there been such a shortage as to seriously impair the crops. All necessary calls for water have been supplied except in the north end of the division, where Districts Nos. 25 and 26 were short during midsummer.

This office has received regular weekly reports from all water commissioners during the season, also annual reports, with the exception of those from Districts Nos. 24 and 35, and a brief summary of each for the season as follows:

District No. 20—This is a very large district, having an irrigated area of 276,099 acres, distributing 3,420 second feet of water among some 365 priorities, being watered by the Rio Grande and its immediate tributaries. Mr. R. W. Maddox has handled this territory, with but two deputies. The crops are good throughout, and no serious trouble or disputes have arisen.

The Rio Grande reached its high stage early in June, running about 5,000 second feet, and gave a sufficient flow for all needs during the entire season.

District No. 21—The Alamosa and La Jara rivers have had no high stage during this season, but the commissioner, Mr. G. S. Lovett, reports crops good, with a pinch in midsummer that was helped out by showers, so that no serious damage was done.

District No. 22, comprising the Conejos river and its tributaries, has been operated by Mr. B. W. Harrison. He has had a fair supply of water all the season, no shortage at any time, and all crops were very good.

District No. 24—Mr. J. P. Sanchez, the water commissioner here, has usually been very prompt in reporting, but this year the question of payment for services rendered has been raised, and I append herewith a communication from him, setting forth his reasons for not reporting as requested by me.

District No. 25—There are twenty-eight small streams in this district, all of them sinking before reaching the main streams, except in time of flood waters. Mr. Cargo, the water commissioner, has been short of water for distribution nearly all the season, and I have been called into the field with him to adjust disputes, but

there has been about two-thirds of a crop harvested, which was better than expected early in the season.

District No. 26—The Saguache creek has been short of water, but all cultivated crops have been good, the native hay on the lower sinks of the stream being the only crop to suffer. Mr. Z. T. Clark has gotten along without friction, and few complaints were entered for such a trying season.

District No. 27—This is a small district, only two creeks to distribute water from, the La Garita and Carnero. Mr. Feles Chavez, the water commissioner, has had plenty of water and very little trouble in handling his territory.

District No. 35—There has been some trouble on the Medano creek in this district. The old water commissioner resigned late in the season, and I took charge until Mr. I. N. Janney was appointed, and he has not been in the field and makes no report.

A tabulation of the water reports for the division (one district, No. 35, out) shows as follows:

Number of priorities in division.....	1.047
Number second feet of water appropriated in division.....	12,306
Number miles of main ditches and canals in division.....	1,425
Average number of days water was distributed in all ditches.....	126
Average daily amount of water distributed by all commissioners...	5,195
Number of acres actually irrigated in division.....	439,239

This makes an average of 84.5 acres irrigated to each second foot of water used, or the duty of water in this division is one second foot of water to eighty acres, in round numbers.

The crops reported show as follows:

Number acres alfalfa in division.....	13,661
Number acres natural grass in division.....	190,298
Number acres cereals in division.....	142,394
Number acres orchards in division.....	43
Number acres market gardens in division.....	275
Number acres potatoes in division.....	7,534
Number acres sugar beets in division.....	10
Number acres field peas in division.....	85,024
Number acres actually irrigated in division.....	439,239
Number acres that can be irrigated.....	624,697

The initial irrigation district for this division is now being formed, comprising the so-called farmers' union system, which

# IRRIGATION DIVISION NO. 3.

## Tabulation of Water Commissioner's Report for the Irrigation Season of 1908.

NUMBER OF WATER DISTRICT	Number of Priorities	Amount of Appropri- ation, sec. ft.	Length of Main Ditch, Miles	Average num- ber of days water carried from natural stream	Average daily amount of water during season sec. ft.	Total number of acres that can be irri- gated	CROPS IRRIGATED FROM CANAL IN ACRES									COST, DOLLARS		
							Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Sugar Beets	Peas	Total Irrigated	Superin- tendence	Repairs	Improve- ments
District No. 20. .	365	3,420	165	170	1,667	381,911	4,262	99,679	104,833	30	269	5,911	10	61,105	276,099	1,985	9,691	\$16,572
District No. 21. . . .	106	2,110	315	80	1,065	39,150	3,460	17,950	12,710			575		3,790	38,485	260	1,645	45
District No. 22. . .	144	1,588	360	180	1,500	119,814	2,890	30,322	16,391			637		16,490	66,730	1,540	515	
District No. 24* . .	64	355	50	140	325	20,000	500	7,000	6,000			300		3,000	16,800			
District No. 25 . .	135	922	135	90	160	38,202	387	23,750	1,146	7		48			25,438			
District No. 26. .	136	594	75	100	150	21,500	2,014	10,512	1,314	4	6	41		384	14,275			150
District No. 27. .	51	47	25	120	28	3,790	148	1,105		2		22		255	1,532		40	
District No. 35	46	310																
Total. . . . .	1,047	12,346	1,425	126	5,195	621,697	13,661	190,298	142,391	43	275	7,534	10	85,024	439,239	\$6,785	\$11,891	\$16,767





covers some 70,000 acres in the heart of the valley. They have secured one of the best reservoir sites on the headwaters of the Rio Grande, and, with their canal system already constructed, this bids fair to be one of the greatest improvements in this section of the State.

The colonization and settlement of a large area on the east side of the valley by promoters, who have secured a large tract of land near Fort Garland, bids fair to be a success if sufficient water can be stored and saved from loss in the loose soil of the foothills, while being carried from the main source at the mouth of the canons to the farm lands of the settlement.

Reservoir construction has made slow progress during this season, but several projects are having preliminary work done, and another season should see a great amount of this work being carried out. Several reservoir filings have been allowed by the government, on the Rio Grande drainage, with promise of others where good faith is shown by the parties applying.

All water commissioners have been painstaking in the performance of their work, and prompt in complying with all orders issued, either from your office or my own. Their actions in this respect have greatly assisted in keeping down litigation over irrigation matters throughout the division.

Appreciating these conditions fully, I wish to thank all the water officers, yourself, your deputies and your office force, as well as the water commissioners of the division, for the courtesies shown while in the discharge of our duties.

Respectfully submitted,

D. S. JONES,  
Division Engineer.

## ANNUAL REPORT DIVISION NO. 4, 1907.

Grand Junction, Colo., November 30, 1907.

HON. T. W. JAYCOX,  
State Engineer,  
Denver, Colo.

Dear Sir—I have the honor to submit my annual report for the season of 1907, and enclose herewith the reports of such of the water commissioners as have been employed during the year. I also forward, under separate cover, such field books as have been received.

## WATER SUPPLY AND CROP CONDITIONS.

The season of 1907 was a most successful one in Division No. 4, at least as far as the water consumers were concerned. Reference to the tabulated reports of the various districts in the division will show at a glance that there has been very little demand for the services of the water commissioners. I have listed the various districts according to the drainage areas on which they are located, and the following main facts will be noted;

On the Gunnison river the only demand for the commissioners' services was for adjustment of water on the tributaries to the lower part of the river; notably, on the tributaries in Delta county, the Uncompahgre in Montrose county and Kannah creek in Mesa county. The need for such services was rather for the adjustment of decreed rights than on account of any real shortage of water. All ditches are reported to have received sufficient water to mature the crops planted.

On the San Juan river there was no demand for the commissioners' services in any districts, but those on such tributaries of the Dolores as the San Miguel and West Paradox creek, and again there was no real shortage, and all crops were made.

On the Grand river, a very small but important part of which is included in Division No. 4, the commissioners' services were only required on tributaries in the Plateau valley, and as in other parts of the division all crops were made.

The result of such conditions is that the statistics provided by the commissioners and their deputies, both as to the use of water and crop reports, are very meagre, and there is nothing much for the division engineer to tabulate. It is only from the Uncompahgre river that complete crop reports are to hand from complete districts (Nos. 68 and 41), though the returns from districts 60 and 61 cover the portions of the districts usually covered. The reports as to the use of water are only partial, as to any district, and are entirely absent from some of those in which commissioners were employed.

It may be said in brief that there is nothing in the report for this division that even approximately conveys an idea of the

crops raised during the season, and except in a few cases on small systems it was impossible to calculate the amount of water used.

This very satisfactory condition of water supply naturally reduced very materially the work of the division engineer, both in the field and in the office. There was practically no demand for field work, either to assist the commissioners or for ditch owners, and except for the seepage investigation, which I conducted on a part of the Uncompahgre river, report of which has already been submitted, the only measurements made were of such a nature that the expenses for the same were supplied by private interests, though the results provide matter of public interest, and are preserved in my records. These measurements were more especially on Rapid creek and Kannah creek, in Mesa county, from both of which sources it is proposed to take water for the supply of towns in Mesa county.

There was a noticeable absence of controversy as to the use of water in the division, and in only one case (in Delta county) was it necessary for me to make a personal investigation as to the proper amount of water to be delivered to a ditch. There was no question involved as to the right of the claimant to the water, but the amount which he should receive from a certain spring, water from which he carried down a creek, was disputed. As this quantity varied from day to day, and even hour to hour, I left the matter entirely in the hands of the commissioner, with instructions for him to give what he thought right, and since my interview with the disputants there has been no complaint as to his distribution.

With the exception of the fruit crop, which was injured by late frosts, and of some local injury to early alfalfa, crops generally have been excellent. The fact that over 1,000 cars of fruit were shipped from the Grand valley is noticeable, particularly when comparison is made with other fruit shipments. The beet crop did not average quite so high per acre as usual, but the gross tonnage handled by the factory at Grand Junction was up to the average. From present indications it looks as though there would be a factory in the Uncompahgre valley in the near future, the beets from this section in the past having been shipped to the junction.

The reasons for the meagre data provided as to the use of water and the crops in the division are the same as were discussed in my report for the season of 1906.

#### NEW IRRIGATION ENTERPRISES.

Continuous work has been carried on by the Reclamation Service on the Uncompahgre valley project, and it is expected that water will be available for use in the valley in 1909. The completion of the Redlands system, in Mesa county, drawing water from the Gunnison, has placed a large area of excellent land under cultivation near Grand Junction. It is probable that



these two projects, in addition to the smaller canals constructed in recent years, and drawing water from the same source, will make it inadvisable to construct more irrigation ditches to divert water from this river without providing means for storage to supplement the natural flow during the dry season. Work is being rapidly carried on in the Montezuma valley on the enlargement of the old system, under the State district law, and the population, and incidentally land values are rising in that section.

Surveys have been started for a canal to be constructed by the United States Government, under the reclamation act, in Mesa county, and in addition for a canal under the State district act, both to draw their supply of water from the Grand river. Many other smaller systems are either under construction or projected in the division, as you will have noticed from the filings made in your office.

#### WATER COMMISSIONERS AND THEIR ASSISTANTS.

The able summary of this question as to the pay of water commissioners, given in your biennial report for 1905-06, makes it unnecessary for me to say much in addition to what I have already said in previous reports, but I desire to express my thanks for your endorsement of the recommendations made by the division engineers. I desire further to draw attention to a point to which I have, for various reasons, not referred before. During the year I have had assurance that two of the commissioners employed during recent years in the division take the stand that they are, under the statute, entitled to pay for each and every day from the time that they are called out in the spring until the irrigation season is considered over in the fall, irrespective of the water supply, and in one case the county commissioners have at least recognized the claim to the extent of paying the bill for services during continuous high water. In the other the commissioner told me that he had received no pay for any time whatever, but that he was bringing suit to collect it for the full period claimed, the defense of the county commissioners being that there was no need for his services. On the other hand, all other commissioners in the division have been in the habit of stopping work when the flood water in the late spring made their services unnecessary for distribution, and some have only put in odd days at different times, when there was actual need for them to regulate the supply. I have not advised any commissioners on this point, it being purely a question of law as to the interpretation of the statute, and I do not offer any opinion on the point now. But I do wish to say that any general departure from the latter custom, which is the general one in the division, sustained by the courts, would lead to very general dissatisfaction on the part of tax payers, and by the various boards of county commissioners, in particular. A decision in favor of the commissioners' claim, followed by a general adoption of this method of computing time



of service, would more than double the present expense of water distribution in the division.

I further wish to draw attention to the fact that most commissioners are in favor of the pay of their assistants being increased from \$2.50 to \$3.50 per day, and provided such assistants are given such work to look after as will take their full time, with the use of a horse, I think the latter rate of pay would be only right for the right kind of men.

#### LITIGATION AND ADJUDICATIONS.

There have been numerous changes of point of diversion since my last report, but probably not so much litigation as to water rights as usual. In some ways it is a matter of regret that after a protracted hearing the District Court has found that there is no injury in the changes which were requested on the Uncompahgre river, such changes being the ones involved in the recent suit of Ashenfelter et al. vs. Carpenter et al., and in their case the findings were that such injury would result from the changes that the petition was denied by the late judge of the court. The only reason that, as an irrigation official, I feel that this finding may be regretted, is based on the evident fact that on the presentation of identically similar evidence as to condition of the water supply as regards distribution, and as to the flow of the river and its tributaries, different referees and judges can arrive at diametrically opposite conclusions. It looks as though, in one trial or the other, the complex questions of fact involved were not clearly presented.

What was practically a re-adjudication of the old conditional decree in District No. 40 has been issued during the year. It is noteworthy that the court states in the decree that priority of right shall be determined by the "priority number as fixed in this decree and further decrees of the court." Now, if the system of streams (Surface and Tongue creeks) were, and were always, to remain independent of all other drainage areas in this and other districts, there might be no confusion, but when it is remembered that the date of appropriation is practically the sole fact that regulates the distribution of water between districts, and that the register kept by the division engineer lists (according to statute) all ditches in his division, according to date, it will be seen that the time will come when it is impossible for him to observe the provisions of a local decree which gives numbers *not* according to dates, and states that such numbers are the evidence of priority. It will occur to anyone who has studied local conditions that where the main stream (the Gunnison) is adjudicated at a separate proceeding, and the rights are numbered independently of the rights on each and every tributary in the same district in which such part of the Gunnison is situate, that very serious complications may arise as soon as the water in the main stream falls short, and the tributaries are called on.

It is impossible, except at great length, to illustrate the confusion that must result, but I draw attention to the matter as serving to illustrate the chaotic condition into which we are bound to drift, and the litigation which lies ahead, when an attempt is made to treat small tributaries as being independent of the main river. The system was wrong to start with, is working out wrongly, and only certain local conditions of water supply have prevented the very serious complications which are bound to ensue from being apparent before this. The only remedy that appears to me to be satisfactory is a general collation of all decrees on each and every drainage system, a work which is practically left by the statute to the division engineer. He, however, is going to discover that action based on such a statutory register will not work out in accordance with the mandates of certain individual decrees.

#### RECOMMENDATIONS.

That the next Legislature be urged to revise the statutes relating to the employment and duties of water commissioners and their assistants, and to pass a law in accordance with the recommendations made by the division engineers, as given in your biennial report.

With many thanks for your help and kindness in the past, I am,

Yours very respectfully,

ARTHUR H. STOKES,  
Irrigation Division Engineer, Division No. 4.

#### DISTRICTS INCLUDED IN THE DRAINAGE AREA OF THE GUNNISON RIVER.

*District No. 28.*—The Tomichi and its tributaries. There was no demand for the services of the water commissioner during the season.

*District No. 59.*—Headwaters of the Gunnison and lands on north bank to Delta county line. Adjudication in 1906, and no commissioner has been appointed or needed.

*District No. 62.*—Tributaries to the river below the Tomichi, and lands on south bank to Delta county line. There was no demand for the services of the water commissioner during the season.

*District No. 40.*—Lands in Delta county and Gunnison county irrigated from the Gunnison and various tributaries. The water commissioner was employed for 346 days, with the assistance during part of the time of eight deputies. The total cost of their services was \$2,585.00. The commissioner reports that there was plenty of natural flow in most of the streams up to July 1. Smith's fork, Minnesota creek and the North fork had a good supply all the season. As he had no reason to employ deputies on some streams, notably the North fork, there

is no record or report from them. The report practically covers the use of water on the Tongue and Surface creek drainage areas.

## TONGUE CREEK—CROP ACREAGE

Alfalfa.....	2,880 acres.	
Grass.....	24 acres.	
Cereals.....	515 acres.	
Orchards.....	524 acres.	
Other crops.....	408 acres.	
Total.....		4,351 acres.

An analysis of the use of water by twenty-six ditches shows that 13,268.42 acre-feet of natural flow, and 566.04 acre-feet of reservoir water were used on 3,496 acres, showing a use of 3.95 acre-feet per acre. In addition to the above, 855 acres were irrigated by reservoir water and natural flow, no data as to amount used or variety of crop being given.

## SURFACE CREEK—CROP ACREAGE

Alfalfa.....	4,629 acres.	
Grass.....	620 acres.	
Cereals.....	1,745 acres.	
Orchard.....	3,019 acres.	
Other crops.....	660 acres.	
Total.....		10,673 acres.

An analysis of the use of water by sixteen decreed ditches shows that 30,803.38 acre-feet of natural flow, and 5,000.12 acre-feet of reservoir water, were used on 7,194 acres, showing a use of 4.97 acre-feet per acre. Besides these ditches, all undecreed ditches had natural flow from April to July 7, and from October to end of the season, and used, in addition, 2,436.96 acre-feet of reservoir water.

*District No. 68.*—Lands irrigated from the upper half of the Uncompahgre river and tributaries. The commissioner was only employed occasionally. His report does not cover the use of water, but gives the following estimate of crops:

Alfalfa.....	3,650 acres.	
Grass.....	5,086 acres.	
Cereals.....	3,191.35 acres.	
Orchards.....	62.50 acres.	
Other crops.....	225.25 acres.	
Total.....		12,215.25 acres.

*District No. 41.*—The Uncompahgre river in Montrose and Delta counties. The commissioner and deputies were not employed continuously, and no returns are given as to the use of water. The commissioner was employed for 109.5 days, with four deputies employed for various times, at a total cost of \$1,661.50. He gives the following crop report:

Alfalfa.....	20,482 acres.	
Grass.....	320 acres.	
Cereals.....	10,580 acres.	
Orchard.....	3,092 acres.	
Gardens.....	144 acres.	
Potatoes.....	1,109 acres.	
Beets.....	816 acres.	
Other crops.....	312 acres.	
Total.....		36,855 acres.

*District No. 42.*—Gunnison river and tributaries and Grand river and tributaries in Mesa county. The commissioner gives the following return of the time put in by himself and deputies. Commissioner, 86 days; five deputies, 229 days; making total expense of \$1,002.50. A deputy was employed on Kannah creek, a tributary of the Gunnison, and the following crop report was sent in:

Alfalfa.....	2,100 acres.	
Cereals.....	10 acres.	
Orchards.....	242 acres.	
Total.....		2,352 acres.

DISTRICTS INCLUDED IN THE DRAINAGE AREA OF THE GRAND RIVER.

*District No. 42.*—(See above.) The commissioner was employed with five deputies, but he reports that a great many



ditches were not visited. Crops were good and almost all matured. The commissioner says:

"On a number of ditches in the district the weirs are from one-half mile to one mile from the headgate, which makes a great deal of work and takes lots of time to regulate the water. I think where the weirs are more than 300 or 400 feet from the headgate there should be a spillway at the weir. I think the commissioners should be paid by the State, and that the deputies should get \$3.50 per day."

The commissioner's crop report is full for the ditches visited, but as his work does not cover nearly half of the irrigated area of the district, it is not representative as to the products of the district. His report as to the use of water is not full.

#### DISTRICTS INCLUDED IN THE DRAINAGE AREA OF THE SAN JUAN RIVER.

*District No. 29.*—Upper waters of the San Juan river and tributaries. There was no demand for the services of the water commissioner during the season.

*District No. 30.*—The Rio Las Animas and tributaries. There is no regularly qualified commissioner, and no call for services.

*District No. 31.*—The Los Pinos and tributaries. The district is not adjudicated.

*District No. 32.*—Tributaries of the San Juan not included in other districts. The district is not adjudicated.

*District No. 33.*—The La Plata and tributaries. There was no regularly qualified commissioner, and no call for services.

*District No. 34.*—The Mancos river and part of the Dolores river and tributaries. The commissioner reported by letter that except for a period of two weeks water was running to waste, and that there had been no need for his services.

*District No. 60.*—The San Miguel river and tributaries. The commissioner was employed a part of the season. He sends the following report of crops:

Alfalfa.....	4,113 acres.	
Grass.....	492 acres.	
Cereals.....	3,121 acres.	
Orchard.....	365 acres.	
Gardens.....	185 acres.	
Potatoes.....	215 acres.	
Other crops.....	55 acres.	
Total.....		8,548 acres.

An analysis of the use of water shows a use of 24,392 acre-feet of water on the above acreage, showing a use of 2.85 acre-



feet per acre. Some of the water was stored, and after the reservoir was emptied it was again filled during the irrigation season.

*District No. 61.*—Part of the Dolores river and tributaries. The commissioner's report only covers the use of water and crop report on West Paradox creek, his services never being required in other parts of the district. The commissioner was employed for 111 days at a cost of \$555.00. He employed no deputies. He gives the following crop report:

Alfalfa.....	649 acres.	
Grass.....	1,264 acres.	
Cereals.....	220 acres.	
Orchards.....	33 acres..	
Gardens.....	15 acres.	
Total.....		2,181 acres.

An analysis of the use of water on 1,013 acres of the above shows a use of 3.75 acre-feet per acre. The balance of 1,168 acres of natural grass was not irrigated.

*District No. 63.*—The Dolores river and tributaries in Dolores county. The district is not adjudicated.

*District No. 69.*—The Dolores river below the San Miguel. The district is not adjudicated.

ARTHUR H. STOKES,  
Irrigation Division Engineer, Division No. 4.

## IRRIGATION DIVISION, NO. 4. ANNUAL REPORT, 1908.

Grand Junction, Colo., Nov. 30, 1908.

THE HON. T. W. JAYCOX,  
State Engineer,  
Denver, Colo.

Dear Sir—I have the honor to present to you my annual report for the season of 1908. In doing so I must as usual express my regret that I am quite unable to tabulate the reports of the Water Commissioners of the division in such form that the result can have any value as a summary of either the amount of crops raised or of the use of water throughout the division as a whole. I therefore give below a statement of the condition of affairs in each district, with such tabulated data as I can make from the reports received, grouping such districts, as I did last year, according to the separate drainage areas in the division. Perusal of this statement will fully explain the state of affairs in the division, and it will be obvious that, although the reports provide little information, the season has been a satisfactory one, and the administration has been economical on account of the generally good supply of water and the limited need of the Water Commissioners' services.

## SAN JUAN DRAINAGE.

*District No. 29*—San Juan river. No commissioner is qualified for the district and there was no demand for service.

*District No. 30*—Las Animas river and tributaries. No commissioner is qualified, and no demand for service.

*District No. 31*—Los Pinos river. The district has not been adjudicated.

*District No. 32*—San Juan tributaries. The district has not been adjudicated.

*District No. 33*—La Plata river. No commissioner is qualified and there has been no demand for service.

*District No. 34*—Mancos river. The commissioner's report on the use of water by 27 ditches shows:

Acreage 5,680 acres. Acre-feet of water used, 8,591. Duty of water 1.51 acre-feet per acre. (The average number of days given on which water was used being only 57, and considerable rain having been reported, it is obvious that this duty does not represent the needs of the district.)

## CROP REPORT

Alfalfa	2,370	acres.
Natural grass	283	acres.
Cereals	2,711	acres.
Orchards	126.25	acres.
Potatoes	110.25	acres.
Other crops	79.50	acres.
Total		5,680 acres.

It will be noted that only 5,680 acres is reported on from the whole San Juan drainage area.

## DOLORES DRAINAGE.

*District No. 34*—Dolores river. Commissioner's services not required.

*District No. 60*—San Miguel river. The commissioner's report on the use of water by 23 ditches shows:

Acreage 9,531 acres. Acre-feet of water used 31,871. Duty of water 3.34 acre-feet per acre.

## CROP REPORT FOR 31 DITCHES

Alfalfa	5,399	acres.
Natural grass	1,054	acres.
Cereals	4,390	acres.
Orchards	687	acres.
Gardens	189	acres.
Potatoes	221	acres.
Other crops	74	acres.
Total		12,014 acres

*District No. 61*—Dolores river and tributaries above San Miguel. The commissioner's services are only required on West Paradox creek. His summary of the use of water cannot be used to show the duty of water.

## CROP REPORT

Alfalfa	670	acres.
Natural grass	160	acres.
Cereals	380	acres.
Orchards	35.50	acres.
Other crops	24	acres.
Total		1,269.50 acres.

It is to be noted that the commissioner's field book is particularly well kept and provides an accurate diary of his distribution of water.

*District No. 63*—Dolores river and tributaries below San Miguel. The district is not adjudicated.

*District No. 69*—Dolores river in Dolores county. The district is not adjudicated.

It will be noted that no services were required of any commissioner on the main Dolores river, and only on two tributaries was there any scarcity of water.

#### GUNNISON DRAINAGE.

*District No. 28*—The Tomichi and tributaries. The commissioner reports very few days' services. His crop report being practically a summary of the acreage given at the adjudication is of no value as a summary of crop acreage for this season.

*District No. 59*—The Upper Gunnison and tributaries. The district has been adjudicated, but no commissioner has ever been needed.

*District No. 62*—The south side of the Gunnison above district 40. No commissioner is qualified and there was no demand for any service.

*District No. 40*—The Gunnison and tributaries in Delta county, etc. The commissioner sends an excellent report for such parts of his district as required his services. These do not represent the district fairly, the main Gunnison and the North Fork not being included, and for this reason I have tabulated the data supplied according to the separate streams, both as to use of water and crop returns.

Surface, Dry and Currant creeks. Forty-eight ditches used 38,109 acre-feet (including 6,264 acre-feet of stored water) on 12,644.5 acres. Duty of water, 3.01 acre-feet per acre.

#### CROPS

Alfalfa.....	5,430	acres.
Grass.....	544	acres.
Cereals.....	2,352	acres.
Orchards.....	3,478	acres.
Gardens.....	178	acres.
Potatoes, etc.....	662.5	acres.
Total.....		12,644.5 acres.

Tongue Creek and tributaries. Thirteen ditches used 12,122 acre-feet of water (including 5,697 acre-feet of stored water) on 2,353 acres. Duty of water 5.15 acre-feet per acre.

## CROPS

Alfalfa.....	1,536 acres.	
Grass.....	10 acres.	
Cereals.....	308 acres.	
Orchards.....	393 acres.	
Potatoes, etc.....	106 acres.	
Total.....		2,353 acres.

Leroux creek and tributaries. Eleven ditches used 12,452.8 acre-feet of water (including 436.03 acre-feet of stored water) on 6,585 acres. Duty of water, 1.89 acre-feet per acre.

## CROPS

Alfalfa.....	2,210 acres.	
Grass.....	50 acres.	
Cereals.....	1,224 acres.	
Orchards.....	2,731 acres.	
Potatoes, etc.....	370 acres.	
Total.....		6,585 acres

Smith's Fork and Crystal creek. Eighteen ditches used 36,657 acre-feet on 8,151 acres. Duty of water, 4.49 acre-feet per acre.

## CROPS

Alfalfa.....	4,531 acres.	
Grass.....	388 acres.	
Cereals.....	1,662 acres.	
Orchards.....	533 acres.	
Gardens.....	44 acres.	
Potatoes, etc.....	993 acres.	
Total.....		8,151 acres.

*District No. 41*—The lower Uncompahgre river. The commissioner gives no report of the use of water which is satisfactory. His service was irregular and any estimate of the average daily amount used was hard to make.



## CROP REPORT

Alfalfa.....	17,119 acres.	
Natural grass.....	393 acres.	
Cereals.....	7,238 acres.	
Orchards.....	3,047 acres.	
Gardens.....	84 acres.	
Potatoes.....	1,746 acres.	
Sugar beets.....	1,556 acres.	
Other crops.....	172 acres.	
Total.....		31,355 acres.

*District No. 68*—The upper Uncompahgre. The commissioner states that without daily visits, which he did not make, any report of the use of water would be guesswork.

## CROP REPORT

Alfalfa.....	2,654 acres.	
Natural grass.....	4,182 acres.	
Cereals.....	2,884 acres.	
Orchards.....	61.25 acres.	
Gardens.....	62.50 acres.	
Potatoes, etc.....	246.75 acres.	
Total.....		10,090.50 acres.

## GRAND RIVER DRAINAGE.

*District No. 42*—Grand and tributaries in Mesa county. The commissioner only performed services irregularly in certain parts of the district. His crop reports are not representative of any one part, and his data as to the use of water are impossible to tabulate.

All field books and reports submitted by water commissioners are sent in with this report.

## GENERAL CROP CONDITIONS.

It may be said generally that the season of 1908 began with poor prospects for irrigation on the western slope. On the Grand Mesa, extending into districts 40 and 42, and covering some of the most valuable fruit land in the State, there was less snow than usual, and commissioners reported early in the year that much of it was melting and immediately sinking into the dry ground on the higher slopes. Contrary to generally accepted theories, it seems obvious to the most observant students of water

supply on the western side that it is rather to the direct runoff from the deeply drifted snows in the gulches both above and below timber line that the farmer must look for the salvation of his crop, and that the equalization of the natural flow of springs and creeks due to the sinking of melting snow under the timber into the soil is of minor importance except to the very early rights and the domestic supply. Perhaps the most serious shortage that can occur is early in the spring, notably in the Uncompahgre valley, which shortage usually occurs at the time when the lower snows in the timber are melting and the runoff is insufficient to supply any but the owners of very early priorities. It is at this time that water consumers look for the melting of the more unprotected snows to supply their needs. Later in the year when the real shortage begins to be felt there is on this side scarcely any snow left in the timber, and again it is to the unprotected drifted snows above timber line that they look for their supply of water. On consultation with several observers this year I found that the conditions this spring in various districts made them believe in the idea, which has come to me as the result of observations extending over a good many years, that in a country where the natural flow of the streams is greatly overappropriated it is to the runoff from unprotected snow, either above or below timber line, that the consumer must look for his water supply, whether for storage or direct irrigation. As a result of cold weather it was late before the early melting started and a flood would have been welcome. Later the supply held out well for early priorities, and rains helped out the later. As a result, most crops put in matured, but the loss to early alfalfa was considerable. As the summary given above shows, there was no shortage in many of the higher districts, a fact probably chiefly due to the cold spring, which rendered early irrigation unnecessary. The very important crop to the western slope, the fruit crop, suffered somewhat in certain localities, while in others the conditions were more generally suitable and unusual crops resulted. Palisade had the usual crop of peaches, but the crop in the Grand valley was below the average, that in Delta county fair and that in Montrose well above the average.

While referring to the fruit crop one cannot omit mentioning the smudging which was undertaken in the Grand valley. The old idea that the formation of a smoke cloud, rather than the generation of heat, was the most effective remedy for untimely frost has given place to the newer one that heat is what is required, and many growers made extensive experiments with pots burning either oil or coal. In orchards where the owners were persistent the results were simply remarkable in the face of most adverse conditions, and as a result many pots have been placed on the market, and it is certain that the majority of growers in the Grand valley at least will undertake systematic smudging next year.

Sugar beets generally were only a fair crop per acre, but the factory, on account of the increased acreage, will have a good run.

#### IRRIGATION DEVELOPMENT.

It is almost impossible for a division engineer to report accurately the new canals, reservoirs, etc., projected during the season in his division. No filings, maps or details of construction are brought directly to his attention, nor is he likely to meet the backers of the enterprises so as to learn their intentions, but I can hardly help referring to some of them. I understand that all maps, plans and surveys are completed by the United States Reclamation Service for the canal tapping the Grand river above Palisade, and besides this a fund of \$250,000 is already provided to start construction, half of this amount being advanced by those who have subscribed their lands for water. All terms of the agreement presented by the government to the Water Users' Association have been unanimously accepted and construction will start at once. The Uncompahgre project, in Montrose county, is going along as fast as possible according to the fund available, and a new contract between the government and the Water Users' Association has just been ratified, under which the undertaking will be completed. Only one new undertaking under the State district law has been brought to my attention, namely, the Orchard Mesa District in the Grand valley, which practically covers a district projected some years ago. Details of this I submit as requested to be published elsewhere in your report.

#### ADJUDICATION AND LITIGATION.

An important adjudication of water rights has been completed in district 40 (Delta county), and others in district 61 and district 42 are under way. No litigation of importance to the public has taken place during the year.

#### RECOMMENDATIONS.

I have nothing to add at this time to recommendations made in previous annual reports, but would renew my request that the particular recommendations made in 1906 by the division engineers collectively receive your continued approval and support. In addition, as a sample of what may be done by us engineers, I submit a field book, kept by a deputy water commissioner, and tabulated by myself, in the form of a diary of the use of water. If each division engineer had the direct authority over subordinates, which I think he should have, he could secure such information from them in such form that he could provide such tabulated statements for every stream in his division on which there was necessity for the services of any water commissioner.

With many thanks for your kind assistance and advice during my term of office,

I am yours very respectfully,

A. H. STOKES,  
Irrigation Division Engineer, Division No. 4.

WATER COMMISSIONER'S REPORT FOR THE IRRIGATION SEASON OF 1908.  
IRRIGATION DIVISION NO. 4.

Number of District	REMARKS	Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Sugar Beets	Other Crops	Total Irrigated
29	No commissioner									
30	No commissioner									
31	Not adjudicated									
32	Not adjudicated									
33	No commissioner									
34		2,370	283	2,711	126		110		80	5,680
60		5,399	1,051	4,390	687	189	221		74	12,011
61		670	160	380	36				24	1,270
63	Not adjudicated									
64										
28	Very incomplete report									
59	Not adjudicated									
62	No commissioner									
40	Surface Creek, etc	5,430	544	2,352	3,478	178	662			12,644
	Tongue Creek	1,536	10	308	393		106			2,353
	Leroux Creek	2,210	50	1,224	2,731		370			6,585
	Crystal Creek and Smith's Fork	4,531	388	1,662	533	44	993			8,151
41		17,119	393	7,238	3,047	84	1,746	1,556	172	31,355
68		2,654	4,182	2,884	61	62	247			10,090
		41,919	7,064	23,149	11,092	557	4,455	1,556	350	90,142





REINFORCED CONCRETE BRIDGE AT GREELEY, WELD COUNTY, COLORADO.





Glenwood Springs, Colo., November 28, 1907.

HON. T. W. JAYCOX,  
State Engineer,  
Denver, Colo.

Dear Sir—Herewith I submit my annual report as irrigation division engineer for Division No. 5 for the irrigation season of 1907.

I may say, in the beginning, that owing to an abundant supply of snowfall last winter—perhaps above the average—supplemented by a precipitation from the clouds, the need and demand for irrigation officials has been much less than in any year within my remembrance.

In many streams which have heretofore given us a great deal of trouble there has scarcely been a call this year for a water commissioner.

In view of the very favorable conditions which have prevailed during the season of 1907 I have not been able to secure from commissioners anything more than crop reports, and these would not have been as complete as they are had not the commissioners, upon my positive request, availed themselves of every possible opportunity when traveling over their districts to secure these data, the most of which were collected early in the season.

That the very favorable conditions as to water supply, as already outlined, climatic requirements approaching perfection, it need scarcely be said that excellent crops have been produced throughout the division. It is true that in several sections the weather was cold and backward in the spring, and considerable alarm was occasioned thereby, but this unfavorable condition seems to have been overcome by the exceptional season later on, resulting in a full crop of almost everything planted by the farmer.

The lateness of the frost and the glorious autumnal weather, which has scarcely yet been disturbed by the approach of winter, have conspired to favor the farmers in the harvesting of their crops, and up to the recent announcement of the financial flurry prices were excellent for everything which the farmers and ranchmen produced.

I am sure the acreage in the crops this season throughout the division is far in excess of any other year, but just in what proportion I do not know, and will leave that for the statistical portion of my report to disclose.

District No. 38, composed principally of lands in the Roaring Fork valley, is easily leader in the culture of potatoes, and this proved one of the most profitable crops in that section. Sugar beets were also grown here in considerable quantities, and, I think, in greater area than in any other portion of the division. In Eagle county potatoes, sugar beets, alfalfa and timothy hay

and grains are the principal crops, and farming in that territory has been very profitable this last summer.

In my last annual report I had occasion to refer to the work being done on the Shoshone power project, about ten miles up the Grand river from Glenwood Springs. This is a gigantic undertaking, and work on the same was pushed incessantly up to the last month, when the plant was practically closed down, with the work being suspended for the present. This great undertaking is the work of the Central Colorado Power Company, an Eastern corporation, having several other projects throughout the State, and it is said that work will be resumed as soon as financial matters are more favorable to develop a work of this kind. At the time of my last report I was under the impression that the water diverted from the Grand river by this company would be returned to the stream before it would be needed by any one for any purpose. I am now informed that the plans of the company contemplate taking the flow of the Grand river, or, at least, a very large percentage of it in times of low water, through a long tunnel in the mountain and thence by canal to a point about four miles below Glenwood Springs. A report of such intention on the part of the company has caused considerable uneasiness to many of the residents of Glenwood Springs, who fear that the welfare and rights of the town will be seriously jeopardized by the Grand river, which flows through the town, being drained to such an extent as to interfere with the sewerage system and other sanitary conditions of the town, and action is now being taken by the citizens, with a view of so presenting the town's claims to Judge Cavender of the District Court that the decree heretofore prayed for by the company and formally allowed may embody such restrictions as will at all times protect the town's rights along sanitary lines.

The waters of Grizzly creek were, in September, adjudicated by Judge Cavender to the Glenwood Light and Water Company, under the law providing for adjudications for purposes other than irrigation, and this company now conveys a portion of the flow of such stream through the mountain by tunnel to Noname creek, thus increasing the waters of the latter stream, the combined waters of these two streams, or so much thereof as necessary, being used for domestic supply for the towns of Glenwood Springs and Cardiff. An effort was made to protest this decree by a few believers in municipal ownership, on the claim that the residents of the town of Glenwood Springs, being the users of this water, should be declared the appropriators of the same, and that for this reason the decree should be made to the town as a municipality, and not to the company, which constructed the tunnel and had diverted and applied the water.

Judge Cavender held that a decision in accordance with such protest would strike at the very foundation principle of the water

laws of the State, and promptly overruled the motion of the protestants, and allowed the petition of the company.

I understand that such work as was in progress on Snake river, in Routt county, where a large body of land was to have been reclaimed under the Carey act, has been suspended, at least for the winter. This is a large enterprise, and it is to be hoped that it may be pressed to a successful conclusion.

Steps have been taken to induce the United States Reclamation Service to construct the necessary ditches and reservoir for the irrigation of a large tract of excellent mesa land lying in the Roaring Fork and Cattle Creek valleys, between Basalt and Glenwood Springs, and said to contain from fifteen to twenty thousand acres. The matter is now in the hands of our representatives in Congress, and a great many interested citizens are anxiously awaiting their report.

During the season I have made numerous visitations to Districts Nos. 37, 38, 39, 45 and 70, and have found little cause to complain of the conditions existing in this territory. In some places the weirs and rating flumes are not in the best condition, but there has been considerable improvement in this line during the last two years. Wherever I went I found an almost complete absence of the complaints that have heretofore greeted me when going about the country. There has been such an abundant supply of water that there was but little demand for nicety of measurement, as nearly every one had all the water he cared for, and was not interested in how much his neighbor was getting. In fact I have been called out this year more to listen to the complaints from those who are getting too much water than I have been to supply those who were lacking.

District No. 53 has been almost entirely without a commissioner this year, Mr. A. H. Hadley, the former commissioner, having tendered his resignation to the Governor soon after the season begun. I do not understand that the vacancy has yet been filled.

Mr. George Lechmere is the new commissioner in District No. 43. I planned to make him a visit and wrote him to that effect, but, after waiting several weeks, received a letter from him saying that he had been busy on the round-up, and would be away from home a week or two longer making cattle shipments, and asking me not to come until later in the season. I later heard from him with the information that there had scarcely been any demand then for his services during the summer, and I concluded it would be almost useless to visit him and explain the manner of doing the work when it seemed there was no work to do. I had also planned a trip from Wolcott to Steamboat, taking in Districts Nos. 37, 53, 52 and 58, but thought best to wait as long as possible, in the hope that a successor to Mr. Hadley might be appointed. Another reason for believing this trip



of small importance was the receipt of a letter late in the season from Mr. Southard, commissioner of District No. 58, saying that he had scarcely had anything at all to do, except the setting of a few headgates and division boxes early in the spring.

I think it is hardly necessary to call your attention to the fact that in District No. 57 there has been no commissioner appointed for a good many years, the supply of water in that district being so great that the people apparently do not feel the necessity of any official division or regulation.

I wish to call your attention to a matter which has brought up considerable inquiry of late, the matter of domestic decrees. Since the passage of the Taylor law providing for domestic decrees a number of ranchmen have been given adjudications for water for domestic use. In some streams the aggregate of these domestic decrees called for the total flow of the streams in the fall of the year. This raises a conflict between the owners of domestic decrees and the owners of reservoir decrees, who desire to fill their reservoirs in the fall and winter, but find the waters of the stream entirely consumed by the domestic decrees. I look for some litigation growing out of the contentions along this line, as it seems as though lawyers are giving conflicting advice as to the value of these two rights. I have not yet called upon you for an opinion in regard to the matter, but mention it here in the hope that it may be discussed at our annual meeting.

I desire to repeat the recommendations made in my annual report last year, and hope that they may soon be embodied in the laws of the State.

Thanking you and your office force for the uniform kindness and many courtesies extended in the past, I am

Yours very truly,

A. J. DICKSON,  
Irrigation Division Engineer, Division No. 5.



## IRRIGATION DIVISION NO. 5.

## Summary of Water Commissioners' Report for the Irrigation Season of 1907.

NUMBER OF WATER DISTRICT	Alfalfa	Natural Citruses	Cereals	Orchards	Market Gardens	Potatoes	Sugar Beets	Other Crops	Small Fruits	Total Irrigated
District No. 37. ....	3,293	4,265	3,779	2	105	329	139	2,991	.....	14,893
District No. 38. ....	6,197	5,886	6,352	91	19	2,249	469	491	.....	21,754
District No. 39. ....	3,544	272	1,091	989	96	411	295	53	8	6,759
District No. 44. ....	4,035	4,755	1,365	.....	.....	.....	.....	.....	.....	10,155
District No. 45. ....	7,540	401	2,445	691	.....	442	235	101	.....	11,855
District No. 52. ....	817	1,091	15	.....	.....	26	.....	80	.....	2,029
District No. 58. ....	2,589	16,339	2,974	815	.....	27	.....	16	.....	22,760
District No. 70. ....	1,896	87	477	316	3	74	.....	163	60	3,076
	29,911	33,096	18,498	2,904	223	3,558	1,138	3,895	68	93,291

Glenwood Springs, Colo., November 30, 1908.

HON. T. W. JAYCOX,  
State Engineer,  
Denver, Colo.

Dear Sir—The matter of submitting annual reports to your office has become quite a habit with some of us, but after a careful perusal of the election returns, I am fully convinced that even habit may be overcome by Democratic majorities, and as time is becoming more and more precious to us, or perhaps I had better say less precious, though more appreciated, I will make this, my farewell report, as brief as may be warranted by the facts and conditions.

I am thoroughly convinced that Irrigation Division No. 5 comprises the best watered section, or perhaps I had better say a section more easy of irrigation, of any territory of equal area in the State of Colorado.

The Grand river, the White river, the Bear or Yampa river, and the Roaring Fork river, with their numerous tributaries, furnish a water supply which thrills the farmers of less favored sections with wonder and admiration. True, some of the small tributary streams, during the hot summer months, furnish a supply inadequate to the rapidly growing needs, but, on the whole, there is comparatively little cause for complaint or regret on this score.

In this connection I am forced to say that what the average farmer thinks he needs and should have and what he actually does need for the production of large and profitable crops represent widely divergent quantities, and I presume the farmer who, in his dealings with the water commissioner, always thinks he gets the worst of it, is not hard to find in any community, and it is not at all impossible to find two neighbors with abundant water rights, each so jealous of that right that, rather than to allow his neighbor to use too much water, soaks and sours and seeps his own land until it is almost worthless, and if remonstrated with by irrigation officials or others, gravely asserts that he is decreed so much water, and that he is only using what belongs to him—in other words, to use a stereotyped expression, he thinks he is merely "holding his own," and this he believes he is justified in doing, even to his own financial loss and the permanent damage to his land, which is bound to follow such conduct.

Along this line I have made quite an effort to educate the people to realize the true situation, viz.: That they are not decreed an ownership in the water, but merely a right to the use of the same.

I must further say that I do not consider that the water officials, under our present laws, have as much power as they

should have in preventing wrong, excessive and harmful use of water.

I know that one is treading on what is considered dangerous ground when he advocates greater power by the water commissioner in regulating the amount of water which shall go to each farmer, notwithstanding the wording of his decree. I fully realize that a commissioner is considered presumptuous who undertakes to say that a farmer needs less water than his decree calls for, or that he will not need any for the next twenty-four hours; but there is not one present here to-day but knows of many instances where men, hiding behind the wording of a decree, have insisted on and used water to excess, to their own detriment, and to the serious loss of neighbors, who were unfortunate in having a later appropriation, and yet, under the present law, and especially the present custom, the water commissioner has felt powerless to, or at least has not felt justified, in preventing the same.

Of course, you will immediately say that the law now provides that the water commissioner may go down the ditches to prevent waste or a wrong or illegal use of water. I grant you this. This is what might be called an emergency provision, and yet so long as water commissioners find no trouble in keeping busy supplying water to headgates from streams, and so long as the question above referred to is one of judgment between the farmer and the commissioner, the latter is not much inclined to look for trouble below the headgates—he does not rush to do that which the law, except in this one instance, says he shall not do, and sometimes crafty farmers, understanding and taking advantage of the conditions, go on in their covetous greed, wasting water to the great detriment of others, and in a manner never intended by the framers of our present laws.

I am thoroughly convinced that when water commissioners are appointed by the State Engineer, or by the Governor, upon the recommendation of the State Engineer, and without dependence upon the will of the county commissioners; when such water commissioners are required to furnish a heavier bond than at present; when they are paid more money for their services and paid by the State; when they are required before appointment to pass an examination similar to that now required by division engineers, and when we shall have some legislative or judicial edict giving water commissioners greater authority in this matter than at present, the waters of the State will be distributed in a far more equitable and profitable manner than is possible at the present time, under the present laws.

In my last report I noted a suspension of work by the Central Colorado Power Company on the big power project at Shoshone, about ten miles east of Glenwood, on the Grand river. This work was resumed early this spring, and has progressed steadily since that time. I have no information as to when the work will probably be completed and water diverted from the river.

As to the Antlers reservoir, below New Castle, I think no work has been done on that since my last report, but I understand arrangements are now under way for raising the dam several feet yet this winter by hydraulic process. This is a reservoir owned by the Farmers' Irrigation Company, and if increased in size is capable of irrigating, in addition to the land owned by the farmers, about 2,000 acres of choice fruit lands, which have never yet been cultivated. This unimproved land was purchased some months ago by Mr. H. K. Devereux and associates, of Colorado Springs, who opened negotiations with the Farmers' Company, with a view of obtaining title to an interest in the reservoir, and enlarging it to a capacity sufficient to irrigate all the lands under it. The question of priority rights was the chief barrier in the way of negotiations, and Mr. Devereux finally abandoned the plan and has since decided to irrigate his lands by pumping the water from the Grand river.

The largest reservoir system in division 5 is that of the Battlement Reservoir Storage Company, and consists of five reservoirs at the head of Battlement creek, near the town of Grand Valley. These reservoirs are also in an uncompleted stage, and work on them is very slow, owing to the altitude of the reservoirs and the very short time each year when it is practical to work on them.

A survey has been made, and I presume plans have been filed in your office, for a reservoir at the head of Mamm creek, which will irrigate about 2,000 acres of splendid land, known as the Hunter mesa, and located on the south side of the Grand river, opposite Rifle.

Concerning an effort made to interest the United States Reclamation Service in the construction of a reservoir and ditches to irrigate a tract of land lying between Cattle creek and the Roaring Fork river, near Carbondale, reference to which was made in my last report, I think nothing has been done, barring a brief reconnoissance by a couple of employes of the government. Whether they have made any report as to the probable feasibility of the project I have not been able to learn.

I had occasion last year to refer to a decree by Judge Cayer, at Red Cliff, adjudicating the waters of Grizzly and No Name creeks, or a considerable portion of the same, to the Glenwood Light & Water Company, a corporation which for many years has furnished the inhabitants of the town of Glenwood Springs with water for domestic purposes. I now understand that steps have been taken, by action in the Supreme Court, to set aside this decision, the claim being made by the petitioners that the decree should have been to the town or the people of the town, since they, and not the company, were the actual appropriators of the water.

I have recently received from the clerks of the District Court at Red Cliff and at Sulphur Springs certified copies of decrees



issued from their courts, but have not yet found time to enter these in the register, but will do so very soon. The record received from Sulphur Springs is the first official information ever received by my office from that territory.

I am as yet unable to secure the much desired information from the District Court at Meeker and Hahn's Peak, although the clerk at the latter place informed me this summer that he would soon be ready to furnish me with the desired information, but two letters since written him on the subject remain unanswered to this day.

In Glenwood Springs I am still waiting the numbering of the decrees by the District Court. I had hoped to have all this information in my office and have it entered on the register by January 1, 1909. If I succeed in this I will be able to turn over to my successor a very complete register, which will render the work of my successor much less arduous than mine has been.

I have heretofore recommended the compilation of the irrigation laws in a form convenient for the use of irrigation officials and others. We now have such a work in Mills' Irrigation Manual. This volume, and the last biennial report issued from your office, contain much valuable information, and it seems to me are almost indispensable to those having to do with irrigation problems.

In Division No. 5 the crops during the past year were, I think, fully up to the standard, except that the first cutting of alfalfa was short in most localities, owing to the cold and backward spring, although the season was slightly more advanced than last year. In the higher altitudes there is a marked falling off in the acreage of sugar beets, and especially is this true as to Eagle county, comprising District No. 37.

In District No. 38 potatoes continue to be the great money making crop, and out of a total of 4,247 acres of potatoes reported in Division No. 5 this year No. 38 produced a little over half of that amount, or 2,208 acres.

Nine districts furnishing crop reports give a total as follows:

Alfalfa, 32,660; natural grasses, 32,787; cereals, 22,226; orchards, 2,458; market gardens, 227; potatoes, 4,247; sugar beets, 1,095; young orchards, 87; pasture, 180; other crops, 6,438; making a total irrigated area of 101,283 acres. Individual reports of water commissioners, as well as a tabulated report for the division, are filed herein.

I have previously made so many recommendations that I do not care to go further in this respect than to reiterate my suggestions and recommendations made to this office November 28, 1906, and a subsequent suggestion that the State Engineer supply detailed printed instructions as to the construction, setting, maintenance and use of headgates, weirs, rating flumes, etc., and perhaps more definite information than has heretofore been issued as to the measurement of water.



I wish now, in bidding official farewell to the State Engineer and his deputies and office assistants, to thank them all for their official and personal courtesies to me in our relations together, and to wish them many years of happiness and usefulness in whatever vocation they may be called.

Respectfully submitted,

A. J. DICKSON,

Irrigation Division Engineer, Division No. 5.

IRRIGATION DIVISION NO. 5.  
SUMMARY OF WATER COMMISSIONERS' REPORTS FOR THE IRRIGATION SEASON OF 1908.

NUMBER OF WATER DISTRICT	Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Sugar Beets	Other Crops	Young Orchards	Pasture	Total Irrigated	Superintendence
District No. 37.	3,151	3,927	3,594	2	54	475	52	2,909			14,164	
District No. 38.	6,167	5,752	6,541	225	49	2,208	247	509			21,198	
District No. 39.	4,455	413	1,254	1,133	82	710	393	36	87	100	8,755	
District No. 44.	4,565	4,140	1,435			25					10,165	
District No. 45.	8,979	335	3,197	748	10	706	231	149			14,355	
District No. 52.	646	594	374		11		172				21,72	\$396.00
District No. 53.	1,667	2,981	383			19		5			5,055	138.50
District No. 58.	1,427	14,561	4,574		7	22		1,587			22,180	
District No. 70.	1,603.	84	874	350	14	82		148		80	3,239	
	32,660	32,787	22,226	2,458	227	4,247	1,095	6,438	87	180	101,283	

## SUMMARY OF THE REPORTS OF DIVISION ENGINEERS FOR THE YEARS 1907-1908.

Reports of the division engineers for 1907 were received at the annual meeting of the division engineers with the State Engineer, held November 30, 1907, at the State Engineer's office. Reports for 1908 were received at the annual meeting of the division engineers with the State Engineer, held November 30, 1908, at the State Engineer's office.

The division engineers' reports are compiled from the reports of the water commissioners of each division.

In the divisions where the water commissioners are on duty through the entire irrigation season the reports received are fairly reliable and contain valuable information.

These irrigation divisions are: No. 1, comprising the South Platte river and its tributaries, and the North Platte river and its tributaries. No. 2, comprising the Arkansas river and its tributaries. No. 3, comprising the Rio Grande river and its tributaries. No. 4 contains such rivers as San Juan, Las Animas, Dolores, San Miguel, Uncompahgre and Gunnison rivers and their tributaries. In many of the water districts of this irrigation division the water commissioners are not called out for service until late in the season, when water gets low in tributaries, and then are only on duty for a short time. For this reason reports received have been incomplete, and a tabulation of the reports would not give the full amounts for the entire division.

In Irrigation Division No. 4 reports were received from six districts out of seventeen. In Irrigation Division No. 5 reports were received from nine divisions out of seventeen. In both of these irrigation divisions many districts are without water commissioners, and in others the water supply was so abundant that the commissioners were not called out.

The year 1907 was a good one from an irrigator's point of view. There was sufficient water for all crops. The year 1908 was quite short in many portions of the State, and required a great deal of extra work on the part of the irrigator to get good results from his water.

The crop reports for the last two years, on the whole, show an increase in the amount of crops grown over the years 1905 and 1906. In several water districts the reports returned by the water commissioners do not agree with those returned in previous years. This is probably due to the inaccurate methods employed in securing data.

The acres grown in alfalfa, cereals, orchards, potatoes and sugar beets show an increase over previous years, as it also does the total amount in cultivation. The acres grown in field peas is somewhat less, due to local conditions. The total acres grown

in sugar beets is given as 151,428 acres. The total number of acres under cultivation is given as 2,136,800. This amount is not correct, as it is only the number of acres reported. No allowance is made for acres grown in water districts from which reports were not received.

### COST OF SUPERINTENDENCE OF CANALS.

From the reports made by the water commissioners the following table was compiled, showing the cost of superintendence and ditch riders per acre. This is really the cost of distributing the water. The cost of operating the canal is made up of cost of superintendence, maintenance and repairs. The table shows the cost of superintendence for the entire district. The several canals in the district may have a greater variation in cost per acre than the districts themselves:

WATER DISTRICT NO.	COST PER ACRE FOR SUPERINTENDENCE AND DISTRIBUTION OF WATER	COST PER ACRE FOR SUPERINTENDENCE AND DISTRIBUTION OF WATER
	1907	1908
1 .....	\$0.10	\$0.18
2 .....	.17	.22
4 .....		
5 .....	.07	.10
6 .....	.10	.11
7 .....	.06	
8 .....	.49	.19
9 .....	.37	.39
12 .....	.34	.43
14 .....	.22	.24
17 .....	.14	.09
64 .....	.09	.09
67 .....	.15	.11

### STORAGE RESERVOIRS.

The value of storage reservoirs is appreciated more and more as the years go by. During the past irrigation season water from reservoirs sold for \$3.50 and \$4.00 per acre foot for the irrigation of potatoes and sugar beets.

During the year 1907 there was stored in Irrigation Division No. 1, 442,950 acre feet of water. This is practically one-half acre foot of water for each acre of land under cultivation in the entire irrigation division.

When the land in natural grasses and the under ditch above 6,500 feet in elevation are taken out, the amount of stored water is greater than one-half acre foot to each acre of land under cultivation.

During the season 1908, 333,280 acre feet of water was stored in reservoirs. This reservoir water contributed largely to the success of agriculture during the past season.

Reports from Irrigation Divisions Nos. 2, 3, 4 and 5 of the amount of water stored are meager.



TABULATION OF THE REPORTS OF THE DIVISION ENGINEERS, 1907.

Number of Division	Length of Main Ditch, Miles	Length of Laterals, Miles	Number acre-ft. used by canals for season	Total number of acres land irrigated	Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Sugar Beets	Other Crops	Peas for Feeding	Total Irrigated
1	3,314	1,927	966,261	1,216,041	217,284	166,418	300,809	15,319	21,809	45,156	87,767	48,792	2,170	905,524
2	2,461	.....	980,688	582,241	155,606	84,532	82,851	14,607	5,229	983	57,081	37,126	.....	438,015
3	1,954	468	.....	566,000	10,854	212,215	100,110	197	827	5,105	.....	.....	125,061	454,369
4*	.....	.....	.....	‡250,000	38,503	7,806	19,382	7,337	344	1,324	816	1,660	.....	77,172
5†	.....	.....	.....	‡200,000	29,911	33,096	18,498	2,904	223	3,558	1,138	3,895	.....	93,291
				2,814,282	452,158	504,067	521,650	40,364	28,432	56,126	146,802	91,473	127,231	1,968,371

\*Nine districts out of seventeen reported.

†Nine districts out of seventeen reported.

‡Estimated for the entire Irrigation Division.

TABULATION OF THE REPORTS OF THE IRRIGATION DIVISION ENGINEERS, 1908.

Number of Irrigation Division	Length of Main Ditch, Miles	Length of Laterals, Miles	Number of acres of water used by canals for season	Total number of acres land irrigated	Alfalfa	Natural Grasses	Cereals	Orchards	Market Gardens	Potatoes	Sugar Beets	Other Crops	Field Peas	Total Irri- gated
1	3.137		1,150,363	1,222,869	222,725	175,348	301,508	15,744	21,809	47,129	93,720	46,001		916,659
2	2.461		618,305	581,229	176,576	94,782	87,576	16,139	5,565	672	51,895	33,152		466,357
3	1.425			624,697	13,661	190,298	142,394	43	275	7,534	10		85,024	439,239
4*				‡250,000	41,919	7,064	23,149	11,092	557	4,455	1,556	350		90,142
5†				‡200,000	32,660	32,787	22,226	2,458	227	4,247	1,095	6,438	267	101,283
				2,878,795	487,541	563,279	576,853	45,476	28,493	64,037	151,428	86,001	85,291	2,013,680

\*Six districts out of seventeen reported.

†Nine districts out of seventeen reported.

‡Estimated for the entire Irrigation Division.



FLUME AND DROP AT CREEDE, MINERAL COUNTY, COLORADO.



CRIB PROTECTION FOR WAGON ROAD AT UPPER CREEDE,  
MINERAL COUNTY, COLORADO.



## CHAPTER V.

## SUMMARY OF DITCH AND RESERVOIR FILINGS.

A total number of 1,873 ditch filings and 1,199 reservoir filings were made in this office during the last biennial period. The total number of 293,754 cubic feet per second of water was claimed by the ditch filings and 503,880,847,000 cubic feet by the reservoir.

These filings were made in duplicate upon tracing cloth. As this office is required to certify that one is a duplicate of the other, it is necessary that the maps be compared, which requires nearly the entire time of two clerks. Under the present filing law, it is necessary that two maps be filed. A print of the original could not be substituted for the duplicate copy. If the filing laws were amended to permit of the filing of a print of the original on file in this office, it would lessen the work of this office of comparing the maps by 40 per cent. and still serve all the purposes of the law.

I desire to again call the attention of the Legislature to the injustice of the present law in charging for claims to water. The present law requires the charge of \$1.00 for each claim to water regardless of the quantity claimed. If a nominal charge were made upon the amount of water claimed, it would increase the receipts of this office, making more money available for the stream gagings and at the same time it would keep down excessive claims to water.

Below is a summary of the filings to water made in this office during the past biennial period.



## SUMMARY OF DITCH AND RESERVOIR FILINGS.

From December 1, 1906, to November 30, 1907.

## DIVISION NO. 1.

DISTRICT NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
1	66	12,841	70	12,868,517,000
2	11	2,111	33	6,130,193,000
3	21	2,296	14	2,436,400,000
4	12	1,170	12	5,151,894,000
5	5	1,633	8	2,511,795,000
6	12	2,125	21	5,430,851,000
7	44	3,014	18	5,822,692,000
8	27	1,984	13	19,261,086,000
9	9	998	4	1,363,562,000
23	9	762	13	25,776,271,000
46	4	55	None	
47	6	884	3	15,727,562,000
48	3	110	None	
64	15	4,362	13	11,313,563,000
65	1	20	1	337,000
Totals	245	34,365	223	113,794,723,000

## SUMMARY OF DITCH AND RESERVOIR FILINGS.—Continued.

From December 1, 1906, to November 30, 1907.

## DIVISION NO. 2.

DISTRICT NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
10.....	18	8,610	10	1,096,356,000
11.....	10	170	2	21,000,000
12.....	20	6,657	12	14,977,080,000
13.....	8	186	9	1,816,561,000
14.....	27	21,051	20	42,689,619,000
15.....	4	51	5	1,214,693,000
16.....	30	15,053	39	9,313,037,000
17.....	21	227	14	65,949,000
18.....	8	831	7	271,026,000
19.....	8	1,154	5	3,319,716,000
49.....	3	146	None	.....
66.....	1	20	None	.....
67.....	31	7,420	19	20,137,611,000
Totals.....	189	61,576	142	94,922,648,000

## SUMMARY OF DITCH AND RESERVOIR FILINGS.—Continued.

From December 1, 1906, to November 30, 1907.

## DIVISION NO. 3.

DISTRICT NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
20	4	60	8	1,807,233,000
21	5	280	None	
22	None		None	
24	3	9	None	
25	None		None	
26	None		None	
27	None		None	
35	3	56	2	1,014,762,000
Totals	15	405	10	2,821,995,000

## SUMMARY OF DITCH AND RESERVOIR FILINGS.—Continued.

From December 1, 1906, to November 30, 1907.

## DIVISION NO. 4.

DISTRICT NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
28..	5	18	None	
29..	4	204	1	1,000,000
30..	5	5,432	1	102,407,000
31..	6	826	1	3,797,313,000
32..	1	4,295	1	11,500,000,000
3 ..	5	235	2	509,982,000
34..	5	4,330	6	11,540,039,000
40..	38	1,660	37	1,391,431,000
41..	1	100	None	
42..	37	23,383	26	1,446,512,000
59..	3	36	2	1,146,000
60..	33	2,411	2	1,597,926,000
61..	9	507	3	398,309,000
62..	1	8	None	
63..	None		None	
68..	7	386	1	2,241,000
69..	4	77	5	4,234,189,000
Totals..	164	43,908	88	36,522,495,000

## SUMMARY OF DITCH AND RESERVOIR FILINGS.—Continued.

From December 1, 1906, to November 30, 1907.

DIVISION NO. 5.

DISTRICT NO.	NUMBER	AMOUNT CLAIMED	NUMBER	AMOUNT CLAIMED
	OF DITCHES	IN CUBIC FEET PER SECOND	OF RESERVOIRS	IN CUBIC FEET
36	19	2,298	9	15,541,401,000
37	4	413	None	
38	25	3,711	9	8,784,363,000
39	7	199	1	629,000
43	9	71	2	918,000
44	23	431	12	26,039,000
45	17	63	1	190,918,000
50	1	12	1	790,000
51	9	2,657	8	4,778,961,000
52	4	1,389	3	92,736,000
53	7	2,670	3	91,629,000
54	3	7	1	1,241,460,000
55	None		None	
56	None		None	
57	9	134	3	14,158,000
58	27	531	14	881,167,000
70	None		None	
Totals.	164	14,586	67	31,645,169,000



# SUMMARY OF DITCH AND RESERVOIR FILINGS.—Concluded.

From December 1, 1906, to November 30, 1907.

DIVISION NOS. 1 TO 5.

IRRIGATION DIVISION NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
1.....	245	34,365	223	113,794,723,000
2.....	189	61,576	142	94,922,648,000
3.....	15	405	10	2,821,995,000
4.....	164	43,908	88	36,522,495,000
5.....	164	14,586	67	31,645,169,000
Totals for state.....	777	154,840	530	279,707,030,000

# SUMMARY OF DITCH AND RESERVOIR FILINGS.

From December 1, 1907, to November 30, 1908.

DIVISION NO. 1.

DISTRICT NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
1.....	86	11,155	81	11,118,439,000
2.....	16	3,847	10	17,529,634,000
3.....	30	4,158	33	6,719,329,000
4.....	9	88	3	6,351,000
5.....	8	374	10	589,161,000
6.....	34	5,204	26	3,450,725,000
7.....	27	3,554	10	871,226,000
8.....	18	529	12	27,793,000
9.....	20	1,372	9	348,646,000
23.....	17	4,281	14	7,745,542,000
46.....	4	116	1	17,017,000
47.....	1	148	None	.....
48.....	8	1,774	1	1,940,004,000
64.....	49	15,599	30	2,562,294,000
65.....	3	283	4	3,297,905,000
Totals.....	330	52,482	244	56,224,066,000

## SUMMARY OF DITCH AND RESERVOIR FILINGS.—Continued.

From December 1, 1907, to November 30, 1908.

## DIVISION NO. 2.

DISTRICT NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
10	16	560	13	1,093,143,000
11	20	3,482	16	17,635,837,000
12	31	2,144	19	4,890,529,000
13	7	4	14	11,607,996,000
14	17	2,048	10	1,171,282,000
15	2	45	2	917,073,000
16	39	4,741	30	654,025,000
17	57	5,404	48	3,325,070,000
18	13	1,960	6	403,428,000
19	19	523	5	7,789,009,000
49	2	100	None	
66	None		None	
67	43	7,313	22	5,873,681,000
Totals	266	28,324	185	55,361,073,000

## SUMMARY OF DITCH AND RESERVOIR FILINGS.—Continued.

From December 1, 1907, to November 30, 1908.

## DIVISION NO. 3.

DISTRICT NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
20.....	15	1,000	20	46,346,554,000
21.....	3	142	None	.....
22.....	5	317	None	.....
24.....	5	68	2	168,028,000
25.....	17	748	8	528,363,000
26.....	1	300	1	165,935,000
27.....	1	33	2	1,052,289,000
35.....	21	3,385	4	211,476,000
Totals.....	68	5,993	37	48,472,645,000

## SUMMARY OF DITCH AND RESERVOIR FILINGS.—Continued.

From December 1, 1907, to November 30, 1908.

## DIVISION NO. 4.

DISTRICT NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
28.....	6	248	None	.....
29.....	5	24	2	303,000
30.....	17	120	3	1,243,000
31.....	14	868	1	6,059,000
32.....	8	2,017	1	4,356,000,000
33.....	7	865	2	1,070,399,000
34.....	4	2,006	2	20,118,000
40.....	37	3,731	41	2,919,206,000
41.....	3	55	None	.....
42.....	59	15,331	48	2,814,325,000
59.....	3	312	None	.....
60.....	31	1,084	11	2,258,097,000
61.....	11	764	4	586,173,000
62.....	2	10	None	.....
63.....	2	2	3	15,104,000
68.....	3	18	1	4,167,000
69.....	5	81	1	908,411,000
Totals .....	217	27,536	120	14,959,605,000

## SUMMARY OF DITCH AND RESERVOIR FILINGS.—Continued.

From December 1, 1907, to November 30, 1908.

DIVISION NO. 5.

DISTRICT NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
36.....	17	2,156	7	36,574,807,000
37.....	6	154	5	1,875,424,000
38.....	22	1,638	2	262,496,000
39.....	8	598	1	73,354,000
43.....	9	25	None	.....
44.....	21	2,404	12	973,296,000
45.....	26	259	5	1,492,303,000
50.....	5	246	4	188,989,000
51.....	22	10,624	1	98,771,000
52.....	3	1,581	6	1,869,049,000
53.....	3	1,552	2	1,744,237,000
54.....	11	891	10	1,137,872,000
55.....	3	8	None	.....
56.....	2	24	2	532,952,000
57.....	26	823	16	120,935,000
58.....	28	1,557	9	2,211,400,000
70.....	3	39	1	543,000
Totals.....	215	24,579	83	49,156,428,000



## SUMMARY OF DITCH AND RESERVOIR FILINGS.—Concluded.

From December 1, 1907, to November 30, 1908.

DIVISION NOS. 1 TO 5.

IRRIGATION DIVISION NO.	NUMBER OF DITCHES	AMOUNT CLAIMED IN CUBIC FEET PER SECOND	NUMBER OF RESERVOIRS	AMOUNT CLAIMED IN CUBIC FEET
1	330	52,482	244	56,224,066,000
2	266	28,324	185	55,361,073,000
3	68	5,993	37	48,472,645,000
4	217	27,536	120	14,959,605,000
5	215	24,579	83	49,156,428,000
Totals for state	1,096	138,914	669	224,173,817,000



REINFORCED CONCRETE BRIDGE AT ALAMOSA, CONEJOS COUNTY, COLORADO.



## CHAPTER VI.

## SEEPAGE MEASUREMENTS.

Measurements of the seepage or return waters of the most important streams in the State were made in the fall of 1907 or 1908.

For the year 1907 the measurements on the Arkansas river were made by C. W. Beach and F. Cogswell; on the Rio Grande and Rio Conejos by F. Cogswell; on the South Platte river, Cache la Poudre river and the Bear, Boulder, South Boulder, Dry, St. Vrain and Big Thompson creeks by Thomas Grieve; on the Uncompahgre river by A. H. Stokes and Thomas Grieve.

For the year 1908 the measurements on the Arkansas were made by C. W. Beach, Thomas Grieve and F. Cogswell; on the South Platte and Cache la Poudre rivers by F. Cogswell; on the Uncompahgre river by A. H. Stokes and on the Rio Grande, Rio Conejos, and Bear, Clear, Boulder, South Boulder, Dry, St. Vrain and Big Thompson creeks by Thomas Grieve.

## ARKANSAS RIVER—1908.

The Bessemer canal was shut down for repairs some time before these measurements were taken, which probably accounts for the small gain between the Bessemer headgate and Pueblo.

The loss shown between Rocky Ford and Fort Lyons canal is probably due to an increase in the amount of water wasted into Timpas creek by the Rocky Ford and Catlin ditches between morning and afternoon.

The large gain between Riverdale and Las Animas is due to fall irrigation under the Jones ditch. The land near the south bank of the river was flooded at the time of these measurements.

The excessive gain east of Las Animas is no doubt due to the flood of October 19-20, which covered the bottom land on both sides of the river to a depth of from six to ten feet.

The measurements were abandoned at Granada on account of the snowstorm of November 27th and succeeding days.

A comparative table of the seepage measurements on the Arkansas river is published.

## RIO CONEJOS RIVER.

The loss in the section from the United States gaging station to San Juan bridge is no doubt due to the fact that there is very little irrigation in that section and the bed of the river is composed of small stones and coarse gravel into which the water sinks.

From the Conejos bridge to the mouth of the Rio San Antonio the slope of the land is away from the river. On the north, or left side, sloping to the northeast and on the south side to the southwest. On the north side the seepage water is intercepted by the north branch of the Rio Conejos and taken out by small ditches.

On the south side the seepage water is intercepted by sloughs and diverted to the Rio San Antonio.

#### RIO GRANDE—1907.

The large return of water shown in the section from Granger station to Del Norte is no doubt due to the fact that the valley is narrow and water is taken in ditches only a short distance back from the river.

The irrigable land in this section is pear-shaped with the small end at Del Norte, where the foothills come very close to the river, thus forcing all the return water to enter the river above the point of measurement at the power house.

Below Del Norte the water is taken by the ditches out into the main valley many miles from the river and a large percentage of the return water is intercepted by the ditches located at the foot of the bluffs along the bottom land adjacent to the river, before they reach the higher outlying mesa.

Many of these ditches at the date of these measurements were dry at the headgates, but lower down were carrying intercepted seepage water.

Some of the ditches intercept the natural drainage streams, which tends to still further reduce the amount of seepage water naturally expected to return to the river.

The solid rock bottom in the river below the Meadow Overflow ditch, about five miles below Alamosa and below the last ditch on the river, appears to force all the water to the surface, giving the second largest return per mile of seepage from direct irrigation from the Rio Grande.

The large increase of seepage shown in the section from the Meadow Overflow ditch to the mouth of the Rio Conejos is largely due to irrigation under and waste from ditches taking water from the north bank of the Rio Conejos. The slope of the land lying adjacent to the two rivers is away from the Rio Conejos and toward the Rio Grande.

Owing to the large amount of water below the mouth of the Rio Conejos measurements were abandoned at that point.

#### RIO GRANDE RIVER—1908.

The right side of the river from La Saucos to a point about a mile below where the river enters the narrow rocky gorge is covered with a slough which is dammed up at the lower end above the level of the river. This probably accounts for the large gain from La Saucos to the State bridge.

Melting snows probably increased the gain to a slight extent on the South Boulder, Dry and St. Vrain creeks.

#### SOUTH PLATTE RIVER—1907.

A gain was found in the section from the Last Chance ditch to Haworth bridge instead of a loss as in the previous year. This



may be due to the plentiful supply of water during the entire irrigation season and the fact that the "Highline Ditch" had been shut down but very little during the summer season. A special measurement on the City ditch between the headgate and the wagon road crossing below flume, a distance of about one-fourth mile, showed a gain of 3.52 sec. feet.

The excessive gain at Kersey bridge is undoubtedly due to a rise in the river which reached Kersey before the measurement was taken and Hardin after the measurement at that point.

#### SOUTH PLATTE RIVER—1908.

The conditions were fine for seepage measurements until the Union ditch was reached on October 17th. The ditches were drawing water for fall irrigation to make up for the lack of water during the summer, thus keeping the water in the river at a low stage and making the conditions similar to those prevailing during the irrigation season.

The snowstorm of October 17th stopped the work until October 22d, and gave a much larger quantity of water in the river from Union ditch to the Bijou canal to be measured. In these sections the measurements were taken in a falling river which tends to increase the results obtained.

The large gain from Hardin to Weldona is due to leakage from the Riverside Reservoir Inlet ditch, carrying 150 second feet, the Bijou canal, which was carrying 300 second feet, and the Jackson Lake Inlet ditch, which had just shut down.

The noticeable increase in seepage from Crook to Julesburg is due to leakage from the Jumbo reservoir and its inlet ditch and to the extension of irrigation during the past two years, to some 20,000 acres of land lying under this reservoir.

Between Red Lion station and Sedgwick four seepage streams were measured, with a total inflow into the river of twelve second feet, all due to leakage from this reservoir and inlet ditch.

It might be said as a general statement applicable to the entire river from the Canon to Julesburg, that the increase in amount of seepage this year, over any previous year, coming as it does at the close of a very dry season, with a general scarcity of water for irrigation over the entire drainage area of the South Platte is due to the leakage from the large ditches carrying water for fall irrigation.

It is also very evident that it is practically impossible to establish any relation between the quantity of water applied to the land either by irrigation or rainfall and the amount of return seepage for any particular season. The rate of flow of water through the underlying sand and gravel is very slow and tends to equalize the amount of seepage during wet and dry seasons.

## UNCOMPAHGRE RIVER.

The measurements were abandoned at Ouray, Montrose county line, in October, 1908, on account of a heavy snow and rain in the mountains, which changed conditions so that the measurement could not again be taken up and accurate results obtained.

## SEEPAGE MEASUREMENTS ON THE ARKANSAS RIVER.

October and November, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Buena Vista.....		290.8				
Nathrop.....	8	383.5	47.83		44.87	44.87
Nathrop.....		364.1				
Salida.....	18	469.1	65.72	14.73	54.01	98.88
Salida.....		473.7				
Howard.....	12	552.6	79.00	2.21	2.11	100.99
Howard.....		542.6				
Texas Creek.....	19	566.9	31.33	2.91	— 4.12	96.87
Canon City.....	24	567.7	43.00	51.11	8.90	105.77
Canon City.....		555.2				
One mile below Castle Rock.....	9	549.1	64.68	50.61	— 20.17	85.60
Beaver Station.....	10	496.6	33.09	47.17	— 38.42	47.18
Beaver Station.....		549.3				
Below headgate Bessemer Canal...	14	380.0	4.20	148.56	— 24.94	22.24
Below headgate Bessemer Canal...		309.1				
Victoria Ave. bridge, Pueblo.....	10	358.2	36.54	26.31	38.87	61.11
Victoria Ave. bridge, Pueblo.....		370.3				
State bridge at Vineland or Nyberg	10	423.8	74.54	2.94	— 18.10	43.01
State bridge at Vineland or Nyberg		458.3				
Boone.....	14	411.12	0.00	110.97	63.79	106.80
Boone.....		379.2				
Nepesta.....	10	275.8	35.79	112.10	— 27.09	79.71
Fowler one and one-half miles below						
H. G. Otero Canal.....	9	279.5	2.51	4.99	6.18	85.89
Fowler one and one-half miles below						
H. G. Otero Canal.....	9	396.3				
Manzanola.....	11	337.6	4.99	139.17	75.48	161.37
Below Ft. Lyon's Supply Ditch....	4	0.75	0.00	360.54	23.69	185.06
Rocky Ford lower bridge.....	9	111.2	60.76	0.00	49.69	234.75
Rocky Ford lower bridge.....		118.9				
Below Ft. Lyons Canal.....	9	2.13	108.30	255.95	30.88	265.63
La Junta lower bridge.....	3	102.4	80.80	2.00	21.47	287.10
La Junta lower bridge.....		97.8				
Robinson or Axtell or Hadley.....	9½	121.58	0.00	0.00	23.78	310.88

# SEEPAGE MEASUREMENTS ON THE ARKANSAS RIVER. Concluded.

October and November, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Las Animas below bridge.....	10	108.64	0.00	40.10	27.16	338.04
Las Animas below bridge.....		170.2				
Caddoa below bridge.....	16	199.6	25.20	0.00	4.20	342.24
Prowers below bridge.....	11½	162.36	0.00	48.32	11.08	353.32
Prowers below bridge.....		141.44				
Lamar.....	9	8.66	Estimated		7.00	360.32
Lamar.....		43.49				
Morse.....	6	80.55	13.16	0.00	23.90	384.22
Carlton.....	6½	92.25	3.30	32.39	40.79	425.01
Granada bridge.....	7	99.89	0.00	3.81	11.45	436.46
Holly.....	11½	163.91	73.35	0.00	— 9.33	427.13
Colorada-Kansas state line.....	4½	161.52	9.29	10.00	— 1.68	425.45

## SEEPAGE MEASUREMENTS ON THE ARKANSAS RIVER.

October and November, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Canon City.....		201				
Castle Rock.....	8	264	46.9	46.7	64.8	64.8
Portland.....	7.5	177	9.4	50.8	— 45.6	19.2
Beaver Station.....	3.5	189	1.5	0.0	10.5	29.7
Beaver Station.....		284				
Below headgate Bessemer Canal...	14	303	0.7	4.6	22.9	52.6
Below headgate Bessemer Canal...		283				
Victoria Ave. bridge, Pueblo.....	10	*284	0.0	12.4	13.4	66.0
Victoria Ave. bridge, Pueblo.....		181				
State bridge at Vineland or Nyberg	10	282	75.6	9.0	34.4	100.4
Boone.....	14	355	37.1	0.0	35.9	136.3
Nepesta.....	10	181	0.5	141.0	— 33.5	102.8
Nepesta.....		294				
Fowler.....	9	279	0.9	0.0	— 15.9	86.9
Manzanola.....	11	197	0.0	93.8	11.8	98.7
Rocky Ford R. R. bridge.....	13	201	9.6	17.3	11.7	110.4
Below Ft. Lyons Canal.....	9	000	64.7	240.5	— 25.2	85.2
La Junta.....	3	27	20.4	0.0	6.6	91.8
Robinson or Hadley.....	9.5	45	0.0	0.0	18.0	109.8
Riverdale.....	4.5	21	0.0	26.1	2.1	111.9
Riverdale.....		47				
Las Animas.....	5.5	70	0.0	15.3	38.3	150.2
Las Animas.....		74				
Caddoa above bridge.....	16	130	53.6	0.0	2.4	152.6
Prowers above bridge.....	11.5	149	0.3	0.0	19.3	171.9
Prowers above bridge.....		164				
Lamar above bridge.....	9	57	0.00	157.0	50.0	221.9
Lamar above bridge.....		53				
Morse at bridge.....	6	92	1.4	2.8	40.4	262.3
Carlton or Grote.....	6.5	108	4.4	0.0	11.6	273.9
Granada below bridge.....	7	123	0.0	3.0	18.0	291.9

\*Bessemer canal turned water in at 1:00 P. M. This shows in measurement at Pueblo on the following morning



## COMPARATIVE TABLE.

Showing Increase in Volume of the Arkansas River, by Sections, Due to the Return of Seepage Waters, as Published in the Biennial Reports of the State Engineer.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	NOVEMBER	SEPTEMBER	OCTOBER		NOVEMBER		OCTOBER		OCTOBER		OCTOBER	
		†1897 SECTION GAIN OR LOSS	†1898 SECTION GAIN OR LOSS	NOVEMBER 1903 SECTION GAIN OR LOSS	NOVEMBER 1905 SECTION GAIN OR LOSS	1906 SECTION GAIN OR LOSS	NOVEMBER 1907 SECTION GAIN OR LOSS	NOVEMBER 1908 SECTION GAIN OR LOSS					
Buena Vista													
Nathrop	8			5.98	42.34						44.87		
Browns Station	10			42.65	12.26								
Salida	8			9.68	25.87						54.01		
Howard	12			49.57	— 0.36						2.11		
Cotopaxi	11.5												
Texas Creek	7.5			5.69	21.41						4.12		From
Canon City	24			2.37	5.29						8.90		Canon City
Castle Rock	8			43.11									64.8
One mile below Castle Rock	1										20.17		
Florence Hot Springs				24.59									
Portland	6.5												45.6
Beaver Station	3.5	From	From	11.35							38.42		10.5
Swallows Station	8	Canon City	Canon City	20.36									
Bessemer Canal	6	54.4	55.2	20.24							24.94		22.9
Pueblo	10	— 42.2	— 16.0	21.64							38.87		13.4
Orchard Grove	8	— 9.4	19.4	37.77									

Vineland or Nyberg.....	2				15.79			18.10		34.4
Boone.....	14	*103.5	20.3		3.34			63.79		35.9
Nepesta.....	10	40.4	—	17.6	13.17			—	27.09	—
Otero Dam.....	7.5	—	5.8	—	20.08					—
Fowler.....	1.5							6.18		—
Apishapa Creek.....	5	16.9	18.2							—
Jones Point.....					18.37					—
Manzanola.....	6							75.48		11.8
Holbrook or Lake Canal.....	3.5				1.21					—
Ft. Lyons Supply Ditch.....	0.5						From	23.69		—
Rocky Ford.....	9	30.6	21.2		25.85		Ft. Lyons	49.69		11.7
Below Ft. Lyons Canal.....	9	35.6	22.4		13.42		Dam	39.88		—
La Junta.....	3	13.0	8.2		6.04			9.87		6.6
Robinson or Hadley.....	9.5							17.04		18.0
Las Animas Consolidated or Jones Canal.....	3	10.8	14.8		15.03					—
Riverdale.....	1.5									2.1
Las Animas.....	5.5	28.5	20.1	—	3.05			27.30	27.16	38.3
Hilton bridge below Ft. Lyon.....	6	38.1	13.3		15.09					—
One mile below Hilton.....	1							20.76		—
Caddoa.....	9	3.6	—	0.2	2.28			5.44	4.20	2.4
Colorado-Kansas canal dam.....	6							11.93		—
Prowers.....	5.5							8.46	11.08	19.3
Amity waste.....	1		—	6.6	—	12.31				—
Lamar.....	8			6.7	6.75			—	0.40	50.0
Morse.....	6							12.16	23.90	40.4

## COMPARATIVE TABLE.—Concluded.

Showing Increase in Volume of the Arkansas River, by Sections, Due to the Return of Seepage Waters, as Published in the Biennial Reports of the State Engineer.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	NOVEMBER	SEPTEMBER	OCTOBER	NOVEMBER	OCTOBER	OCTOBER	OCTOBER
		†1897 SECTION GAIN OR LOSS	†1898 SECTION GAIN OR LOSS	NOVEMBER 1903 SECTION GAIN OR LOSS	NOVEMBER 1905 SECTION GAIN OR LOSS	1906 SECTION GAIN OR LOSS	NOVEMBER 1907 SECTION GAIN OR LOSS	NOVEMBER 1908 SECTION GAIN OR LOSS
Carlton or Grote,	6.5	From				15.60	40.79	11.6
Granada	7	Lamar				4.13	11.45	18.0
Holly	11.5	13.2	14.2			6.84	9.33	
Colorado-Kansas state line	4.5						1.68	
Coolidge, Kansas	2.5		0.0					

†From U. S. G. S. Water Supply paper No. 74.

\*Unreliable.

‡Estimated.

## SEEPAGE MEASUREMENTS ON BEAR CREEK.

September, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN CREEK	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Morrison.....		20.7				
Below Pioneer Union ditch.....	3	1.4	0.2	20.6	1.1	1.1
Jefferson-Arapahoe county line....	4½	3.5	0.0	11.2	13.3	14.4
Jefferson-Arapahoe county line....		3.7				
At mouth.....	3	2.5	0.0	8.6	7.4	21.8

September, 1908.

Morrison.....		30.7				
Below Pioneer Union ditch.....	3	11.1	0.3	18.4	— 1.5	— 1.5
Jefferson-Arapahoe county line....	4½	3.4	0.0	19.6	11.9	10.4
At mouth.....	3	1.8	0.0	5.2	3.6	14.0

## SEEPAGE MEASUREMENTS ON CLEAR CREEK.

September, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN CREEK	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Mouth of canon, three-fourths mile above Golden.....		46.2				
Below Rocky Mountain ditch.....	3	24.8	35.2	62.1	5.5	5.5
Mt. Olivet station, head of slough	3	14.7	0.0	14.4	4.3	9.8
Mt. Olivet station, head of slough		19.7				
Arvada, mouth of slough.....	3	18.3	5.9	7.6	0.3	10.1
Arvada, mouth of slough.....		11.1				
Clear Creek and Platte River ditch	5	0.0	2.3	14.3	0.9	11.0
Mouth at Brighton bridge.....	3	0.9	0.0	0.0	0.9	11.9

## SEEPAGE MEASUREMENTS ON BIG THOMPSON CREEK.

October, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN CREEK	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Home Supply Dam.....		74.6				
Below Barnes ditch.....	5	4.4	9.4	83.4	3.8	3.8
Below Greeley and Loveland canal	3	0.0	0.0	8.2	3.8	7.6
Lytle bridge.....	8	15.4	6.5	3.4	12.3	19.9
Below Hill and Brush ditch.....	5	21.2	0.0	1.6	7.4	27.3
Below Big Thompson and Platte Valley ditch.....	5	25.5	0.0	0.0	4.3	31.6
Below Evans town ditch or St. Louis Colony ditch No. 1.....	8	48.9	11.4	0.0	12.0	43.6

## SEEPAGE MEASUREMENTS ON BIG THOMPSON CREEK.

November, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN CREEK	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Home Supply dam.....		45.2				
Below Barnes ditch.....	5	15.8	4.7	40.4	6.3	6.3
Below Greeley and Loveland canal	3	0.0	0.0	17.8	2.0	8.3
Lytle bridge.....	8	21.0	12.1	3.6	12.5	20.8
Lytle bridge.....		17.5				
Below Hill and Brush ditch.....	5	22.4	0.4	0.2	4.7	25.5
Below Big Thompson and Platte Valley ditch.....	5	26.7	0.2	0.7	4.8	30.3
Below Evans town ditch or St. Louis Colony ditch No. 1.....	8	53.2	16.9	1.4	11.0	41.3



## SEEPAGE MEASUREMENTS ON BOULDER CREEK.

September, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN CREEK	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Gaging station.....		56.7				
Valmont.....	6	23.8	5.2	41.4	3.3	3.3
Valmont.....		10.6				
Boulder-Weld county line.....	8	3.9	7.6	20.9	6.6	9.9
At mouth.....	4½	2.6	2.2	0.0	0.9	10.8

October, 1908.

Gaging station.....		19.0				
Valmont.....	6	14.6	4.2	9.7	1.1	1.1
Boulder-Weld county line.....	8	3.5	3.5	14.4	— 0.2	0.9
At mouth.....	4½	1.4	0.0	3.2	1.1	2.0

## SEEPAGE MEASUREMENTS ON THE CACHE LA POUDE RIVER.

October, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Gaging station in canon .....		117				
Below New Mercer ditch.....	7	60.4	5.2	67.3	5.5	5.5
Below Larimer and Weld canal....	3	43.6	16.6	45.2	11.8	17.3
Below Reservoir No. 2 Supply ditch	4½	18.6	3.8	44.5	15.7	33.0
Strauss bridge.....	5	42.2	0.0	0.0	23.6	56.6
Below Cache la Poudre canal No. 2	2½	37.9	0.0	0.5	— 3.8	52.8
Below Eaton ditch.....	3	32.5	0.0	15.4	10.0	62.8
Below Jones ditch.....	7½	62.5	15.4	0.0	14.6	77.4
Below Greeley pump house.....	5	110.0	0.0	0.0	47.5	124.9
Below Ogilvey ditch.....	2½	127	3.5	0.0	13.5	138.4

## SEEPAGE MEASUREMENTS ON THE CACHE LA POUFRE RIVER.

November, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Gaging station in canon .....		106.36				
Larimer county ditch.....	4	11.33	0.00	89.26	5.77	5.77
Larimer county ditch.....		21.80				
New Mercer ditch.....	3	32.80	0.00	0.00	11.00	5.23
Larimer and Weld canal.....	3	34.80	0.00	1.21	3.21	8.44
No. 2 Reservoir Supply ditch .....	4.5	17.70	13.87	43.40	12.43	20.87
No. 2 Reservoir Supply ditch .....		31.00				
Inlet to Fossil Creek reservoir .....	3	0.60	0.00	56.70	26.30	47.17
Strauss bridge.....	2	4.70	0.00	0.00	4.10	51.27
Cache la Poudre No. 2 canal .....	2.5	9.76	0.00	0.00	5.06	56.33
Eaton ditch.....	3	15.07	0.00	1.90	7.21	63.54
Eaton ditch.....		13.47				
Jones ditch.....	7.5	42.96	6.21	0.00	23.28	86.82
Greeley pump house.....	5	73.50	0.00	2.78	33.32	120.14
Ogilvey ditch.....	2.5	103.20	8.03	3.74	25.41	145.55
Ogilvey ditch.....		104.90				
Gaging station at mouth.....	3.5	128.60	3.74	0.00	19.96	165.51

NOTE.—Larimer County ditch on Nov. 7th, at 11 A. M., took from river 60 second feet of water and at 4:00 P. M. returned 10 second feet for use of Ft. Collins sugar factory via Lake Canal. This water shows in river measurement of Nov. 8th at Larimer County ditch. The Ft. Collins sugar factory on Nov. 8th was using water from its reserve reservoir.

Larimer County ditch at 9:00 P. M. on Nov. 8th returned 50 second feet of water to river for Ft. Collins mill. A portion of this water was taken out by Ft. Collins sugar factory via Lake Canal to refill reservoir, part taken out by No. 2 Reservoir Supply ditch, and the river measurement on morning of Nov. 9th at No. 2 Reservoir Supply ditch shows an increase of 13 second feet.

## SEEPAGE MEASUREMENTS ON DRY CREEK.

September, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN CREEK	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Headgate.....		0.5				
At mouth.....	7½	2.2	0.0	1.4	3.1	3.1

October, 1908.

Headgate.....		0.8				
At mouth.....	7½	1.7	0.0	1.8	2.7	2.7

## SEEPAGE MEASUREMENTS ON THE RIO CONEJOS.

October, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
U. S. G. S. gaging station.....		103.20				
San Juan bridge.....	6	62.90	0.34	30.14	— 10.50	— 10.50
San Juan bridge.....		61.90				
Conejos bridge.....	6	53.80	0.46	22.89	14.33	3.83
Conejos bridge.....		49.00				
Cerritos bridge.....	10	11.46	0.00	26.01	— 11.53	— 7.70
Cerritos bridge.....		10.78				
Below mouth of Rio San Antonio..	5	22.59	12.92	0.75	— 0.36	— 8.06
Sanford bridge.....	7	31.66	0.00	0.00	9.07	1.01
Sanford bridge.....		31.75				
Below McIntire Springs.....	5	57.12	19.59	0.00	5.78	6.79
Mouth.....	7	54.38	0.10	6.48	3.64	10.43

## SEEPAGE MEASUREMENTS ON THE RIO CONEJOS.

October, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
U. S. G. S. gaging station .....		98.1				
San Juan bridge.....	6	73.1	0.0	16.3	— 8.7	— 8.7
Conejos bridge.....	6	23.8	0.0	48.0	— 1.3	— 10.0
Cerritos bridge.....	10	5.3	4.0	20.0	— 2.4	— 12.4
Cerritos bridge.....		5.0				
Below mouth of Rio San Antonio ..	5	4.6	6.1	4.9	— 1.6	— 14.0
Sanford bridge.....	7	14.9	0.0	0.0	10.3	— 3.7
Below McIntire Springs.....	5	42.3	19.6	0.0	7.7	4.0
Mouth.....	7	36.9	0.0	8.1	2.7	6.7

## SEEPAGE MEASUREMENTS ON THE RIO GRANDE.

October, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Granger Station.....		671				
Del Norte.....	11	572.10	21.05	146.77	26.82	26.82
Del Norte.....		465.90				
Seven mile bridge, one-fourth mile above Prairie Canal.....	7	442.40	0.00	32.89	9.39	36.21
Seven mile bridge, one-fourth mile above Prairie Canal .....		426.60				
Monte Vista.....	8	392.90	0.00	51.95	18.25	54.46
Monte Vista.....		379.10				
County line bridge.....	7	375.00	0.00	17.64	13.54	68.00
County line bridge .....		376.20				
Alamosa.....	11	383.20	0.00	1.96	8.96	76.96
Alamosa.....		381.70				
Below Meadow overflow ditch.....	5	394.20	0.70	0.47	11.97	88.93
Above mouth of Rio Conejos .....	12	490.50	64.60	0.00	31.70	120.63

## SEEPAGE MEASUREMENTS ON THE RIO GRANDE.

September and October, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Granger Station.....		383				
U. S. G. S. Cable Gaging Station ..	6	413	3.0	4.9	31.9	31.9
Del Norte.....	5	305	4.8	126.4	13.6	45.5
Seven mile bridge, one-fourth mile above Prairie Canal.....	7	248	0.0	31.2	— 25.8	19.7
Seven mile bridge, one-fourth mile above Prairie Canal.....		250				
Monte Vista.....	8	181	0.0	67.0	— 2.0	17.7
County line bridge.....	7	131	0.0	57.7	7.7	25.4
Alamosa.....	11	132	0.0	0.0	1.0	26.4
Below Meadow overflow ditch.....	5	136	0.5	0.0	4.0	30.4
Above mouth of Rio Conejos.....	12	157	21.2	0.0	— 0.2	30.2
Above mouth of Rio Conejos.....		176				
La Sauces.....	3	203	36.2	0.0	— 9.2	21.0
State bridge above Colorado-New Mexico line.....	14	236	13.4	0.0	19.6	40.6

## SEEPAGE MEASUREMENTS ON SOUTH BOULDER CREEK.

September, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN CREEK	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Gaging Station.....		19.4				
Dry Creek.....	4	8.4	2.7	7.7	— 6.0	— 6.0
At mouth.....	5½	0.3	0.0	7.8	— 0.3	— 6.3

October, 1908.

Gaging Station.....		3.8				
Dry Creek.....	4	1.3	0.4	4.1	1.2	1.2
Dry Creek.....		1.9				
At mouth.....	5½	0.5	0.0	1.9	0.5	1.7



## SEEPAGE MEASUREMENTS ON THE SOUTH PLATTE RIVER.

October and November, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Waste gate Northern Colo. Irr. Co.'s ditch.....		27.0				
Below Last Chance ditch.....	3	30.3	0.7	14.7	17.3	17.3
Haworth bridge.....	3	29.7	0.0	10.8	10.2	27.5
Littleton.....	6	66.9	16.7	0.0	20.5	48.0
Petersburg.....	3	23.0	14.0	76.8	18.9	66.9
Denver, 16th st. viaduct.....	7	136	88.1	0.7	25.6	92.5
Below Burlington ditch.....	4	50.4	48.0	135.9	2.3	94.8
Below Fulton dam.....	7	82.7	4.2	0.3	28.4	123.2
Brighton, lower bridge.....	7	138.2	3.5	8.5	60.5	183.7
Below Platteville dam.....	8	168	4.8	9.3	34.3	218.0
Platteville.....	8	144	0.0	65.7	41.7	259.7
Platteville.....		149				
Above mouth of St. Vrain Creek..	4	166	0.0	0.0	17.0	276.7
Below waste gate of Union ditch....	5	278	91.0	8.4	29.4	306.1
Evans, lower bridge.....	7½	400	69.7	0.0	52.3	358.4
Above mouth of Cache la Poudre river.....	3	463	0.0	0.0	63.0	421.4
Kersey bridge.....	3	764	175.0	0.0	126.0	547.4
Hardin.....	10	662	0.0	95.7	6.3	541.1
Below Putnam ditch.....	12	344	0.0	342.0	24.0	565.1
Orchard.....	8½	397	0.0	0.0	53.0	618.1
Weldon.....	9	240	0.0	178.0	21.0	639.1
Fort Morgan.....	9	255	20.7	49.9	44.2	683.3
Snyder.....	11	265	0.0	90.1	100.1	783.4
Balzac.....	7	324	15.7	6.6	49.9	833.3
Merino.....	11	318	0.0	53.8	47.8	881.1
Sterling.....	13½	277	6.1	74.2	27.1	908.2
Hill.....	11½	313	2.0	35.5	69.5	977.7
Crook.....	17	325	0.0	7.4	19.4	997.1
Sedgwick.....	15	356	0.0	0.0	31.0	1,028.1
Julienburg.....	15	373	5.6	0.0	11.4	1,039.5

## SEEPAGE MEASUREMENTS ON THE SOUTH PLATTE RIVER.

October and November, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Above Denver Water Co.'s pipe intake.....		119.00				
Below Denver Water Co.'s pipe intake.....		97.00				
Below waste gate of Northern Colo. Irr. Co.'s ditch.....	2	63.00	0.00	34.29	0.29	
Below waste gate of Northern Colo. Irr. Co.'s ditch.....		98.20				
Below Last Chance ditch.....	3	98.60	0.20	16.48	16.68	16.97
Haworth bridge.....	3	68.00	0.00	37.75	7.15	24.12
Haworth bridge.....		56.80				
Littleton.....	6	84.20	11.48	14.43	30.35	54.47
Petersburg.....	3	111.30	8.63	7.44	25.91	80.38
Petersburg.....		106.50				
Denver, 16th st. viaduct.....	7	133.50	23.30	17.61	21.31	101.69
Denver, 16th st. viaduct.....		125.30				
Below Burlington ditch.....	4	172.90	28.80	7.66	26.46	128.15
Below Burlington ditch.....		169.30				
Below Fulton dam.....	7	85.10	1.87	116.80	30.73	158.88
Brighton, lower bridge.....	7	69.80	0.00	67.76	52.46	211.34
Brighton, lower bridge.....		54.60				
Below Platteville ditch, dam.....	8	85.70	26.74	32.51	36.87	248.21
Platteville.....	8	25.70	0.00	94.34	34.34	282.55
Platteville.....		24.20				
Above mouth of St. Vrain Creek ..	4	40.80	0.00	5.46	22.06	304.61
Below waste gate of Union ditch..	5	108.40	58.00	9.62	19.22	323.83
Below waste gate of Union ditch..		175.60				
Evans, lower bridge.....	7½	342.50	120.50	12.94	59.34	383.17
Evans, lower bridge.....		311.60				
Above mouth of Cache la Poudre river.....	3	363.80	0.00	6.33	58.53	441.70
Kersey bridge.....	3	602.60	202.20	8.40	45.00	486.70
Kersey bridge.....		572.60				
Hardin.....	10	464.20	0.20	154.81	46.21	532.91
Hardin.....		444.10				

# SEEPAGE MEASUREMENTS ON THE SOUTH PLATTE RIVER—Concluded.

October and November, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Below Putnam ditch.....	12	188.80	0.00	290.55	35.25	568.16
Orchard.....	8½	243.90	0.00	25.92	81.02	649.18
Orchard.....		219.30				
Weldona.....	9	60.90	0.00	207.60	49.20	698.38
Weldona.....		57.80				
Fort Morgan.....	9	99.20	26.62	36.77	51.55	749.93
Fort Morgan.....		95.70				
Snyder.....	11	66.70	0.00	119.51	90.51	840.44
Snyder.....		61.60				
Balzac.....	7	121.40	4.35	0.00	55.45	895.89
Merino.....	11	53.30	0.00	107.55	39.45	935.34

October and November, 1908.

Merino.....		53.20				
Sterling.....	13¼	120.40	22.00	39.06	84.26	1,019.60
Iliiff.....	11¼	90.30	0.00	82.81	52.71	1,072.31
Iliiff.....		87.90				
Crook.....	17	67.60	0.00	67.90	47.60	1,119.91
Crook.....		66.50				
Sedgwick.....	15	100.40	0.00	1.47	35.37	1,155.28
Julesburg.....	15	169.30	27.30	0.00	41.60	1,196.88

## SEEPAGE MEASUREMENTS ON ST. VRAIN CREEK.

September and October, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN CREEK	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Lyons, gaging station .....		52.0				
Below Oligarchy ditch .....	3	11.8	0.0	48.1	7.9	7.9
Below Niwot ditch .....	3	6.5	0.0	5.7	0.4	8.3
Below Niwot ditch .....		18.9				
Boulder-Weld county line .....	6	45.3	24.8	10.9	12.5	20.8
Boulder-Weld county line .....		41.7				
Below Boulder creek .....	3	77.1	27.1	0.4	8.7	29.5
Fleming bridge .....	5½	102	7.7	5.1	22.3	51.8
At mouth .....	6½	102	0.0	0.0	0.0	51.8

## SEEPAGE MEASUREMENTS ON ST. VRAIN CREEK.

October, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN CREEK	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Lyons, gaging station .....		33.3				
Below Oligarchy ditch .....	3	30.7	0.0	11.8	9.2	9.2
Below Niwot ditch .....	3	15.1	0.0	17.2	1.6	10.8
Below Niwot ditch .....		21.5				
Boulder-Weld county line .....	6	67.6	34.0	1.7	13.8	24.6
Below Boulder creek .....	3	88.9	17.0	0.0	4.3	28.9
Below Boulder creek .....		81.0				
Fleming bridge .....	5½	101.0	1.9	0.0	18.1	47.0
Mouth .....	6½	108.0	0.0	0.0	7.0	54.0

## SEEPAGE MEASUREMENTS ON THE UNCOMPAHGRE RIVER.

October and November, 1907.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Bachelor switch.....		56.75				
Eleventh Correction line.....	6	45.83	3.24	9.26	4.90	4.90
Ridgway.....	4	68.36	13.65	0.00	8.88	3.98
Seven miles below Ridgway or be- low Cow creek.....	7	94.06	23.99	1.01	2.72	6.70
Seven miles below Ridgway or be- low Cow creek.....		95.50				
Ouray-Montrose county line.....	5	97.28	0.84	12.30	13.24	19.94
Ouray-Montrose county line.....		98.28				
Stark's bridge.....	7	38.04	1.36	70.38	8.78	28.72
Stark's bridge.....		37.54				
Montrose.....	5	22.19	0.33	11.49	4.19	24.53
Montrose.....		38.59				
Olathe.....	13	57.79	29.76	51.32	40.76	65.29
Delta.....	12	103.99	44.30	36.86	38.76	104.05

## SEEPAGE MEASUREMENTS ON THE UNCOMPAHGRE RIVER.

October, 1908.

PLACE WHERE MEASUREMENTS WERE TAKEN	DISTANCE IN MILES	AMOUNT IN RIVER	SECTION		SECTION GAIN OR LOSS	TOTAL GAIN OR LOSS
			INFLOW	OUTTAKE		
Bachelor switch.....		45.00				
Eleventh Correction line.....	6	40.41	2.68	7.40	0.13	0.13
Eleventh Correction line.....		40.91				
Ridgway.....	4	52.05	8.69	0.00	2.45	2.58
Ridgway.....		52.50				
Ouray-Montrose county line.....	12	84.33	24.40	10.64	18.07	20.65



## CHAPTER VII.

## STREAM MEASUREMENTS.

This office has maintained gaging stations on the following streams:

- Boulder creek at Boulder.
- South Boulder creek at Eldorado Springs.
- St. Vrain creek at Lyons.
- Big Thompson creek near Arkins.
- South Platte river at Denver.

In addition to this work, this office has kept up gaging stations on the South Platte river at Henderson, Fort Lupton and Union; on the Arkansas river at Pueblo and La Junta; on the Purgatoire at Higbee, for the aid of water commissioners in the distribution of water.

This department has co-operated with the United States Geological Survey, by paying the observers and part of the expenses of gagings at the following stations:

- Arkansas river at Canon City.
- Arkansas river at Holly.
- Arkansas river at Pueblo.
- Clear creek at Forkscreek.
- Conejos river at Mogote.
- Cucharas river at Walsenburg.
- Grand river at Palisades.
- Grand river at Kremmling.
- Grape creek, near mouth, at Canon City.
- Purgatoire river at Trinidad.
- Rio Grande at Del Norte.
- Rio Grande near Lobatos.
- South fork South Platte river at South Platte.
- South Platte river at South Platte.
- South Platte river at Julesburg.
- South Platte river at Kersey.

The expenses paid for gagings at the above stations by this office during the past two years amounted to \$129.41; the amount paid to the observers amounted to \$562.14, making a total of \$691.55.

The great increase in the number of reservoirs and power propositions built during the past few years makes it desirable that the flow of streams be obtained in winter as well as during the irrigation season. The practice during the past years has been to commence observations in April and continue until

November. This leaves several months in which there is nothing certain regarding the flow.

Greater accuracy could be obtained at some stations by installing cables across the streams where the bridges, used for gagings at high water, are located at poor sections.

Co-operation with the United States Geological Survey is desirable for obtaining the best results in this work, as it prevents a duplication of results, and the field can be covered in a more systematic manner. The waters of Colorado are one of our chief assets. Mines may be worked out, but the waters continue to flow year after year. A knowledge of the available water supply is of great value to investors in irrigation and power enterprises. The desired information can only be obtained by actual measurements and observations. The scope of this work should be enlarged upon and money appropriated by the Legislature for this purpose.



CONVICTS AT WORK ON ROAD NEAR TRINIDAD, COLORADO.



REINFORCED CONCRETE CULVERT UNDER STATE WAGON ROAD.  
BUILT BY CONVICTS.



## ARKANSAS RIVER DRAINAGE.

## DAILY MEAN GAGE HEIGHT.

Arkansas River at Oxford Farmers' Dam, for 1907, from Reports  
of Irrigation Division Engineer, Division No. 2.

DAY	MAY Gage Height	JUNE Gage Height	JULY Gage Height	AUG. Gage Height	SEPT. Gage Height
1.....		1.10	2.20	1.50	.90
2.....	.50	.....	2.30	1.50	1.00
3.....	.50	1.10	.....	1.70	.90
4.....	.60	1.50	2.00	2.00	.80
5.....	.60	1.50	1.80	1.50	.80
6.....	.60	1.70	2.00	1.40	.80
7.....	.80	1.60	2.00	1.00	.80
8.....	.90	1.50	1.70	1.00	.70
9.....	.80	1.50	1.80	.70	.70
10.....	.80	1.50	1.80	1.10	.....
11.....	.70	1.30	1.70	1.00	.70
12.....	.70	1.20	.....	1.00	.70
13.....	.80	1.10	1.50	1.00	.....
14.....	.90	1.40	1.50	.80	.60
15.....	.90	1.50	1.80	.90	.60
16.....	.90	1.50	1.50	.90	.80
17.....	.80	1.30	1.30	.90	.70
18.....	.80	2.20	1.20	.80	.70
19.....	.90	1.80	1.10	.70	.70
20.....	.90	1.70	1.10	.80	.70
21.....	1.00	1.50	1.30	.80	.70
22.....	1.30	1.50	1.40	.80	.70
23.....	1.20	1.50	1.30	.80	.70
24.....	1.20	1.60	1.10	.70	.70
25.....	1.50	1.50	1.10	.70	.70
26.....	1.10	1.50	1.80	.70	.70
27.....	1.10	1.80	1.70	.80	.70
28.....	1.00	1.80	2.80	.90	.....
29.....	1.00	1.90	2.00	.90	.70
30.....	1.10	2.00	2.70	.90	.....
31.....	1.50	.....	1.50	.90	.....



## DAILY MEAN GAGE HEIGHT.

Arkansas River at Oxford Farmers' Dam, for 1908, from Reports  
of Irrigation Division Engineer, Division No. 2.

DAY	MAY Gage Height	JUNE Gage Height	JULY Gage Height	AUG. Gage Height	SEPT. Gage Height
1.....	.40	.70	1.00	1.30	.60
2.....	.40	.70	1.00	1.00	.50
3.....		.70	.80	.80	.50
4.....	.40	.60	.70	.80	.50
5.....	.40	.95	.70	.70	.50
6.....	.40	.95	.90	.70	.50
7.....		.90	.90	.70	.40
8.....	.30	.90	.80	.80	
9.....	.30	.90	.90	.60	.40
10.....	.30	.80	.80	.50	.40
11.....	.40	1.10	.80	.50	.40
12.....	.40	1.20	1.00	.70	.20
13.....	.40	1.30	1.00	.50	.20
14.....	.40	1.15	.60	.60	.20
15.....	.40	1.30	.90	.50	1.30
16.....	.50	1.00	1.20	.50	.40
17.....	.50	1.20	1.00	.90	.50
18.....	.20	1.30	.90	.70	.40
19.....	.40	1.20	1.20	1.20	.40
20.....	.40	1.10	1.00	.70	.40
21.....	.50	1.00	1.00	1.00	.40
22.....	.80	.90	.80	1.20	.40
23.....	.80	1.00	.80		.30
24.....	.90	1.00	.80	.80	.30
25.....	.80	1.00	.70	.80	.40
26.....	.70	1.10			.40
27.....	.80	1.00	.60		.40
28.....	.80	1.00	.50	.80	.50
29.....	.80	1.10	.50	.60	.50
30.....	.70	1.00	.50	.60	.40
31.....	.60		.80		

# ARKANSAS RIVER DISCHARGES AT FORT LYON CANAL DAM.

For the Year 1907.

MONTH	Carried by Canal Acre-feet	Amount Passing Acre-feet	Total Acre-feet
January.....	21,204	7,200	28,404
February.....	2,002	.....	2,002
March.....	8,134	520	8,654
April.....	9,302	.....	9,302
May.....	27,214	12,080	39,294
June.....	66,386	.....	66,386
July.....	62,134	.....	62,134
August.....	25,516	7,020	32,536
September.....	15,526	2,300	17,826
October.....	13,234	3,720	16,954
November.....	7,960	1,550	9,510
December.....	6,128	5,050	11,178
TOTALS.....	264,740	39,440	304,180

The above record was furnished by Sam G. Porter, Chief Engineer of the Arkansas Valley S. B. & I. L. Co., Holly, Colo.

# ARKANSAS RIVER DISCHARGES AT FORT LYON CANAL DAM.

For the Year 1908.

MONTH	Carried by Canal Acre-feet	Amount Passing Acre-feet	Total Acre-feet
January .....	2,736	8,000	10,736
February .....	6,760	1,050	7,810
March .....	8,860	.....	8,860
April .....	2,296	1,160	3,456
May .....	5,502	1,610	7,112
June .....	21,076	15,288	36,364
July .....	23,508	10,720	34,228
August .....	31,118	5,200	36,318
September .....	4,746	1,050	5,796
October .....	11,084	5,000	16,084
November .....	13,094	5,970	19,064
TOTALS .....	130,780	55,048	185,828

The above record was furnished by Sam G. Porter, Chief Engineer of the Arkansas Valley S. B. & I. L. Co., Holly, Colo.

## ARKANSAS RIVER DISCHARGES AT AMITY CANAL DAM.

For the Year 1907.

MONTH	Carried by Canal Acre-feet	Amount Passing Acre-feet	Total Acre-feet
January.....	100	17,645	17,745
February.....	12,261	7,610	19,871
March.....	2,239	1,170	3,409
April.....	1,919	4,460	6,379
May.....	17,056	11,154	28,210
June.....	26,830	50,942	77,772
July.....	28,118	100,746	128,864
August.....	24,584	17,692	42,276
September.....	8,952	10,152	19,104
October.....	17,500	1,740	19,240
November.....	13,594	2,408	16,002
December.....	19,422	8,794	28,216
TOTALS.....	172,575	234,513	407,088

The above record was furnished by Sam G. Porter, Chief Engineer of the Arkansas Valley S. B. & I. L. Co., Holly, Colo.

## ARKANSAS RIVER DISCHARGES AT AMITY CANAL DAM.

For the Year 1908.

MONTH	Carried by Canal Acre-feet	Amount Passing Acre-feet	Total Acre-feet
January.....	3,309	25,444	28,753
February.....	10,096	8,278	18,374
March.....	5,796	2,304	8,100
April.....		964	964
May.....	316	1,516	1,832
June.....	14,176	16,736	30,912
July.....	20,100	20,498	40,598
August.....	19,180	48,278	67,458
September.....	4,412	1,754	6,166
October.....		141,762	141,762
November.....	7,000	5,742	12,742
TOTALS.....	84,385	273,276	357,661

The above record was furnished by Sam G. Porter, Chief Engineer of the Arkansas Valley S. B. & I. L. Co., Holly, Colo.



## DAILY MEAN GAGE HEIGHT.

Purgatoire River at Higbee, for 1907, from Reports of Irrigation  
Division Engineer, Division No. 2.

DAY	MAY Gage Height	JUNE Gage Height	JULY Gage Height	AUG. Gage Height	SEPT. Gage Height
1.....	.20	4.50	.....	1.50	.90
2.....	.20	.....	1.75	.....	.80
3.....	.20	.....	.70	1.00	.70
4.....	.20	.....	.....	1.00	.60
5.....	.90	2.80	.80	1.60	.60
6.....	.80	7.00	2.00	.50	.50
7.....	1.10	3.75	.80	.90	.80
8.....	.70	.....	.50	.90	.80
9.....	.70	2.50	.50	.80	1.00
10.....	.60	2.30	1.00	.80	.60
11.....	1.00	2.30	.50	.80	.50
12.....	.60	2.30	2.75	.70	.50
13.....	.60	2.00	1.00	.70	.20
14.....	.60	2.00	.50	.80	.20
15.....	.60	.....	.....	1.00	.20
16.....	1.30	1.50	.....	.50	D
17.....	1.45	1.50	.....	.60	D
18.....	1.20	2.00	2.60	1.20	D
19.....	1.10	1.60	1.00	1.00	D
20.....	1.10	1.50	.50	1.00	D
21.....	1.50	1.50	.50	1.00	D
22.....	1.10	1.00	1.15	.60	D
23.....	1.10	1.00	.85	1.00	D
24.....	.90	1.00	1.20	.80	D
25.....	.....	1.00	.65	.80	D
26.....	.90	1.00	4.75	2.30	D
27.....	.40	2.75	5.20	1.50	D
28.....	.40	2.00	2.50	2.10	D
29.....	.40	1.00	2.00	2.00	D
30.....	2.10	.20	1.00	2.30	D
31.....	3.50	.....	1.50	1.30	.....

D—Dry.

## DAILY MEAN GAGE HEIGHT.

Purgatoire River at Higbee, for 1908, from Reports of Irrigation  
Division Engineer, Division No. 2.

DAY	MAY Gage Height	JUNE Gage Height	JULY Gage Height	AUG. Gage Height	SEPT. Gage Height
1	D	D	D	2.00	1.00
2	D	D	D	1.50	1.00
3	D	D	D	1.00	1.00
4	D	D	D	.80	.80
5	D	D	D	.50	.80
6	D	D	D	.50	.50
7	D	D	D	.50	.50
8	D	D	D	1.80	.50
9	D	D	D	1.00	.50
10	D	D	D	1.00	.50
11	D	A	D	.50	.50
12	D	D	D	2.75	.50
13	D	D	1.4	1.00	D
14	D	D	D	1.00	D
15	D	4.8	2.0	1.00	D
16	D	1.5	1.25	1.00	D
17	D	1.0	3.00	3.00	D
18	D	1.0	1.5	1.60	D
19	D	1.0	5.5	1.50	D
20	D	.5	1.75	A	D
21	D	A	.70	2.00	D
22	D	D	.50	1.00	D
23	D	D	2.00	3.50	D
24	D	D	.80	2.65	D
25	D	D	5.40	1.50	D
26	D	D	2.25	1.50	D
27	D	D	2.00	1.50	D
28	D	D	.80	9.00	D
29	D	D	.80	2.75	D
30	D	D	.50	1.80	D
31	D		5.25	1.00	

D—Dry.    A—No report.

## DAILY MEAN GAGE HEIGHT.

South Platte River at Union, for 1907.

Frank Gilley, Observer, Pawnee.

DAY	JUNE Gage Height	JULY Gage Height	AUG. Gage Height	SEPT. Gage Height	OCT. Gage Height	NOV. Gage Height
1.....	2.00	A	A	.80	.....	1.10
2.....	A	A	A	1.40	A	.....
3.....	A	A <sup>1</sup>	A	1.40	.....	.90
4.....	A	A	A	1.00	A	.....
5.....	A	A	A	1.00	.....	1.10
6.....	A	A	A	.....	A	.....
7.....	A	A	A	1.20	.....	1.00
8.....	A	A	A	.....	1.90	.....
9.....	A	A	A	1.00	.....	1.00
10.....	A	1.80	A	.....	1.60	.....
11.....	A	1.70	1.10	1.00	.....	1.10
12.....	A	1.30	1.00	.....	1.80	.....
13.....	1.80	1.20	.90	1.20	.....	1.10
14.....	1.40	1.40	.90	.....	1.80	.....
15.....	1.40	1.20	.60	.80	.....	1.60
16.....	1.00	1.20	.60	.....	1.80	.....
17.....	1.40	1.10	.70	1.40	.....	.....
18.....	1.40	.80	.70	.....	1.70	.....
19.....	1.30	.90	.80	1.40	.....	.....
20.....	1.00	1.10	.70	.....	1.40	.....
21.....	1.10	1.10	.60	1.40	.....	.....
22.....	1.10	1.10	.60	.....	1.30	.....
23.....	1.10	1.20	.60	1.40	.....	.....
24.....	1.10	.80	.80	.....	1.30	.....
25.....	1.30	.90	.90	1.00	.....	.....
26.....	A	1.80	1.00	.....	1.80	.....
27.....	A	1.30	1.80	1.60	.....	.....
28.....	A	1.90	1.00	.....	1.20	.....
29.....	A	A	.90	1.60	.....	.....
30.....	A	A	.60	A	1.10	.....
31.....	.....	A	.90	.....	.....	.....

A—Above 2.00 ft. mark on gage.

THE FOLLOWING DISCHARGE MEASUREMENTS WERE MADE IN 1907.

DATE	GAGE HT.	HYDROGRAPHER	DISCHARGE
June 1 .....	2.00	C. W. Beach.....	934 sec. ft.
July 17 .....	1.02	Thos. Grieve.....	236 sec. ft.
Sept. 10 .....	0.83	Thos. Grieve. ....	226 sec. ft.

## DAILY MEAN GAGE HEIGHT.

South Platte River at Union, for 1908.

Frank Gilley, Observer, Pawnee.

DAY	MAY Gage Height	JUNE Gage Height	JULY Gage Height	AUG. Gage Height	SEPT. Gage Height	OCT. Gage Height	NOV. Gage Height
1.....		.80	.60	.90	.50		.60
2.....	.80	.70	.60	.90	.50	.80	
3.....	.80	.90	.60	.70	.60		.70
4.....	.80	.80	.60	.60	.80	.90	
5.....	.80	.80	.40	.70	.80		
6.....	.90	.70	.40	.70	.90	.90	
7.....	.90	.70	.50	.80	.80		
8.....	1.90	.70	.70	.90	.80	.80	
9.....	1.30	.70	.80	.90	.80		
10.....	1.20	.70	.80	.90	.70	.80	
11.....	1.20	.80	.80	.70	.60		
12.....	1.30	.80	.80	.90	.80	.80	
13.....	1.10	.80	1.00	.90	.80		
14.....	1.20	.80	1.00	1.00	.80	.80	
15.....	1.30	.80	.80	1.00			
16.....	.90	.90	.80	.90	.90	.80	
17.....	.80	.90	.80	.80			
18.....	.70	2.00	.80	1.00	.90	.90	
19.....	.50	1.00	.90	1.00			
20.....	.50	.80	1.00	1.30	.70	1.60	
21.....	.40	.80	1.00	.90			
22.....	.60	.70	.90	.90	.70	1.30	
23.....	.60	.60	.90	.90			
24.....	1.00	.60	.70	.90	.70	1.00	
25.....	1.00	.60	1.00	.90			
26.....	1.10	.50	.90	.80	.70	.90	
27.....	1.40	.50	.80	.80			
28.....	1.20	.50	.80	.70	.70	.80	
29.....	.90	.50	.80	.70			
30.....	.90	.60	.90	.60	.80	.70	
31.....	.80		1.00	.60			



THE FOLLOWING DISCHARGE MEASUREMENTS WERE MADE IN 1908.

DATE	GAGE HT.	HYDROGRAPHER	DISCHARGE
May 2.....	0.81	C. W. Beach.....	117 sec. ft.
June 10.....	0.70	U. S. G. S. ....	90 sec. ft.
July 21.....	0.90	U. S. G. S.....	155 sec. ft.
July 31.....	0.85	Thos. Grieve.....	143 sec. ft.



CONVICTS GRADING WAGON ROAD NEAR TRINIDAD, COLORADO.



VIEW ALONG COMPLETED WAGON ROAD CONSTRUCTED  
BY CONVICTS.



SOUTH PLATTE RIVER DRAINAGE.  
TABLE OF DISCHARGE IN SECOND FEET OF BIG THOMPSON CREEK AT ARKINS, BELOW  
HANDY DAM.

Drainage Area 305 Square Miles.

YEAR	STAGE OF WATER	MONTH											
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1907	Maximum.....	.....	.....	.....	*150	916	1,268	1,576	694	†170	.....	.....	.....
	Minimum.....	.....	.....	.....	75	99	649	524	180	135	.....	.....	.....
	Mean.....	.....	.....	.....	107	396	959	995	330	146	.....	.....	.....
1908	Maximum.....	.....	.....	.....	a141	237	600	1,250	552	207	79	77	.....
	Minimum.....	.....	.....	.....	7	59	204	204	156	77	20	20	.....
	Mean.....	.....	.....	.....	86	133	381	360	309	125	52	60	.....

\* April 10-30 inclusive. †Sept. 1-5 inclusive.

NOTE.—Monthly discharge does not include water in Handy Ditch.  
aApril 10-30 inclusive.

DISCHARGE IN SECOND FEET OF BOULDER CREEK AT BOULDER.  
Drainage Area 179 Square Miles.

YEAR	STAGE OF WATER	MONTH											
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1907	Maximum					579	795	948	383	130	45	49	52
	Minimum					152	383	355	112	39	26	14	16
	Mean					343	623	604	208	71	33	33	35
1908	Maximum				101	203	358	250	175	58	31	28	
	Minimum				6.5	42	186	128	60	35.4	18.5	9.5	
	Mean				42	115	264	180	121	44	23	20	

a Gage washed out July 31. New gage put in on Aug. 14, and readings begun Aug. 16. No relation between old and new gage.



DISCHARGE IN SECOND FEET OF SOUTH PLATTE RIVER AT FIFTEENTH STREET, DENVER.  
Drainage Area 3,840 Square Miles.

YEAR	STAGE OF WATER	MONTH											
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1907	Maximum.....	'202	146	202	274	814	1,156	2,120	845	565	135	170	218
	Minimum.....	90	90	106	90	219	414	274	365	135	92	92	123
	Mean.....	124	112	161	211	451	759	832	551	355	107	112	159
1908	Maximum.....	152	98	122	88	191	280	225	al,406	.....	.....	.....	.....
	Minimum.....	78	60	78	69	60	69	98	78	.....	.....	.....	.....
	Mean.....	108	76	92	77	106	101	141	293	.....	.....	.....	.....

a Aug. 1 to Aug. 22.

DISCHARGE IN SECOND FEET OF SOUTH BOULDER CREEK AT MARSHALL.  
Drainage Area 125 Square Miles.

YEAR	STAGE OF WATER	MONTH											
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1907	Maximum.....				159	459	528	444	120	40	42	19	16
	Minimum.....				22	108	339	138	35	22	22	9	10
	Mean.....				73	287	433	258	62	26	25	15	14
1908	Maximum.....				61	130	244	162	96	28	26	22	.....
	Minimum.....				17	40	112	46	32	14	10	10	.....
	Mean.....				38	79	162	81	55	20	18	16	.....

NOTE.—Monthly discharge does not include water in Community Ditch and South Boulder and Coal Creek Ditch

DISCHARGE IN SECOND FEET OF ST. VRAIN CREEK AT LYONS.  
Drainage Area 209 Square Miles.

YEAR	STAGE OF WATER	MONTH											
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1907	Maximum.....	.....	.....	.....	*226	†710	880	976	536	140	100	32	26
	Minimum.....	.....	.....	.....	118	426	488	488	161	42	28	10	10
	Mean.....	.....	.....	.....	146	538	705	701	271	79	51	17	16
1908	Maximum.....	.....	.....	.....	87	152	412	566	288	148	60	43	.....
	Minimum.....	.....	.....	.....	16	43	159	152	126	38	20	28	.....
	Mean.....	.....	.....	.....	39	100	264	223	184	96	39	37	.....

\* April 10-19 inclusive. † May 16-31 inclusive.

NOTE.—Discharge does not include water in Supply Ditch.









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